TRAJECTORIES OF TWO RACINE BIRTH COHORTS: A THEORETICALLY INTEGRATED MODEL FOR EXPLAINING OFFENDING

By

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Macro-level research evidencing the relationship between communities and crime dates back to the early ecological work of Park and Burgess and later further developed by Shaw and McKay into what is commonly referred to as social disorganization theory. This research has since shown that poverty, ethnic heterogeneity, and residential mobility lead to the inability for members of the community to develop mechanisms of informal social control, which in turn leads to higher rates of crime.

In contrast, micro-level theories such as Sampson and Laub’s theory argues that individual pathways of offending can be altered by life transitions such as marriage and employment. Comparatively, Moffitt’s taxonomy asserts that there are two theoretically distinct groups of offenders, where one group displays an adolescent-limited type of offending and the other group are considered to be life-course-persistent or chronic offenders. Moffitt has also argued that the life-course-persistent type is predominantly a male phenomenon.

This study will provide one of the first attempts to explore the possibility of developing a theoretically integrated model for explaining group offending using trajectory analysis and relying on data from two Racine Birth Cohorts. Results from this study relying on official data
yielded varying levels of support for all of the theoretical frameworks mentioned above. Specifically, all of the trajectory models discovered groups consistent with Moffitt’s typology, as well as uncovering groups not necessarily consistent with her typology. Also consistent with Moffitt, sex was shown to be a significant covariate for predicting group assignment. Bivariate support was found for Sampson and Laub’s age-graded theory of informal social control. Lastly, multivariate support was revealed for the impact of living in a socially disorganized area. Yet, once mlogit models were estimated incorporating the individual and neighborhood effects there was evidence of mediation. It appeared that individual and family variables at times completely or at least partially mediated the effect of social disorganization as a distinguishing feature of group membership. Implications for the current findings and directions for future research are also discussed.
CHAPTER 1
INTRODUCTION

Introduction

There exists a large body of research that has identified the association between the variation in the rate of offenders and community structural dynamics, most notably in the social disorganization literature (Bursik & Grasmick, 1993). Similarly, there has been a long line of research that has linked individual-level factors to involvement in offending (Farrington, 1995). Yet, few efforts combine these levels of analysis. On this score, Sampson (1997:32) provided an accurate summary of the current state of research in integrated approaches to studying offending in noting that “few studies have successfully demonstrated a unified approach to individual and neighborhood-level dimensions of crime.”

The primary focus of this dissertation is to present empirical data that will shed light on the question of the extent to which macro-level, micro-level, or some combination of factors best relates to offending over the life course. In order to answers these questions, this study relies on extensive longitudinal data from two birth cohorts of Racine, Wisconsin residents (Shannon, 1988, 1991) and utilizes a novel methodology for identifying latent classes of offenders. After classifying the Racine residents into offender groups, a series of multinomial regression models will allow for an assessment of the relative strength macro-level and micro-level factors for increasing and/or decreasing the likelihood of belonging to one trajectory group as opposed to another.

Background

While a handful of studies have compared rates of offending with individual/family SES and area (or school) SES and have found that the highest rates of offending generally were observed in the lowest SES areas among the individuals with the lowest SES (Braithwaite, 1979;
Reiss & Rhodes, 1961; Wikstrom, 1991a), only a few studies have investigated the influence of
other individual and community covariates on offending. Lindstrom (1996) found that the level
of family interaction was significantly associated with juvenile offending and this relationship
was the most pronounced in more socially disadvantaged neighborhoods. Kupersmidt et al.
(1995) showed that juveniles living in single-parent families in low SES neighborhoods were
more likely to be aggressive than their counterparts in high SES neighborhoods. Relying on a
comparison of two different groups of Pittsburgh neighborhoods (i.e., underclass and non-
underclass), Peeples and Loeber (1994) indicated that the relationship between race and juvenile
offending was only apparent in the underclass neighborhoods.

Even less research has targeted the integration of individual and neighborhood effects on
offending under the auspices of the criminal career paradigm (Blumstein et al., 1986) and recent
developmental frameworks. Wikstrom (1991b) conducted one of the first studies to address this
deficiency in the existing research and found that individuals that resided in the most socially
disadvantaged areas had the highest levels of both participation and frequency of offending.
Loeber and Wikstrom (1993) also showed that not only did juveniles offend at higher rates (i.e.,
greater participation and frequency) in low SES neighborhoods when compared with those from
neighborhoods with higher SES a significantly larger proportion of the offenders in the low SES
neighborhoods became serious offenders.

In a more recent study, Wikstrom and Loeber (2000) examined whether the interaction of
risk and/or protective factors and community context had an influence on early and late-onset
offending among three samples of boys in 90 Pittsburgh neighborhoods. They found that
neighborhood socioeconomic context did not have a direct effect on the prevalence of offending
for boys who had a high number of risk factors, but for those who had balanced risk-protective
factor scores, neighborhood context mattered. In addition, they indicated that individual risk-protective scores had a greater impact on the rate of early-onset offending (before age 13) than did neighborhood context, but that a direct neighborhood effect was observed for late-onset offending (after age 12).

Lynam et al. (2000) found that the effects of impulsivity on juvenile offending was stronger in poor neighborhoods; however, living in a disadvantaged neighborhood did not heighten nonimpulsive boys’ risk for juvenile offending when compared with residing in more advantaged neighborhoods. Lynam et al. (2000) also noted that the direct neighborhood effects on individual juvenile delinquency were relatively weak, whereas the neighborhood effects were stronger when using self-reported measures of the quality of the neighborhood obtained directly from the inner-city youth.

In a more recent study, Piquero, Moffitt, and Lawton (2005) investigated the possible interaction effects of individual, familial, and neighborhood-level factors on life-course-persistent offending. Their data were derived from the National Collaborative Perinatal Project (Baltimore site) and consisted of information from the original NCPP study that included early childhood and census-tract measures along with additionally including follow-up interviews with the children in the 1990s. Piquero et al. (2005) failed to find direct effects for either neighborhood or individual risk for life-course-persistent offending; however, they did find that individual, family, and neighborhood-level effects predicted life-course-persistent offending patterns among African-Americans in disadvantaged neighborhoods. In addition, while Piquero et al. (2005:230) concluded that their analysis demonstrated similarities across race in life-course-persistent patterns of offending, there were marked differences in the neighborhood contexts where the Whites and African-Americans lived.
With attention to the relative arbitrariness of how prior research has defined offender groups, more recent research applying Nagin and Land’s (1993) group-based modeling technique has begun to identify latent classes of offenders that exhibit distinct pathways of offending (for review see Piquero, 2007; see also Nagin, 2005). The consistent finding across these studies has been the identification of three main types of offending groups: (1) non-offenders; (2) adolescent-limited offenders; and (3) chronic or high-rate offenders. D’Unger, Land, McCall, and Nagin (1988) were also able to discover similar offending types across a variety of longitudinal data sources. It is important to emphasize here that the data relied on in this study is official data not self-report; therefore it is likely that the non-offender group will be much larger than it would be if the trajectories were estimated using self-report data instead.

Additionally, D’Unger, Land, and McCall (2002) found evidence of relatively comparable latent offending classes using data from the Second Philadelphia Birth Cohort (Tracy, Wolfgang, & Figlio, 1990); however, the adolescent-limited group they uncovered was characterized as adolescent-peaked because of their elevated levels of offending in adolescence. This adolescent-peaked grouped has also been noted by other researchers (for review, see Piquero, 2007). Yet, other groups have also emerged such as low-level chronics or late-onsetters (see D’Unger et al., 1998, 2002).

Prior applications of this methodology have also found similar offender groups in male and female trajectories (Cote et al., 2001, 2002; D’Unger et al., 2002; Fergusson & Horwood, 2002; Land, 2000; Piquero, Brame, & Moffitt, 2005) and other research has identified factors other than sex such as low socioeconomic status (McDermott & Nagin, 1998) and peer and school influences (Chung et al., 2001) as being strongly related to the likelihood of being classified as a chronic offender. Land (2000) has also shown that sex was a significant predictor of chronic
offending patterns, although its effect was completely mediated by the inclusion of neighborhood context.

Present Study

This current study contributes to the literature in following ways. First, by drawing from the present advancements in the criminological literature regarding the application of trajectory analysis for classifying offenders (Nagin & Land, 1993; Nagin, 2005), this study seeks to provide another replication of the latent class groups that have been previously identified by prior researchers (for review, see Piquero, 2007) such as the non-offenders, adolescent-limited/peaked offenders and chronic offenders across two Racine Birth Cohorts. Second, this study seeks to investigate whether sex is a distinguishing feature of group-based trajectories as has been discussed in prior applications of this group-based modeling technique (see Cote et al., 2001, 2002; D’Unger et al., 2002; Fergusson & Horwood, 2002; Land, 2000; Piquero et al., 2005). Third, this research will include an exploration into the impact that social disorganization has on individual offending patterns. Fourth, guided by two prominent developmental theoretical frameworks, specifically Sampson and Laub’s (1993) age-graded theory of informal social control and Moffitt’s (1993) taxonomy of adolescent-limited and life-course-persistent offenders, this study seeks to explore the impact of key life transitions (marriage, employment) on desistance from offending in adulthood and assess the viability of Moffitt’s taxonomy. Fourth, the saliency of Moffitt’s (1994; see also Moffitt et al., 1994) claims that males are more likely to be life-course-persistent offenders than females will also be explored. Finally, this study seeks to address the rather limited amount of research integrating macro-level and micro-
level factors that may simultaneously affect an individuals’ pathways of offending using data from two of Shannon’s (1988, 1991) Racine Birth Cohorts.  

### Layout of Dissertation

This dissertation will consist of six chapters. Chapter 2 will begin with a discussion of the various theoretical frameworks that provide the basis for the study. More specifically, it will begin with a brief description of how scholars have defined a “community” over time followed by an outline of the origins and theoretical tenets of social disorganization theory. Next will be an explanation of the relationship between age and crime and how research on the age-crime curve complements the emergence of the criminal career paradigm. Similarly, the narrative will continue with a discussion of how the criminal career paradigm had a direct contribution to the development of what has become known as developmental/life-course criminology. This chapter will conclude with a presentation of Sampson and Laub’s (1993) age-graded theory of informal social control (see also Laub & Sampson, 1993) and Moffitt’s (1993) taxonomy of offending, the latter providing the theoretical rationale for hypothesizing why different classes of offenders may exist and the former describing certain life transitions that may affect an individual’s offending trajectory.

Chapter 3 will continue by offering an in-depth exploration into the prior extant literature that can be found examining each of the theoretical frameworks mentioned above. Most notably, this chapter will illustrate the links between social disorganization and individual patterns of offending, along with addressing the prior research on chronic offending, crime over the life-course (i.e., Sampson and Laub’s age-graded theory of informal social control), and offer a

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1 This study relies on data from the 1942 and 1949 Racine Birth Cohorts, as opposed to all three of the cohorts (1942, 1949, 1955), because there is not any self-reported interview data available for the 1955 cohort precluding its use for investigating the particular individual-level factors addressed in this research. According to Shannon (1988, 1991), lack of continued federal funding prevented him from interviewing the most recent 1955 cohort.
description of studies that have supported Moffitt’s (1993) proposed taxonomy and also demonstrated evidence that life-course-persistent offending may be disproportionately found among males. This chapter concludes with a presentation of the findings from several recent applications of Nagin and Land’s (1993) methodological technique for identifying group-based offending trajectories.

Chapter 4 will provide a systematic explanation of the source of the data and their limitations for the current research along with an in-depth description of the 1942 and 1949 Racine Birth Cohorts used in the analysis. The sample and data information will be followed by a comprehensive identification of all of the measures incorporated in this study including the macro-level and micro-level factors and the two dependent measures (number of police contacts and offending group membership). The final section of this chapter will explain the stages of the analysis as far as the ordering of the analytic procedures and the model specifications and will conclude with a brief discussion of the strengths of the study.

Chapter 5 will present the findings from all of the statistical analyses including the results from (1) the group-based trajectory estimations and model selection criteria; (2) a discussion of the importance of sex in predicting group assignment; (3) description of factors that are associated with group assignment; and (4) an examination of the impact of macro-level and micro-level variables (both separately and simultaneously) for significantly distinguishing between trajectory groups. The final chapter (Chapter 6) will begin with a further discussion on the findings as well as limitations of this research. This section will be followed by an offering of some suggestions and guidance for future research on mutli-level modeling and theoretical integration and will conclude with a few final thoughts.
CHAPTER 2
THEORETICAL PERSPECTIVES

Introduction

The origins of macro-level research, specifically social disorganization, can be traced back to the early work in the first half of the twentieth century by Park and Burgess (1925) and the later expansions by Shaw and McKay (1942). These researchers and others that followed in their footsteps have formed what is commonly referred to today as the Chicago School. These researchers, most notably Shaw and McKay, were influenced by the deep-rooted sociological tradition of studying the ecology of crime and focused on explaining why crime rates not individual criminality was higher in certain areas of the community. This tradition of studying and theorizing about crime in the aggregate persisted for some time until there became an increased interest in studying individual-level factors that affect offending, which was strongly influenced by the increased use of survey methodology in sociology and criminology. This early individual-level research sparked some of the most influential criminological theories that exist today including social learning theory (Burgess & Akers, 1966; Akers et al., 1979) and social control/bonding theory (Hirschi, 1969).

By the late 1970s and early 1980s individual-level research had evolved in the sociological and criminological literature and led to what is still considered one of the most robust relationships in the social sciences, i.e., the age-crime relationship, or the notion that crime rises to a peak in middle to late adolescence followed by a precipitous decline in early adulthood. Hirschi and Gottfredson (1983) argued that there is no need for any theory to account for the relationship between age and crime because it is invariant across culture, time, and space. Although, there has been a relatively strong amount of debate over this early assertion (which will be returned to later), this along with evidence from Wolfgang et al.’s (1972) research on
chronic offending fueled the development of the criminal career paradigm. This perspective involves a series of dimensions that will be addressed below, but most importantly, this framework highlighted the similarities and differences among offenders and their criminal careers (see Blumstein et al., 1986).

Coinciding with this new research interest was the birth of developmental criminology or life-course criminology. This theoretical perspective focuses on how involvement in crime changes over the life course. It highlights factors such as life transitions or turning points that can alter an individual’s offending trajectory (Elder, 1985). In addition, Sampson and Laub (1993) formulated an age-graded theory of informal social control that recognizes that different types of individuals have different offending careers and that there are age-dependent or age-graded processes that influence, shape, or alter one’s pathway of offending. In comparison, one of the most recognized developmental theories of crime (other than Sampson and Laub’s age-graded theory of informal social control) is that of Moffitt’s (1993) taxonomy of adolescent-limited and life-course-persistent offenders.

Moffitt argues that there are three theoretically and qualitatively distinct groups of individuals including: (1) the non-offenders; (2) the adolescent-limited offenders; and (3) the life-course-persistent offenders. Furthermore, she also argues that the patterns of offending for the two latter groups (i.e., the groups who are actually involved in offending) are driven by different causal processes, have different ages of onset, and are particularly distinct in their frequency of offending and career lengths. All of the theoretical issues touched upon above will be the focus for the remainder of this chapter, but it is first important to briefly visit the debate among scholars (sociologists and criminologists alike) on what is a community or neighborhood.
This definitional disagreement over the “appropriate” unit of analysis has been at the heart of macro-level research for some time.

**What is a Community?**

Community theory gained increased attention within the realms of sociology in response to the ecological work of Park and his colleagues at the University of Chicago in the 1920s and 1930s. Their study of the dynamics of urban life in Chicago supported the idea that variables such as population size, density, and heterogeneity interact to produce communities that can be characterized as “urban.” Following a brief decline in community-based sociological research in the 1950s and 1960s, the 1970s and 1980s hosted a general resurgence in attention devoted to the “community/neighborhood” debate. This movement was fueled by research that relied on using local community areas (Heitgerd & Bursik, 1987; Bursik, 1984, 1986), census tracts or some aggregation thereof (Schuerman & Kobrin, 1986; Shannon, 1988, 1991; Taylor & Covington, 1988), police districts (Shannon, 1988, 1991), and even electoral wards (Sampson & Groves, 1989) as the units of analysis. The consistency among the findings that were produced based on these varying aggregations and definitions of community/neighborhood was that there existed significant differences in local politics, economics, and lifestyles between communities and that the world is no longer comprised of “small isolated groups of human beings scattered over a vast territory” (Wirth, 1938:2).

An extension to the “community/neighborhood” definitional debate and its historical origins was more recently provided in Bursik and Grasmick’s (1993) classic work, * Neighborhoods and Crime: The Dimensions of Effective Community Control*. The authors began with the contention that although consensus had yet to be obtained regarding the definition of neighborhoods, there were several characteristics that the majority of sociologists would indicate that delineated a neighborhood including: (1) a small physical area within a larger area; (2) some
sort of common interest in the preservation of the inhabited area; and (3) a collective identity that tends to be constant over time (Bursik & Grasmick, 1993:6).

Bursik and Grasmick (1993) further argued that social control may exist within communities in different forms or what they identify as private, parochial, and/or public networks. However, they did contend that all communities tend to operate with the same underlying desire for informal and formal associations for eliciting social control in order to minimize crime (bearing in mind that particular crimes are likely to be differentially viewed as unconventional as well as differentially enforced across communities). Although, the “community/neighborhood” debate may be unresolved, but there appears to be a movement toward fleshing out the strengths of its definitional attributes and providing a more encompassing characterization.

This concept of community and the process of identifying particular factors that are associated or lead to crime were the basis for what has emerged as one of the classic theories of crime, or what is commonly known in the discipline as social disorganization theory. This next section presents the historical roots of the theory and lays out the core assumptions behind why crime should be higher in socially disorganized communities.

**Social Disorganization**

Early macro-level research investigating the importance of ecological characteristics for explaining crime rates has its origins from the Chicago School and the work of Park and Burgess (1925) and Shaw and McKay (1942). The work of the latter scholars focused on attempting to offer a conceptual framework to explain the stability of aggregate crime/delinquency rates over time in the city of Chicago despite the dynamic change in the racial and ethnic composition of its neighborhoods (Shaw & McKay, 1942). Shaw and McKay argued that the majority of the crime tended to be concentrated in pockets of the city that Park and Burgess (1925) characterized as the
zones of transition that surround the central business district. The negative inverse relationship that Shaw and McKay observed between the neighborhoods’ spatial distance from the central business district and their crime rates provided the framework for their theory of social disorganization. More specifically, their theory emphasizes the concentration of high levels of population turnover, racial and/or ethnic heterogeneity, and poverty in the neighborhoods that exhibit the highest rates of crime/delinquency.

At the fundamental level, social disorganization is assumed to be the causal factor between neighborhood characteristics and offending patterns at the aggregate level because it emphasizes the importance of the ability of a community’s residents to realize shared goals and values and regulate the conduct of its citizens (i.e., informal social control) (Berry & Kasarda, 1977; Kornhauser, 1978; Sampson & Groves, 1989; Sampson, Raudenbush, & Earls, 1997). High population turnover (i.e., residential instability) as identified by Shaw and McKay (1942), is seen as a structural antecedent that may impede the ability of communities to organize effectively and to self-regulate residents’ behavior because of the constant out-migration that characterizes high-crime communities. This high rate of residential mobility is believed to produce a social atmosphere where many residents are “uninterested in communities they hope to leave at the first opportunity” (Kornhauser, 1978:78). This situation leads to the potential failure of the community’s residents to forge interpersonal ties, or even weak ties which some scholars have argued are the most important (see Bellair, 1997; Granovetter, 1973), because of the prevailing opinion that either they or their neighbors will soon be leaving the area.

Racial and/or ethnic heterogeneity is the second structural characteristic recognized by Shaw and McKay (1942) that may perhaps hinder the ability of communities to develop mechanisms of informal social control. It is also causally linked to the high rates of population
turnover mentioned above. This connection is primarily due to the fact that in communities that are characterized by rapid compositional change, it becomes difficult to promote a unified front against the “invasion” of potentially threatening groups (Bursik & Grasmick, 1993:33). Furthermore, heterogeneity can inhibit communication, especially in communities that are plagued by language barriers. This will more than likely make it increasingly difficult for the residents to solve or even express their common problems and goals (Kornhauser, 1978:75).

Shaw and McKay (1942) also indicated that high rates of poverty/low socioeconomic status are characteristic of socially disorganized communities. According to Shaw and McKay, this situation was attributable to the constant out-migration to the suburbs of residents that had the ability to move, and the area that the former residents left behind still tended to be plagued by poverty and increased crime/delinquency rates, regardless of which racial/ethnic group settled into the area. These individuals who lack the opportunity and/or resources to “escape” this socially disorganized area (i.e., the inner city) have been referred to by Wilson (1987) as “the truly disadvantaged” because they have to live in areas of extreme concentrated poverty and with a high density of subsidized housing. This density of subsidized and predominantly renter-occupied housing has also been associated with crime rates (see Schuerman & Kobrin, 1986).

Schuerman and Kobrin (1986) have indicated that although little is known about how neighborhoods evolve into high-crime areas, prior research has evidenced distinct stages of neighborhood development that typify the reciprocal effects of crime and community decline. “Emerging” is the first stage where neighborhood deterioration precedes the high-crime rates, but once communities move through the transitional stage and into the last stage (i.e., enduring phase), then the high-crime rates precede the further deterioration of the neighborhood. A host of factors has been attributed to neighborhood deterioration including: movement from single to
multiple family dwellings, residential mobility, broken homes, rise in young adult population, minority group relations, female participation in the work force, and even advanced education. In addition, according to Taylor (1995), prior scholars have contended that community decline is primarily the result of residential mobility or at least the residents’ desire to move from their current area. This resident turnover has been connected to many adverse neighborhood outcomes including weaker attachments among residents, lower satisfaction with the neighborhood, less local involvement, and decreased housing values.

Although not explicitly referenced by Shaw and McKay in the formulation of their theory, the relative inability of researchers to perhaps appropriately interpret Shaw and McKay’s underlying assumptions and/or disentangle the reciprocal effects of social disorganization—meaning that the factors identified above may both influence crime rates and foster social disorganization—led to a shift in the discipline in favor of individual-level theories of crime causation (Land, 2000). However, several researchers have made recent attempts to revitalize the work of Shaw and McKay (1942) and better define the causal pathways that exist between neighborhood characteristics and offending (see Bursik & Grasmick, 1993; Sampson & Groves, 1989).

Bursik and Grasmick (1993) put forth an attempt to define their systemic theory of neighborhood organization for explaining crime. At the fundamental level, systemic theory is predicated upon the ability of neighborhoods to control themselves and their surrounding environment in order to minimize their likelihood of victimization and reduce crime. The authors argue that formal and informal mechanisms of social control are equally important if the neighborhood is to be successful in reducing crime.
The private, parochial, and public spheres are regarded as the three specific elements that are important in eliciting the necessary controls on the behaviors of the neighborhood’s members. The private level of control is expressed through the strong intimate informal networks that exist within the communities that are able to reduce crime by threatening or withdrawing social support from those members who engage in inappropriate or non-normative behavior. The parochial level of control is directly tied to the ability of social institutions such as the school and church to influence behavior through the shared sentiments of the neighbors for reducing victimization risk. The public level of control is perhaps the most difficult to obtain and emphasizes the ability of the neighborhood to mobilize government resources at the local level and acquiring crime controlling agents (i.e., police) as an external resource to reduce the crime in their neighborhood. These three mechanisms are believed to manifest themselves through neighborhood-level interactions over time; however, the greatest impediment for the formation of the ties is residential instability, which presents a dilemma being that those communities who need these three mechanisms the most will be the least capable of developing them (Bursik & Grasmick, 1993).

Sampson and Groves (1989) also emphasized the importance of family disruption when examining the effect of social disorganization on crime. They argued that marital and family disruption (i.e., divorce and single-parent households) may decrease the ability for community residents to develop informal social controls. This assumption is based on the belief that two-parent households provide stability and increased supervision for their children. Two parents also allow for more supervision over their personal property. Sampson (1987) has shown rather large effects for family disruption on rates of juvenile crime. Although, Sampson and Groves (1989) demonstrated that social disorganization (as measured by sparse friendship networks,
unsupervised teenage peer groups, and low organizational participation) mediated a rather significant portion of the direct effect of family disruption on crime/delinquency rates as well as mediating the effects of other structural characteristics such as classical social disorganization measures (low SES, residential mobility, and ethnic heterogeneity).

In sum, the social disorganization framework provides a backdrop for explaining why crime rates may be higher in communities that are characterized by high population turnover, ethnic/racial heterogeneity, and residential instability, but just how social disorganization can also be expected to have an affect on individual outcomes will become clearer in the next Chapter (Ch. 3). The next section (along with the remaining sections in Chapter 2) illustrates a complete shift in theoretical framework by not focusing on explanations of crime in the aggregate but by presenting a series of criminological paradigms and micro-level developmental theories that have been offered to explain individual variation in crime.

**Age-Crime Relationship and Criminal Careers**

Perhaps the most commonly accepted fact about crime is the association between age and crime (Cohen & Land, 1987; Hirschi & Gottfredson, 1983; Hirschi & Gottfredson, 1985; Farrington, 1986a; Greenberg, 1985; Obrien, Stockard, & Isaacson, 1999; Sampson & Laub, 1990, 1992; Shavit & Rattner, 1988; Steffensmeier, Allan, Harer, & Streifel, 1989; Steffensmeier, Streifel, & Shihadeh, 1992). The progression of what has been referred to in the literature as the “age-crime curve” is that the crime rate, as measured by arrest, typically increases from the minimum age of criminal responsibility and peaks in the teenage years followed by a decline in early adulthood (Farrington, 1986a). Although this general statement accurately characterizes the age-crime curve, in order to fully understand the complexity the age-crime relationship it is necessary to revisit Hirschi and Gottfredson’s (1983) original article discussing this phenomenon entitled *Age and the Explanation of Crime*. 

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Hirschi and Gottfredson (1983:54), in response to what they considered to be the misapplication of the age-crime distribution by scholars in criticizing social theories of crime and supporting longitudinal methods over cross-sectional designs, assert that the effect of age is invariant across time, place, social and cultural conditions, and crime type. They indicated that rates of delinquency have been comparable over the last 150 years and that the age distribution of delinquency in England and Wales in the 1940s, Argentina in the 1960s, and the United States in the 1980s are virtually indistinguishable. They further argued that although non-White offenders may start their delinquency earlier and offend at a higher rate than Whites and that while boys offend at higher rates than girls for particular offenses, the age-crime curve is still invariant across race and sex (1983:556). In addition, they provided evidence against the differences in the age-distributions of property and person offenses. They illustrated that while official data may reveal different age-crime curves for person and property offenses, this difference is not observed in self-report data; therefore, the effects of age are indeed invariant across crime type.

Hirschi and Gottfredson’s (1983) early claims about the invariance of the effects of age across historical and cultural conditions and crime type were soon met by criticism. Farrington (1986a) specified that the main limitation of interpreting the types of age-crime curves used by Hirschi and Gottfredson (1983) is that there is probable ambiguity in differentiating between age and period effects. Period effects are significant factors that are time-period specific, such as eras of high unemployment, riots, and/or civil unrest, and these influences are only related to changes in the crime rates of those cohorts that are aligned with that particular era in history. In contrast, age effects are universal changes that occur with age (i.e., natural maturation) that lead to physical deterioration for all cohorts during all periods of observation.
Farrington (1986a) further argued that there is also the issue of disentangling cohort effects when interpreting the age-crime relationship. Cohort effects are influences that are due to an offender’s membership in a specific cohort, such as belonging to the baby-boomer generation. Taken together, all of these matters present problems because an individual’s actual age is always measured in number of years and typically equals the current year (period) subtracted by birth year (cohort) (Farrington, 1986a).

Furthermore, according to Farrington (1986a) the inherent characteristic of the age-crime curve that receives the least amount of attention is that it reflects variations in the prevalence (how many individuals are involved in crime) rather than the incidence (how many crimes are committed) of offending (see also Blumstein et al., 1988). While age-crime curves for individuals are typically unimodal (with only one peak in the teenage years), Farrington (1986a) argues that these curves do not mirror the aggregate curve that was referred to by Hirschi and Gottfredson (1983). Additionally, individual crime rates have been shown to be constant during a criminal career, thus providing evidence that arrest rates do not always decrease with age for all offenders (Blumstein & Cohen, 1979).

Farrington (1986a) also showed that aggregate age-crime curves can be comparable, but it is their measures of distribution and central tendency that vary across time, place, sex, and offense type. Nevertheless, despite the conflicting arguments discussed above particularly between Hirschi and Gottfredson (1983) and Farrington (1986a), there is virtually no definitive evidence refuting the strong relationship between age and crime. Given the robustness of this relationship, recent attention has drawn researchers to focus on how criminal behavior changes throughout the various stages of life (Sampson & Laub, 1990, 1992) and this approach has
become characterized as the criminal career paradigm (Blumstein, Cohen, Roth, & Visher, 1986).

Blumstein et al. (1986) pointed out that the bulk of prior research in criminology was devoted to investigating crime using aggregate crime rates and/or crimes per capita in the general population. This aggregate crime rate is the product of the participation rate of offending and the frequency of offending among the general population involved in crime, which according to Blumstein et al. makes studying individual criminality difficult. Hence, in an effort to better enable researchers to study differential offending patterns, the criminal career paradigm is unique because it divides the aggregate crime rate into two modules and has its own set of terminology and dimensions.

The first module of the aggregate crime rate is participation in offending, or prevalence. Criminal career research distinctly categorizes individuals into those who are criminally active and those who are not (Blumstein & Cohen, 1987). Participation measurement is an expression of both the offender’s involvement in crime and the range of the criminal acts committed during the observation period (i.e. serious or serious and non-serious offenses). Regardless of the range of specified offenses or the particular observation period, active offenders always include new offenders (i.e., first offense occurs during observational period) and offenders who began their offending prior to the observation period but remain criminally active during the period of study (Blumstein et al., 1986:18). Therefore, according to Piquero, Farrington, and Blumstein (2003:246), “the longer the average duration of offending, the greater the contribution of persisters to measured participation in successive observation periods.”

According to Blumstein et al. (1986), national estimates of participation in offending can range anywhere from a low of 25% to almost 45% depending on the operationalization of what
constitutes an offense. Visher and Roth (1986) conducted one of the most comprehensive attempts to capture a “true” estimate of the participation rate of offending across the United States and Great Britain. They found that across both countries, the average participation rate for non-traffic related offenses was approximately 30%. However, the rate fluctuated based on which type of criteria was employed, with the participation rate being the lowest when a stringent official measure was used such as “conviction” (West & Farrington, 1973, 1977) and the participation rate tended to be the highest when a more comprehensive official definition of offending was utilized such as “police contact” (Shannon, 1988, 1991).

The second partition of the aggregate crime rate is frequency of offending. This refers to the average annual crime rate contributed by a particular group of offenders. Participation illustrates the pervasiveness of offending in the general population, whereas the frequency refers to the intensity of the individual offender’s criminal activity (Blumstein et al., 1988). The frequency of offending is referred to as lambda (\( \lambda \)), in order to discriminate it from the aggregate rate used in the Uniform Crime Reports (UCR) (Blumstein & Cohen, 1987), and regarding lambda, most studies have found relative stability over age, (Blumstein et al., 1986; Chaiken & Chaiken, 1982), sex (Blumstein et al., 1986), and crime type (Peterson & Braiker, 1980).

The length of an individual’s criminal career (duration) and the seriousness of offending are also important concepts in the criminal career paradigm (Blumstein et al., 1986:13). The duration of a criminal career indicates the total length of time of a criminal’s offending (Blumstein & Cohen, 1988). It represents the time that elapsed from the offender’s initial offense to the time of his/her last offense (Blumstein et al., 1986:13), or in other words the interval between an initiation and a termination in offending (Piquero et al., 2003). Research has shown that there is a significant amount of variation in criminal careers, where many offenders’
criminal careers are brief and end in their teenage years and others continue to commit crimes up to and beyond middle age.

Piquero, Brame, and Lynam (2004) have argued that the relative inattention of research regarding the duration of criminal careers is due to the difficulty in determining the true end of a criminal career. This difficulty has been addressed by Blumstein et al. (1986:18) where they stated the importance of distinguishing total career length from residual career length, wherein the later refers to the estimated time remaining in an offender’s criminal career given the specific observational period. Attention to this element is what Piquero et al. (2003) referred to as subsequently calculating estimates of career termination probabilities after an offender's arrest. Numerous studies (for review, see Piquero et al., 2003) have attempted to measure offender career lengths in actual number of years producing varying results ranging from a low of five years (Blumstein, Cohen, & Hsieh, 1982) to a relative high of 17.27 years (Piquero, Brame, & Lynam, 2004).

Most recently, Kazemian and Farrington (2006) found evidence of a general decline in residual career length and offending frequency over time based on data from the Cambridge Study in Delinquent Development. The decline in residual career length was observed in the original South London male sample and among their sons, although offending frequency did not decline as a result of conviction for the fathers. In addition, age of onset was associated with both residual career length and offending frequency, but the relationship was noticeably weaker among the fathers.

The seriousness dimension of criminal career research reflects both the number of offenses committed, as well as the particular patterns of switching (i.e., versatility) among offenses (Blumstein et al., 1986:13). There are numerous types of offenses in which criminals can engage
in across the course of their career, as is there are wide variation among offenders in their levels of specialization and seriousness of offending. Offenders have been classified as either “specialists” (concentrating in only one offense type or closely correlated offenses) or “generalists” (active in numerous types of related and non-related offenses) and the types of offenses can also fluctuate, either escalating or de-escalating in seriousness (Blumstein et al., 1986:18).

In a summary provided by Piquero et al. (2003:250) the authors note that most research has provided support for the generality of offending throughout the duration of a criminal career and that specialization might occur more frequently among adult offenders versus juvenile offenders. In addition, there is some evidence in favor of offense versatility, although this switching tends to occur across clusters of logically related crime types (i.e., violence, property, and other). Also, minimal research has addressed the issue of co-offending patterns and found that juveniles tend to commit crimes in groups, especially regarding burglary and robbery, and males tended to co-offend with other males.

Overall, criminal career research, comprised of all its relative dimensions, attempts to address questions of if, how, and why different factors influence the beginning of criminal activity, the continued participation and prevalence of offending, and factors related to desistance or termination of criminal activity. This criminal career paradigm also directly coincided with the movement toward developmental and life-course perspectives for explaining crime; however, the life-course approach differs from the traditional approach to criminal career research because it recognizes that there may be different types of offenders that may have different types of careers (Farrington, 1999). The next section is devoted toward describing life-course theory and
presents both sides of the debate regarding the persistent-heterogeneity versus state-dependent explanations of criminal behavior.

**Developmental Criminology/Life-Course Theory**

The life-course perspective can be defined as a series of pathways throughout the developmental process where there are varying age-dependent expectations and available options in an individual’s decision-making process. These decisions along with the natural course of life events are seen to shape the trajectory of an individual’s life and can be influenced by transitions and turning points (Elder, 1985). Trajectories are viewed as pathways of development over the life span such as work life, marriage, schooling, or involvement in crime. They are seen as long-term behavioral patterns that are marked by a sequence of life events and transitions. These transitions are then described as distinct life events that occur in shorter intervals that may alter an individual’s behavioral trajectory (such as first job, first marriage, first child, etc.) (Elder, 1985:31-32).

Sampson and Laub (1990) extended this framework by focusing on the strong association between childhood events and adulthood experiences, and the idea that transitions can redirect an individual’s life-course behavioral pathway. They indicated that life-course analysis focus on the length, timing, and the order of significant life events (including crime) and their effect on future social development (Sampson & Laub, 1992). Attention to the impact of life events is critical because prior research has shown that committing a crime has a considerable behavioral influence on the likelihood of an individual committing crime in the future (Nagin & Paternoster, 1991).

Loeber (1982) indicated that children who initially exhibited high rates of antisocial behavior were more likely to continue this behavior than those who initially showed slower rates of antisocial behavior. Relying on data from 411 South London males, Farrington (1995:956),
concluded that “offending may increase or decrease over time, but the worst offenders at one age still tend to be the worst at another age.” This statement is essentially the basis of Gottfredson and Hirschi’s persistent-heterogeneity interpretation (or static approach) of the relationship between past and future offending where they state that:

The best predictor of crime is prior criminal behavior… [and] research shows that differences between people in the likelihood that they will commit criminal acts persist over time…and these differences appear early and remain stable over much of the life course (1990:107-108).

Gottfredson and Hirschi (1990) expand upon this viewpoint in their discussions regarding their theory of low self-control. According to Gottfredson and Hirschi (1990: 97), the main underlying cause of low self-control is ineffective child-rearing. They argue that it is the primary caregiver's (i.e., the parents) role to teach the child self-control through monitoring their behavior, recognizing deviant behavior when it occurs, and effectively punishing the observed deviant behavior. These practices are believed to foster the child's development of self-control and an ability to delay gratification. The formulation of this core trait will also better enable the child to become more sensitive to the interests and desires of others, become more independent and willing to restrain their behaviors, and have a lesser propensity for using force or violence as a mechanism for resolving disputes or achieving their ends.

Gottfredson and Hirschi (1990:90-91) further argue that the six primary elements that characterize individuals who exhibit low self-control are impulsivity, insensitivity, physically as opposed to mentally oriented, short-sightedness, risk-takers, and displaying a low tolerance for frustration. Although these six components are known to be distinct personality and behavioral traits, these various dimensions are all believed to be established early on in childhood and coalesce within individuals to manifest a single construct that remains persistent throughout the life course. The fact that these elements fuse together to generate a unitary construct, what
Gottfredson and Hirschi refer to as criminal propensity, does not necessarily mean a crime will occur. The theorists indicate that this propensity will only cause an individual to engage in a crime or an analogous behavior once it converges with an opportunity to commit a criminal act. However, this temporal convergence of propensity and opportunity is not meant to argue the fact that it occurs without the individual's knowledge of some social, legal, or natural sanctions associated with their behavior. It is meant to indicate that individual's with low self-control will tend to behave criminally given the opportunity because they typically perceive fewer negative consequences and have less to lose when compared with individuals with high self-control (Gottfredson & Hirschi, 1990).

In contrast to Gottfredson and Hirschi’s (1990) viewpoint, a state-dependence interpretation (or dynamic approach) has also been presented to account for the positive association between past and future criminal behavior. This perspective asserts that prior participation in criminal activity reduces internal inhibitions and external constraints to future criminal activity and intensifies the prior offender’s motivation to commit future crime. Or in other words, the prior commission of a crime causes a subsequent increase in the probability of an individual engaging in a future crime (Nagin & Paternoster, 1991; Nagin & Farrington, 1992). The state-dependence hypothesis also recognizes the impact of life events on criminal behavior (Piquero, Brame, Mazerolle, & Haapanen, 2002). In support of this interpretation, Sampson and Laub contend that:

Lives are often unpredictable and dynamic; exogenous changes are ever present. Many changes in life result from chance or random events in individual lives…while other changes in life directions stem from macro-level ‘exogenous shocks’ (1995:50).

Despite the existing points of contention between the two rival explanations, the results from Piquero et al. (2002) based on data from 524 males released from California Youth Authority (CYA) institutions indicated that criminal offending appears to involve a combination
of the persistent-heterogeneity and state-dependence explanations. This finding led Piquero et al. to conclude that theoretical models must account for the relative contribution of both explanations in attempting to describe the overall progression of criminal behavior. Other research has also argued in favor of taking the “theoretical middle ground” when studying crime (Paternoster & Brame, 1997; Paternoster et al., 1997).

Additionally, previous research has found evidence for the relationship between the stability of offending and antisocial behavior, but indicate that the trajectory of offending will differ across ages and vary over the life course (Nagin, Farrington, & Moffitt, 1995). Taking this into account, Sampson and Laub (1993) proposed a theoretical model that addresses the impact that life events and transitions can have on an individual’s behavioral pathway and the following section provides a larger discussion of their theory as contained within a developmental life-course perspective.

**Sampson and Laub’s Age-Graded Theory of Informal Social Control**

Sampson and Laub’s (1993) age-graded theory informal social control can be viewed as a merging of the ideas of state dependence (Nagin & Paternoster, 1991) and cumulative continuity, wherein cumulative continuity assumes that adverse life circumstances accumulate and exert a more significant effect as their frequency increases over time (Caspi & Moffitt, 1993; Moffitt, 1993) in order to create a model for explaining crime over the life course. They argue that social capital (investment or stakes in conformity) and turning points (employment, marriage) are important factors that may challenge traditional deterministic theories of crime that assume that early childhood experiences lay the groundwork for later development (Bandura, 1982).

argue that ineffective child rearing (including the parents’ failure to effectively monitor, recognize and punish their child’s unwanted behaviors) in the early years of a child’s life (prior to age 8) fosters the development of low self-control. This latent trait is then viewed as a relatively stable phenomenon that increases the likelihood of involvement in criminal and analogous behavior throughout an individual’s life. Comparatively, in Wilson and Hernstein’s (1985) book, *Crime and Human Nature*, these scholars state that crime could be best explained by individual differences in impulsivity and temperament, along with an interaction of these qualities with familial factors (see also Grasmick et al., 1993; Nagin & Paternoster, 1991).

Fueled by this renewed interest in childhood and drawing from social control theory (Hirschi, 1969) and Elder’s life-course approach (1975, 1985), Sampson and Laub (1993:303) began to focus on age-graded life transitions and argue that institutions of formal and informal social control matter and vary over the life course. They contend that age-graded informal social control is essential for promoting interpersonal bonds that link individuals to the larger social institutions in which they live (i.e., work, family, school). They also acknowledge that both continuity and within-individual changes do occur over time and that specific life transitions and other factors related to development may intervene in one’s pathway of offending (i.e., also referred to as the stepping-stone approach by Farrington, 1986b).

Sampson and Laub (1993) further developed their theoretical framework with attention to what they characterize as a series of building blocks. The first building block focuses on the intervening role of informal family and school social bonds. Their second building block focuses on the continuity of antisocial behavior that begins early on in a child’s development and extends throughout adulthood. They also recognize that particular life events and social ties in adulthood can alter an individual’s behavioral trajectory and this viewpoint is central to their
third building block, i.e., the importance of adult social bonds. They propose that social bonds
developed in adulthood (employment, marriage) can explain involvement/lack of involvement in
crime regardless of any underlying individual criminal propensity. In addition, they emphasize
that it is not only the mere exposure of individuals to these bonds, the quality and intensity of
these bonds is critical. Drawing on the work of Elder (1975, 1985), Sampson and Laub also
hypothesize that different adaptations to key life events can affect an individual’s trajectory, and
crucial turning points such as divorce or death of a love one can redirect life trajectories.

Two additional important concepts in Sampson and Laub’s age-graded theory of informal
social control include the processes of self-selection and cumulative continuity. Self-selection is
the classic “birds of a feather flock together” argument, and is based on the belief that
individuals with low self-control resulting from ineffective parenting systematically sort
themselves into criminogenic environments. For example, delinquent youth will tend to
gravitate toward delinquent peers in adolescence, and similarly, will find delinquent spouses in
adulthood and continue their offending behavior (Gottfredson & Hirschi, 1990).

In comparison, cumulative continuity (Moffitt, 1993) integrated with the concept of state-
dependence (Nagin & Paternoster, 1991) refers to the idea that involvement in delinquency has
an incremental effect on the interpersonal social bonds formed in adulthood (i.e., labor force
attachment, marital cohesion). For instance, an arrest and subsequent incarceration in
adolescence may lead the youth toward dropping out of school. This practice would logically
affect their future job prospects and thus result in the failure of the individual to develop strong
adulthood bonds to the labor force, which inevitably increasing their likelihood of involvement
in crime (Tittle, 1988).
Furthermore, Sampson and Laub (1993) view change as occurring along a continuum where change can be shaped by a shift in societal roles and environments and this individual or environmental change can lead to the development of social capital (Coleman, 1988, 1990; Nagin & Paternoster, 1992). Sampson and Laub (1993) further argue that the lack of social capital is one of the central antecedents of weak social bonds. Similarly, individuals who lack social capital are expected to be closed off from the informal networks among individuals in the social system, which also has a negative influence on their future life prospects (Coleman, 1990).

However, Sampson and Laub (1993) also caution that just getting married or employed is insufficient for manufacturing social capital. These social ties are only seen as important in cases where they impose obligations and restraints on individuals that lead them to refrain from criminal involvement. According to Sampson and Laub (1993), this process offers an explanation for not only career desistance but late-onset criminality because regardless of an individual’s early developmental history, if they are able to form social capital or investment in societal institutions, then they will always be less delinquent/criminal. Additionally, they argue that social capital can be reciprocal in nature and that there are racial, ethnic, and structural variations in social capital (see Anderson, 1990; Short, 1990). In short, according to Sampson and Laub, their life-course theory seeks to:

- Return development to where it probably should have been all along, conceived as the constant interaction between individuals and their environment, coupled with purposeful human agency and random developmental noise (2005:40).

Sampson and Laub’s (1993) age-graded theory of informal social control soon sparked researchers’ interests; however, in the same year developmental psychologist Terrie Moffitt (1993) unveiled a theoretical typology that claims that there are different types of offending trajectories that exist in the social world and her taxonomy classifies offenders as either adolescent-limited or life-course-persistent. The next section provides a discussion of Moffitt’s
proposed taxonomy of offenders and highlights the features that distinguish an adolescent-limited offender from a life-course-persistent offender. Also discussed is Moffitt’s (1994; see also Moffitt et al., 1994) more recent claims as to why life-course-persistent offending may be limited almost exclusively to males.

**Moffitt’s Taxonomy**

Moffitt (1993) identifies the adolescent-limited offenders as normative and believes they include individuals who are generally well socialized and adjusted, do not begin their offending early in life, and are simply acting out a passing phase in the developmental process of adolescence. These individuals only offend because of the process that she identifies as “social mimicry,” whereby the youth achieve status and power in their adolescent social world by mirroring the antisocial behaviors of others (most notably the behavior of their life-course-persistent counterparts). Therefore, through direct observation and reinforcement, the adolescent-limited offenders begin to engage in similar behaviors in order to assert their individuality and emerging “adulthood” status. However, although their rates of offending may converge with that of their life-course-persistent counterparts only briefly in mid-adolescence (ages 14 to 17), the adolescent-limited offenders (by definition) desist from offending soon after this developmental time period. These adolescent-limited offenders are also typified by inconsistent, erratic, and brief offending careers. Moffitt (1993) further argues that they may shoplift and smoke some pot, but at the same time follow school rules.

In contrast, Moffitt (1993) identifies the life-course-persistent group as offenders who begin their criminality/behavior problems early in childhood and exhibit an ongoing pattern of behavioral problems throughout their life. These offenders begin biting and hitting at age 4, shoplifting and truancy at age 10, selling drugs and stealing cars at age 16, robbery and rape at age 22, and fraud and child abuse at age 30 (Moffitt, 1993:679). Moffitt argues that there is no
reason to believe that these offenders ever extraordinarily abandon their antisocial tendencies and assume a prosocial identity later in life. Although prior research has shown that while offending may decline in middle to late adulthood among criminal psychopaths, their antisocial personality traits (Cleckley, 1976) have been shown to persist until age 69 (Harpur & Hare, 1994). Farrington et al. (1990) have also indicated that early-onset offending is strongly correlated with the seriousness of offending and the length of an individual’s offending career.

Furthermore, compared with their adolescent-limited counterparts, life-course-persistent offenders’ problematic behavior is not the result of social mimicry but it is believed to result from neurodevelopmental impairments that lead to a lack of self-control. This inability to form self-control (see also Gottfredson & Hirschi, 1990) affects their socialization and development and thus makes these individuals vulnerable to committing crime. Moffitt (1993) has also attributed this group’s persistent offending to an interaction of living in a poor social environment and neurological problems during early fetal development that inhibit temperamental, cognitive, and behavioral development. A series of studies have shown that one of the most robust predictors of antisocial behavior is neurological deficiencies (see Moffitt, 1990; Moffitt & Henry, 1991; Hirschi & Hindelang, 1977).

Moffitt (1993) continues to argue that a substantial portion of the antisocial behavior exhibited by these life-course-persistent offenders can be attributed to heritability (or intergenerational transmission of antisocial behavior) (Heusmann et al., 1984). Prior research has shown that there is a strong consistency between parents and their children in their temperament and personality traits (Plomin, Chipuer, & Loehlin, 1990) and in their cognitive abilities and intelligence scores (Plomin, 1990; Loehlin, 1989). Loeber et al. (2000) indicated that at-risk children are often exposed to adverse home environments and neighborhood
conditions because of their parent’s vulnerability to a host of problems including their inability to deal with difficult children because they lack sufficient coping resources (see also Synder & Patterson, 1987). Furthermore, Moffitt (1997) has found that these life-course-persistent offenders were always more likely to be involved in crime regardless of the status of the neighborhood in which they resided.

Moffitt continues by asserting that age will exert a direct influence on the strength of the association between an individual’s underlying criminal propensity and their offending patterns. According to Moffitt, it is expected that criminal propensity should be strongly associated with antisocial behavior in early childhood, yet the strength of the association should be greatly reduced in adolescence because the adolescent-limited offenders exhibit the highest prevalence rates during this time period and these offenders lack a criminal propensity. The strong correlation between criminal propensity and crime should again resurface in adulthood because the life-course-persistent offenders become the predominant group once again in this time period (see also Piquero & Brezina, 2001).1

Guided by prior research, Moffitt and colleagues have offered some theoretical refinements to the two offender typologies to explain differential rates of offending across sex. The adolescent-limited type exemplifies female offending patterns (Moffitt, 1994) and life-course-persistent offending pattern is almost exclusively a male phenomenon because (1)

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1 It is important to note here that there is a strong degree of overlap between Moffitt’s life-course-persistent offender and Gottfredson and Hirschi’s (1990) characterization of an offender with low self-control. The main similarity is found in their definitions of propensity, which is believed to be influenced by impulsivity, hyperactivity, and low verbal ability (see also Bartusch et al., 1997). Similarly, in line with Moffitt et al.’s (1994) sex expectations for life-course-persistent offending, Gottfredson and Hirschi (1990:148-153) argue that male and female differences in opportunity or supervision can explain the disproportionate rates of offending across sex. Blackwell and Piquero (2005) found support for the relationship between low self-control and offending among males and females, but indicated that there were sex differences in their responses toward their parents' control. Therefore, it is likely that Gottfredson and Hirschi would argue that sex differences in self-control can explain the concentration of life-course-persistent offending patterns among males.
neuropsychological disorders are more prevalent among males (Rutter, 1983; Singer et al., 1968); (2) childhood-onset conduct problems are very rare among girls (Werry, 1986); and (3) female delinquent behavior tends to be more erratic than male delinquent behavior (Moffitt et al., 1994:283).

While large scale self-report studies versus those based on official data have shown that virtually every adolescent commits some illegal behavior (see Elliot et al., 1983), according to Moffitt (1993) there is yet another group of individuals who are characterized as abstainers or non-offenders. Similarly, Moffitt (1993) provides some theoretical speculations as to why these individuals fail to become involved in crime and delinquency. Moffitt argues that perhaps these youth experience late-onset puberty and therefore do not sense the maturity gap or perceive the social assets associated with crime (1993:689). Prior research has indicated that females that began menstruating after the age of 15 did not show any involvement in delinquency.

The abstainers may also lack the opportunities to engage in delinquency. Adolescent delinquency rates have been shown to be higher in urban versus rural areas (Skogan, 1990), and Sampson and Groves (1989:789) have also commented that one of the strongest correlates of violence is the “presence of unsupervised groups of teenagers.” In another study, Farrington and West’s (1990) research with their London male cohort showed that adolescents who resided in criminogenic environments but did not engage in delinquency could be characterized as nervous and withdrawn and also tended to entirely lack friends or only have a few friends.

Most recently, Piquero, Turner, and Brezina (2005) provided one of the first empirical tests investigating Moffitt’s (1993) abstainer hypothesis and found that there did exist a relatively small group of adolescents (a slightly greater proportion of females) that could be classified as abstainers. Piquero et al. (2005) indicated that teacher attachment was inversely related to
association with delinquent peers for the females and that less association with delinquent peers was related to being an abstainer among the males. However, Piquero et al. also noted evidence that was contrary to Moffitt’s expectations. More specifically, they did not find that the abstainers were more likely to be sad and depressed or completely excluded from all peer networks. Piquero et al. (2005) showed that the abstainers were still relatively active in the dating scene and were not typically loners, but argued that they were just adolescents who were involved in a more prosocial network of peers.

Overall, Moffitt’s taxonomy provides a solid theoretical framework to explain not only differential offending patterns of individuals, but also offers speculations as to why some youth never become involved in delinquency. Furthermore, her offender typology can also account for sex differences in offending.

This concludes the chapter on theoretical frameworks. It attended to the assumptions underlying social disorganization theory, the age-crime curve and the criminal career paradigm, the recent theoretical advancements of an age-graded theory of informal social control (Sampson & Laub, 1993), and the existence of adolescent-limited and life-course-persistent offenders (Moffitt, 1993) including the recent theoretical extensions to account for sex differences in offending. The next chapter contributes a thorough discussion of what the prior literature has discovered regarding these perspectives.
CHAPTER 3
REVIEW OF THE LITERATURE

Introduction

The theoretical perspectives presented above have been the focus of a considerable amount of empirical testing. While, social disorganization theory has received a substantial amount of attention for explaining crime rates at the macro-level (for review, see Bursik & Grasmick, 1993; Sampson & Groves, 1989). The theory (particularly surrounding neighborhood SES) has also been applied to accounting for individual variation in offending. This line of research will be discussed in more depth below. It will be followed by an examination of the studies (most notably that of Wolfgang et al., 1972) that have identified the existence of a relatively small proportion of chronic high-rate offenders (between 2% and 14% depending on which study is being referred to) who are responsible for at least half of the overall crime and even a larger percentage of the violent offenses. The next sections will present the research evidence on the impact that life transitions such as marriage and employment can have on an individual’s pathway of offending and the literature that has provided support for Moffitt’s (1993) taxonomy as an explanation of sex differences in offending. Finally, this chapter will conclude with an illustration of the prior applications of Nagin and Land’s (1993) methodological technique for identifying groups of individuals with similar offending trajectories as well as providing several hypotheses that will be tested in this current study.

Impact of Social Disorganization at the Individual Level

In general, community-level scholars (e.g. Bursik & Grasmick, 1993) have associated the geographic concentration of socioeconomic disadvantage to the social disorganization of the neighborhoods, and these disorganized neighborhoods have been argued to have adverse effects on the individuals and families that reside within those areas. In contrast, other scholars contend
that the concentrated effects of poverty cannot be fully explained without including control measures for both familial and individual-level characteristics (see Gephart, 1997:14). Although, while social disorganization theory (as originally formulated) sought to explain crime at the aggregate level, there are empirically-based reasons to expect that social disorganization may also have an effect on individual behavior. Simcha-Fagan and Schwartz took a step toward this possibility:

An aggregate-level theory cannot be expected to provide a comprehensive explanation of individual delinquency or criminality, it should clarify those contextual effects which, independently of or in interaction with the adolescent’s predisposition, affect individual behavior (1986:688).

Jencks and Mayer (1990) provided a review of the current extant knowledge on the effects that social compositional measures (e.g., poverty) have on a series of developmental outcomes including: educational attainment, cognitive skills, criminal activity, and economic success. They indicated that the research is generally mixed at best regarding the influence of average SES (in the aggregate) on the likelihood of an individual’s chances for planning to go to college, attending college, and/or graduating from college, especially for Whites. Research has shown that youth from high SES neighborhoods are more likely to have higher educational attainment compared with their counterparts who come from lower SES neighborhoods. In addition, Black men’s chances of competing in the job market and finding well-paid jobs were greatly reduced when they resided in a heavily concentrated Black or welfare dependent neighborhood (see also Aber et al., 1997).

Klebanov et al. (1997) provided an extension of the research on the influences of neighborhood effects on crime by specifically testing whether or not these effects are mediated and/or moderated (or interact with) by family processes such as maternal warmth, cognitive stimulation in the home, maternal coping style, availability of social support, and the physical
environment of the home. They found that the positive effects of living in a high SES neighborhood on academic achievement, higher verbal ability scores, and less behavior problems and the negative effects of living in heterogeneous neighborhoods on verbal ability scores were mediated by the quality of the home learning environment. The effect of home environment was found across all age groups, measures, and resource-rich and resource-poor neighborhoods. They also found support for the interaction of the home environment and family characteristics in each neighborhood type in ways related to criminal outcomes. Similarly, additional research by Brooks-Gunn et al. (1993) showed that neighborhoods had an effect on childhood IQ and the likelihood of becoming a teenage parent and/or dropping out of school. Thus, it appears that neighborhood level effects may be both direct and indirect, but perhaps a substantial proportion of their effects are indirect in that they operate through individual and family factors.

Simcha-Fagan and Schwartz (1986:671) argue that structural characteristics have an impact on the organizational networks among members of the community, and these networks can subsequently affect an individual’s ability to form social bonds to the community. Individuals who rent property as opposed to owning their own property are less likely to have a stake in the community in which they live, and thus may be less inclined to participate in neighborhood organizations that provide a mechanism of informal social control. Similarly, individuals who rent their property may be less likely to care about the maintenance or up-keep of their dwelling because they do not intend to be there long. This lack of investment could lead to neighborhoods incivilities (Wilson & Kelling, 1982), which have been linked a breakdown in informal social control and crime (Sampson, 1995). Dwelling units that are over-crowded such as public housing units are also likely to lead to a sense of “anonymity” among the residents. The failure of individuals to get out of their units and develop informal social ties with their
neighbors may be due to their exposure to violence and fear of crime (Roncek, 1981; Sampson, 1995). Sampson and Groves (1989) have also shown that high rates of residential instability were associated with juvenile delinquency and crime.

Gephart (1997) reviewed the developmental impact of community effects on adverse individual outcomes. In early childhood, children who reside in areas of extreme disadvantage face a slightly higher risk for having a low birth weight and suffering from child abuse. Comparatively, additional analyses have shown that the presence of affluent neighbors was associated with higher IQs and the presence of low-income neighbors was related to a greater likelihood of behavioral problems in early childhood.

Furthermore, research has also found that the influence of a neighborhood’s socioeconomic status on individual outcomes in early childhood and middle childhood were different across races. At age 3, the benefit of affluent neighbors (versus middle SES neighbors) on children’s IQ scores was more salient among White children than African-American children (Brooks-Gunn et al., 1993). Similar findings were also found among children at ages 5 and 6 for IQ scores, verbal ability, and reading achievement scores (Chase-Lansdale et al., 1997; Duncan et al., 1994). In addition, all of these studies revealed that the presence of low SES neighbors was positively associated with early childhood behavior problems.

Gephart (1997) also indicated that research investigating neighborhood effects during late childhood and early adolescence found that community impoverishment, the burden of child-care, and residential instability were significant predictors of various forms of delinquency such as violent crime, drug trafficking, juvenile delinquency, and teen pregnancy (see Gephart, 1997). Two additional studies have also shown that neighborhood SES had a stronger effect for male adolescents than female adolescents (Entwisle et al., 1994; Halpern-Felsher et al., 1997).
Research has also shown that living in a high SES neighborhood increased older adolescents’ chances of graduating high school and attending college (Brooks-Gunn et al., 1993; Duncan, 1994; Ensminger et al., 1996; Halpern-Felsher et al., 1997). All of these studies suggested that the protective effect of living in a higher SES neighborhood was more salient for males. Crane (1991) has also provided evidence that males had the worst outcomes when living among low SES neighbors. In addition, a series of studies reviewed earlier have all consistently shown that living in a low SES neighborhood was positively associated with higher rates of criminal and delinquent behavior (Braithwaite, 1979; Lindstrom, 1996; Loeber & Wikstrom, 1993; Lynam et al., 2000; Peeples & Loeber, 1994; Piquero et al., 2005; Reiss & Rhodes, 1961; Sampson & Groves, 1989; Wikstrom, 1991a, 1991b; Wikstrom & Loeber, 2000).

The U.S. Department of Housing and Urban Development (HUD) initiated what is known as the Moving to Opportunity for Fair Housing Demonstration (or MTO) in 1994 motivated by the success of the Gautreaux Program that has been in operation in Chicago for almost three decades. Rosenbaum (1995; see also Rosenbaum & Popkin, 1991) presented quasi-experimental evidence that Gautreaux youth who moved to the suburbs greatly increased their educational attainment and job opportunities when compared with those that remained in the poor urban areas. Intrigued by these findings and the idea that residential mobility may benefit individuals from disadvantaged communities, the MTO program became operational in five selected sites (Baltimore, Boston, Chicago, Los Angeles, and New York City).

The MTO program involved randomly providing families vouchers allowing some families with children in high poverty areas to move to less poor areas with the hope that this relocation would increase their educational and employment opportunities. Eligibility for the program was determined by the families that lived in Section 8 public housing units with at least a 40%
poverty rate according to 1990 census tract data. Prior MTO evaluations have indicated that residential relocation significantly contributed to a reduction in violent arrests for males and better overall health among the children that moved from the public housing units (Katz et al., 2001; Ludwig et al., 2001). Katz et al. (2001) also noted significant reductions in criminal victimization among individuals that moved out of the Section 8 housing.

Leventhal and Brooks-Gunn (2003) noted that the MTO program had profound effects on mental health outcomes for the individuals and families that relocated. They reported that the parents who moved reported less distress than did those that remained and the boys that moved (especially those between ages 8 and 13) reported significantly less depression, anxiety, and/or dependency problems when compared with their counterparts who were still in public housing. Most recently, Kling et al. (2007) noted the substantial mental health and education benefits for the adults and females, but commented on the adverse effects associated with the males who received vouchers (for an extended review of MTO impact evaluations, see also Orr et al., 2003).

Overall, there is reason to believe that structural factors including those highlighted in social disorganization theory can have an effect on individuals’ outcomes and perhaps influence their pathway of offending. It is likely that living in areas characterized by social disorganization will increase an individual’s likelihood of being a chronic offender. This concept of chronic offending is the topic of the discussion presented in the following section.

**Prevalence and Incidence of Chronic Offending**

Relying on data from the well-known Philadelphia Birth Cohort Study, Wolfgang, Figlio, and Sellin (1972) provided some of the earliest evidence of the existence of chronic offenders. Wolfgang et al. found that there were a group of delinquents that represented only 6% of the cohort and 18% of the cohort's delinquents but were responsible for committing roughly half of all the offenses and about two-thirds of all of the violent offenses. In a ten-year follow-up study
of 10% of the original Philadelphia birth cohort, Wolfgang, Thornberry, and Figlio (1987) found that these chronics, originally defined as having had five or more police contacts as juveniles, had increased the seriousness of their offending into adulthood. Tracy, Wolfgang, and Figlio (1990) found even higher rates of chronic offending among members of the Second Philadelphia Birth Cohort Study. They found that the chronics represented 7% of the cohort and 23% of the offenders, yet were responsible for committing 61% of all the offenses including 60% of homicides, 75% of forcible rapes, 73% of robberies, and 65% of the aggravated assaults.

In a similar study, Snyder (1988) examined a cohort of Phoenix and Utah youths and found that the chronics, defined as having had five or more referrals to juvenile court, represented only 5% of the cohort. However, like the original Philadelphia Birth Cohort, they were responsible for 51% of all the offenses committed including 61% of murders, 64% of rapes, 67% of robberies, 61% of aggravated assaults, and 66% of burglaries. Shannon (1988) studied three youth cohorts in Racine, Wisconsin and found a slightly higher percentage of chronics (8% to 14%) than the previously mentioned studies, but still found that they were involved in an overwhelming majority (75%) of all of the felony arrests.

Hamparian, Schuster, Davis, and White (1985) in a follow-up study of the original Columbus Cohort (Hamparian, Schuster, Dinitz, & Conrad, 1978) found that 60% of the previously identified chronics (representing only 2% of the cohort) had been arrested at least once by their early-twenties for an adult felony offense. These offenders were also more likely to have had an earlier onset of delinquency, more frequent and serious offending, and displayed continuity in offending from their youth through their mid-twenties.

The high frequency offending of chronics that has been illustrated when examining official arrest data is also evident in self-report surveys. Results from the National Youth Survey (NYS)
have shown that about 5% of juveniles at each age level from twelve to seventeen years old can be classified as serious, chronic offenders. These offenders are characterized as having engaged in three or more aggravated assaults, sexual assaults, gang fights, and/or strong arm robberies within the previous year. In addition, on average these chronics committed 132 delinquent offenses annually and 8% of these offenses are considered serious and violent. Perhaps more alarming is the fact that 84% of the offenders identified as chronics in the survey had no official record of delinquency and this disparity between official measures and self-reported measures of offending cannot be underestimated (Elliot, 1994; Elliot, Huizinga, & Morse, 1986).

Further support for the existence of chronic offenders was also provided in a series of RAND Inmate studies conducted during the late 1970s and early 1980s. Petersilia, Greenwood, and Lavin (1977) conducted the first of these studies and focused on the criminal careers of 49 inmates in a California medium-security prison. All of these offenders were currently serving time for armed robbery and were characterized as repeat offenders because they all had served at least one prior prison term. Petersilia et al. (1977) gathered information on the frequency of offending from structured interviews with the offenders and their official criminal records. Overall, the 49 inmates self-reported committing 10,500 serious crimes even though the majority of the offenders had spent the better part of their criminal careers behind bars.

Peterson and Braiker (1980) carried out the second Rand Inmate study where they administered self-report questionnaires to 624 incarcerated male felons in five of California’s state prisons asking the inmates to report what types of offenses they committed during the three years prior to their current imprisonment. Peterson and Braiker found that the majority of the inmates did not specialize in offending and that most of the felons who committed one crime type at a high frequency also reported significant criminal activity in other types of crime. On
average, these chronic offenders represented about 8% of the inmates but self-reported committing over 60 crimes per year.

Chaiken and Chaiken (1982) conducted the third Rand Inmate study investigating high-rate offending, wherein they analyzed the criminal histories and survey results from 2,190 prison and jail inmates in California, Texas, and Michigan. Chaiken and Chaiken identified what they referred to as a small group of “violent predators” or “omni felons” and these individuals reported committing robberies, assaults, and drug deals at disproportionately higher rates than the other inmates. In addition, they tended to commit burglaries, thefts, and other property crimes at higher rates than even the offenders who self-reported to specialize in those specific crime types.

Overall, all of the studies described above have shown strong empirical support for “chronic offenders” and these offenders represent only 2% to 14% of the offending population (depending on which study is being referred to), yet they are responsible for at least half of all the offenses committed (Farrington, 1999). The fact that a sizeable fraction of the crime problem can be attributed to a relatively small number of identifiable chronic offenders provides support for preventative measures and early identification (see Piquero, Farrington, & Blumstein, 2003).

However, in contrast to the robust finding of chronic offending among various samples and time periods and the evidence that these individuals tend to be criminally active for long periods of time, Sampson and Laub (1993) argue that key life transitions such as marriage and/or employment can have an impact on an individual’s pathway of offending, even if they are/were chronic offenders. The following section addresses the empirical evidence in support of the effect that these various life events can have on behavioral outcomes, most notably desistance from crime.
The Effect of Life Transitions on Offending

Sampson and Laub’s (1993) age-graded theory of informal social control takes the position that key life transitions (including delinquency) can affect adult outcomes. Similarly, Caspi and Moffitt (1993) have referred to delinquency (particularly serious) as a “knifing off” of future opportunities, or in other words delinquency in adolescence is expected to impede the formation of conventional social bonds that will continue to have an effect in adulthood.

Relying on the Gluecks’ data (1950, 1968), Sampson and Laub (1993) presented preliminary support for their theory, whereby individuals who exhibited the strongest ties to work and family had the lowest rates of delinquency. In contrast, incarceration in the adolescent years was inversely related to job stability and positively associated with continued criminal involvement. Nagin and Waldfogel (1998) have also noted the adverse effects that an adolescent conviction has on future job opportunities among West and Farrington’s (1977) London male cohort. Additional research has shown that involvement in delinquency results in the worst adult outcomes for lower class boys, particularly among lower class boys with a high frequency of police contacts (Hagan, 1991). Jessor et al. (1991) have also indicated that delinquency is not a major impediment for the formation of prosocial adult bonds for middle class adolescents.

Based on the results of Sampson and Laub’s (1993) original test of their age-graded theory of informal social control, support was found that delinquency was associated with crime in adulthood as well as being significantly related to a series of adverse life events including being AWOL from the military, economic dependence, and having had martial problems. Contrary to what Gottfredson and Hirschi (1990) would predict, they also found significant independent effects for marital attachment and job stability on involvement in adult crime net of the effects of criminal propensity.
Sampson and Laub (1993:317-320) concluded by offering six key issues to guide future research testing their theory. First, there is some element of luck, randomness, or chance in an individual’s life course (also referred to by Rutter, 1989 as “adventitious happenings”). Second, there is individual variation in the effects that life transitions have on behavior. Third, macro-level opportunity structures for marriage and labor market activity are important (i.e., segmentation of the labor market, ethnic enclaves). Fourth, criminal propensity cannot completely explain adult crime because life transitions can also affect opportunities and motivations to commit crime (see also Cohen & Machalek, 1988). Fifth, the effect of cumulative continuity is strongest among those in disadvantaged racial and economic conditions. Sixth, historical context matters.

With attention to some of these suggestions, Horney et al. (1995) found clear evidence that meaningful change in life circumstances was associated with desistance from crime based on their interviews with 658 offenders in a Nebraska Correctional Facility. They also estimated hierarchical linear models that allowed them to control for criminal propensity and still found that the offenders’ reported reduced involvement in criminal activity when they were living with their wife. Overall, their results suggested that life transitions can alter behavioral patterns of offending at particular periods of time, especially in the short-term. Laub et al. (1998) estimated trajectories with the Glueck’s data and found that the timing and quality of marriages were what was important and that the inhibiting effects of marriage on crime were gradual and grew in intensity over time. Similar to Horney et al. (1995), these findings were still observed while controlling for criminal propensity and a host of other factors.

More recently, Piquero et al. (2002) developed a stakes in conformity index where they combined the life circumstances of employment and marriage to gauge the possible cumulative
effects of local life circumstances on pathways of offending among serious offenders from the California Youth Authority. Based on their results, Piquero et al. concluded that it is likely the case the these mechanisms of informal social control (or life transitions) can have a stronger effect on instrumental as opposed to interpersonal crimes because commission of the former tends to involve a relative degree of planning.

Laub and Sampson (2003) estimated models that took into account within-individual change and found that when controlling for age, individuals who were currently married had lower criminal propensity scores when compared with their scores when they were not married. They also found these differences in propensity existed in times where the individuals were employed or in active military service compared with periods when they were not.

In another study testing Sampson and Laub’s theory, Warr (1998) provided an analysis of two waves of longitudinal data from the National Youth Survey of 1,725 individuals. Counter to Sampson and Laub’s (1993) position, Warr hypothesized that the link between life transitions and crime might be better explained by the effect that these transitions have on altering the relationships with delinquent peers (Akers et al., 1979, 1985; Sutherland, 1947). Warr’s results did reveal that marriage was strongly associated with desistance from crime, but he indicated that for many of these individuals, getting married was a key life transition that signaled a severing of heavy involvement with their delinquent peers and instead re-focused their attention to their spouse and the desire to have children.

These findings led Warr to conclude that marriage not only reduces individuals’ motivation for continuing criminal behavior by re-directing their goals, it also greatly minimizes their opportunities for offending by limiting the amount of time that they have to spend with their former delinquent peers. In addition, Warr cautioned that there still existed the possibility of a
selection effect in that individuals who do in fact get married are perhaps qualitatively different from those who do not get married, and that individuals who are not involved with delinquent peers and/or engaged in crime may appear to be more suitable marriage prospects.

Maume, Ousey, and Beaver (2005) have since reexamined Warr’s (1998) hypotheses and conclusions using data from the National Youth Survey, but improve upon Warr’s earlier study by specifically investigating the effects of marital attachment on desistance from marijuana use and control for the possible selectivity bias in the relationship between marital attachment, delinquent peer associations, and desistance. In line with Sampson and Laub’s theory, Maume et al. found that marriage was important to the desistance, particularly for those marriages that were characterized by high levels of attachment. Contrary to Warr’s (1998) findings, marriage still maintained significant direct effects for affecting desistance net of the effect of delinquent peer association (measured as the change in the number of delinquent associates).

Uggen (2000) investigated the impact that employment (i.e., a turning point) has on an offender’s recidivism relying on data from over 3,000 individuals from nine U.S. cities, which were originally part of the 1977 National Supported Work Demonstration Project that targeted the underclass and the ghetto poor. The individuals who participated in this project were randomly assigned to either of two treatment groups (construction work or service jobs) or to a control group where no job placement was given. The work and arrests histories were collected for all of these individuals every nine months for three years. The results from the event history analysis yielded a variety of noteworthy findings. First, although the program failed to reduce crime overall across the entire sample, its impact was definitely age-graded. Job treatment significantly reduced recidivism among the older participants (particularly aged 27 or older) whereas the job treatment had little to no effect on crime among the young adults (late
teens/early twenties). Therefore, it appeared that this life transition (employment) affected desistance from crime only for a certain age group of individuals (older adults) providing support for Sampson and Laub’s (1993) theory.

In a recent review of the state of their theory and in response to some noted criticisms (see Moffitt, 2005), Sampson and Laub (2005c:18) refined their views toward the influence of life transitions on adult offending by arguing that involvement in institutions such as marriage and work provide both short-term and long-benefits. In the short-term, these life transitions can alter an individual’s motivation for crime by re-focusing their energy and attention toward conventional outlets (spending time and caring for their spouse/family or their job) and can produce the long-term benefit of fostering their development of prosocial adult bonds or stakes in conformity.

Sampson and Laub (2005c:36) continued by arguing that marriage (or employment) should not be viewed as a one particular point in time, but viewed as a dynamic and cumulative causal factor that affects desistance from crime over time (see also Laub et al., 1998). Given the above presented evidence in support for Sampson and Laub’s age-graded theory of informal social control, it is important also to visit the research providing support for Moffitt’s taxonomy of offending for explaining sex variations in offending and this becomes the focus of the following section.

The Saliency of Moffitt’s Taxonomy across Sex

According to Moffitt et al. (2001), females typically have fewer risk factors than males; therefore, they are less likely to be early-onset and/or life-course-persistent offenders. In contrast, the sex similarities in adolescent-limited offending are due to the process of social mimicry where there is an equal-opportunity for offending among males and females in the adolescent years (Moffitt et al., 2001). Moffitt et al. (2001) have also suggested that while
neurodevelopmental disorders affect the life-course pathways of offending similarly for males and females, males experience early cognitive deficits far more frequently than females. Their results showed that significant sex differences existed in almost all cognitive areas including hyperactivity, impulsivity, and temperament.

Tibbetts and Piquero (1999) conducted one of the earliest tests of whether Moffitt’s taxonomy applies to males and females and reported that they failed to find enough females who exhibited the life-course-persistent pattern of offending in order to provide sufficient statistical power in a Philadelphia cohort. Subsequently, Fergusson et al. (2000) were able to show that a single model could explain antisocial behavior across sex, but the ratio of involvement in early-onset offending and late-onset offending was 4:1 and 2:1 for males and females respectively. In contrast, Aguilar et al. (2000) found that the prevalence of early-onset offending was similar across sex.

In another study, Moffitt and Caspi (2001) found that the sex ratio for life-course-persistent offending was 10:1, whereas the sex ratio was virtually negligible for adolescent-limited offending (1.5:1). Similarly, Kratzer and Hodgins (1999) found a rather large sex ratio for life-course-persistent offending (15:1) and adolescent-limited offending (4:1) among a Swedish cohort of 13,000 individuals. Mazerolle et al. (2000) reported that early-onset offending was associated with persistent offending and a lack of specialization among members of a Philadelphia cohort (n= 3,655). In addition, in a longitudinal study of 820 girls, Cote et al. (2001) did observe an antisocial group characterized by persistent and frequent offending, although this group only made up 1.4% of the entire sample of females.

Comparatively, Silverthorn and Frick (1999) have argued antisocial girls tend to share many of the correlates of childhood-onset offending and adulthood adjustment problems that the
childhood-onset boys express. The difference is that antisocial girls typically demonstrate a “delayed-onset” pathway (do not begin their offending until adolescence). They propose that this third developmental pathway is unique to females and while the cognitive and neurological deficits and the dysfunctional family environment is present in these girls’ childhood, they do not produce overt antisocial behavior until adolescence.

Silverthorn and Frick (2001) provided a preliminary test of their “delayed-onset” offender typology among 72 incarcerated youth. They found that there were similar percentages of early and late-onset offenders among the males, but that the females were more likely to show the delayed-onset (late-onset) patterns of offending and these girls displayed similar risk factors as the childhood-onset boys. Subsequently, two additional tests found that early-onset and delayed-onset offending were similar among boys and girls and that the early-onset girls shared the same risk factors as the early-onset boys (see Fergusson & Horwood, 2001; Moffitt & Caspi, 2001).

More recently, White and Piquero (2004) provided another test of sex differences/similarities in early versus delayed-onset offending, except using a large sample of African-American participants from the Philadelphia portion of the National Collaborative Perinatal Project. White and Piquero (2004) discovered that females were just as likely as males to display early-onset patterns of offending, but comparatively, the late-onset females shared many risk factors with the early-onset males. Noting all of the research presented above, according to recent review, Piquero and Moffitt (2005) argued that females do show less involvement in criminal activities at both levels (adolescent-limited offenders and life-course-persistent offenders) when compared with males.

Taken together, all of the previously reviewed research has indicated that (1) macro-level factors can affect individual behavior, (2) there exists a small group of chronic offenders who
commit disproportionate amounts of crime; (3) life transitions can alter individual offending pathways; and (4) Moffitt’s taxonomy can be used to explain sex differences in offending, particularly the findings that males are more likely to be found among the life-course-persistent offender group than the females. Noting this evidence, the following section directs attention toward examining the stability of offender groups across recent prior applications of Nagin and Land’s group-based modeling technique, along with a discussion of the factors that have been found to be associated with offending group membership.

**Prior Applications of Group-Based Models of Offending**

Similar to the theoretical developments in criminal career and developmental research, modern innovations in methodological approaches to studying group-based modeling, specifically the technique developed by Nagin and Land (1993) (i.e., what has been referred to by many names including trajectory analysis, finite mixture models, or semiparametric mixed Poisson-based regression models). The technique permits disaggregating aggregate offending patterns into group-based offending trajectories of individuals that exhibit distinct pathways over time (Nagin & Land, 1993; Land, McCall, & Nagin, 1996; Land & Nagin, 1996; Nagin, 2005). This method for modeling multiple pathways of offending provides a mechanism to identify and distinguish between certain types of behavioral trajectories. It also enables the use of regression models such as multinomial regression in order to examine which covariates are best able to predict which offending group that an individual is assigned.

Nagin and Land (1993) provided the first application of this methodology based on data from the well known South London cohort of 411 males (West & Farrington, 1973, 1977). Relying on convictions as their measure of offending, they found evidence of four groups of offenders including a non-offender group, an adolescent-limited group, and two groups of chronic offenders with different degrees of high-rate offending.
McDermott and Nagin (1998) found support for the existence of three offender groups based an analysis of male respondents from the National Youth Survey, which is a well-known self-report survey. The first group was classified as the non-offenders. The second group was referred to as adolescent-peaked. They tended to resemble the third or chronic offending group in adolescence but then began to desist at the age of 18 until there was no observed offending at age 24.

Additionally, trajectory analyses based on two distinctly different types of offenders (Gluecks’ Boston delinquents vs. California Youth Authority parolees) from different time periods and contexts found that there seemed to be 4 to 6 trajectory groups that all began to decline by adulthood (see Laub et al., 1998; Piquero et al., 2002). Laub et al. (1998) and Piquero et al. (2002) also noted that marriage or stakes-in-conformity (that included marriage) was related to lower trajectories.

A more comprehensive attempt to identify the consistency of latent offending groups was performed by D’Unger et al. (1998) using data from the London cohort (West & Farrington, 1973, 1977), the Second Philadelphia Birth Cohort (Wolfgang, Figlio, & Sellin, 1972; Tracy et al., 1990) and the three Racine Birth Cohorts (Shannon, 1988, 1991). They found support for the considerable similarity of offending groups across the data sources, with the constant finding of non-offending, adolescent-limited or peaked offending, and chronic offending groups. Specifically concerning the Racine Birth Cohorts, D’Unger et al.’s results revealed the similar four classes of offenders noted above for the 1942, 1949 and 1955 cohorts, but discovered an additional fifth group for the 1942 and 1955 cohorts with a late-onset pattern of offending. D’Unger et al. (1998) illustrated that this group showed relatively stable rates of offending throughout their twenties. Broidy et al. (2003) also found three to four trajectory groups when
examining childhood physical aggression and later involvement in delinquency/crime using data with various demographic groups (males/females) and six different study sites represented including: Child Development Project; Christchurch Health and Development Study, Dunedin Multidisciplinary Health and Human Development Study, Montreal Longitudinal Study, Pittsburgh Youth Study and the Quebec Provincial Study.

More recent research has also observed these similar offending groups disaggregated by sex (Cote et al., 2001, 2002; D’Unger et al., 2002; Fergusson & Horwood, 2002; Land, 2000; Piquero et al., 2005), although some studies were unable to identify a chronic offending group among females (D’Unger et al., 2002; Piquero et al., 2005). D’Unger et al.’s (2002) analysis provided five offender groups for the males and only three for the females. Furthermore, they indicated that while the age patterns of offending tended to be similar across sex, the frequency of offending was higher among the males.

In contrast, Cote et al. (2001) discovered a life-course-persistent group of offenders among the females, but noted that this group only comprised 1.4% of the sample of nearly 900 females. In a more recent study, Cote et al. (2002) found that the broad patterns of development (as far as groups) were similar across sex, but males were more likely to exhibit higher impulsivity trajectories when compared with the females. Relying on data from 896 members of the New Zealand Dunedin Birth Cohort, Fergusson and Horwood (2002) indicated that while identical offending trajectories were found for the males and females, the females were more likely to be of low risk and found predominantly among the adolescent-limited group, whereas the males were more likely to be in the chronic offending groups. Most recently, Piquero et al. (2005) discovered three classes of offending (low, medium, and high-rate) among males and only two for the female models (low and medium-rate) using data from the Dunedin birth cohort. In
summary, Hipwell et al. (2002) concluded that the main difference between boys and girls behavioral patterns of offending is that only a very small proportion of girls follow the life-course-persistent trajectory.

Chung et al. (2001) also discovered another trajectory group that they termed desisters that illustrated an atypical trajectory in that they were characterized by early-onset offending (before age 13) but instead of showing the steady rise in mid-adolescence into young adulthood, the group’s trajectory declined and appeared to desist by age 21. According to Chung et al. (2001), further analyses suggested that it was not individual and familial factors that could be attributed to their desistance but rather the influence of less exposure to peer, neighborhood, and school factors typical associated with offending. They also indicated that aggressiveness, antisocial peers, and drug availability were consistent predictors of initial levels of offending measured at age 13 and that individual factors including aggression, depression, and anxiety significantly distinguished the late-onset offenders from the non-offending group.

Piquero (2007) provided a comprehensive review on the studies to date applying Nagin’s and Land’s (1993) group-based modeling technique and concluded that there existed relative consistency in the number of trajectory groups and the shape of the curves, but there was variability across the studies depending on the length of follow-up and the ages that were represented in the analysis. Additionally, in line with Moffitt these studies have shown evidence of adolescent-limited and life-course-persistent trajectories across diverse data sets, cohorts, countries and using various measures for offending including self-reports, teacher ratings, parent ratings, and police records based on either contacts, arrests, or convictions. However, these applications have also uncovered other trajectories not consistent with Moffitt’s (1993) predictions such as the low-level chronics and late-onset type.
The next section provides an elaboration of the theoretically integrated model using macro-level and micro-level factors for explaining group-based offending trajectories. Specifically, the discussion focuses on how the social disorganization framework can be incorporated with Sampson and Laub’s age-graded theory of informal social control and Moffitt’s developmental taxonomy.

**Integrated Theoretical Model for Explaining Offending**

Typically, criminological and sociological research focuses on either examining community level or aggregate rates of delinquency/crime or investigating the differences between delinquents/criminals and nondelinquents/criminals. Although, in recent years scholars have begun to recognize the importance of multi-level research and integrated theoretical models (see Reiss, 1986; Moffitt, 1997a; Sampson, 1997; Farrington, Sampson, & Lauritsen, 1994). In an attempt to answer these calls for research in this area, the proposed model in this study emphasizes the importance of three particular theoretical perspectives (social disorganization, age-graded theory of informal social control, and Moffitt’s taxonomy) for explaining group-based offending trajectories. The proposed model is further elaborated on below and the conceptual figure (along with additional variables included in the analyses) is displayed in Figure 3-1.

In the 1920s Shaw and McKay reported that the areas that were characterized by the highest rates of crime and delinquency also tended to display comparatively high rates of infant mortality, low birth weight, child abuse, along with other adverse factors for early childhood development. According to Sampson (1997:43) the consistent finding of moderate-strong continuity of early onset offending behavior and later criminal involvement and the long-standing covariation of delinquency rates and social problems clearly emphasizes that “there is a connection between healthful development of young children and community structure.”
quality of health care services has also been shown to vary across communities with the most socially disorganized areas having the poorest services (Lash, Sigal, & Dudzinski, 1980).

Similarly, Moffitt (1997a) and others (see Bronfenbrenner, Moen, & Garbarino, 1984) have argued nueropsychologically vulnerable children may be disproportionately found in poor areas given the association between brain deficiencies and poverty. Moffitt (1997a) also highlights the concentration of low birth weight, poor infant nutrition, and the incidence of exposure to toxic agents as being greater in poor neighborhoods. Furthermore, children with early developmental/neurological deficits are not typically born into protective and supportive environments with in-tact families, but rather into families with parents who socialize their children in a criminogenic environment where both parent and child are vulnerable to the adverse neighborhood conditions (Moffitt, 1997a). These at-risk or “difficult” children are then likely to receive negative reactions from their parents in efforts to control their problem behavior in early development and this negative reaction is likely to be continued throughout adolescence among peer groups at school and individuals in the community (see Goldsmith, Bradshaw, and Reiser-Danner, 1986) whereby further exacerbating the development/continuity of antisocial behavior. Caspi et al. (1987:308) summarizes this interaction as one in which “the child acts; the environment reacts; and the child reacts back in mutually interlocking evocative interaction.”

Thus, in the proposed theoretical model, living in a socially disorganized area should impact group-based offending trajectories by increasing the likelihood of being assigned to a chronic offender group.

Moffitt (1994) has also suggested that chronic offending can perhaps be regarded as an exclusively male phenomenon because of the disproportionate concentration of risk factors such as neurodevelopmental disorders and early behavior problems among males. Additionally,
Moffitt and others (see Moffitt et al., 1994) have argued that female delinquency tends to be more erratic when compared with male delinquency. More recently, Piquero and Moffitt (2005) have contended that males do tend to show more involvement in crime/delinquency regardless of offender group, i.e., adolescent-limited or life-course-persistent. Consequently, it is expected that a greater proportion of males will exhibit both types of offense trajectories and more specifically, being male will be a significantly distinguishing feature of group-based patterns of offending.

In contrast, Sampson and Laub’s age-graded theory of informal social control argues that social bonds or stakes in conformity in adulthood affect desistance from crime. It is expected that individuals who exhibit a virtual non-offending trajectory will also display the greatest amount of stakes in conformity since they are likely to be already bonded as youth and adolescence since they show no involvement in delinquency. Similarly, this assumed early attachment to institutions such as family and school is likely to continue into adulthood in that they will also be more likely to be married and have full-time jobs which will further restrict their involvement in crime. Second, while social disorganization is likely to affect group assignment to an offender group, it is believed that the experience of life transitions such as marriage and employment will increase the likelihood that individuals will express an adolescent-limited/peaked offense trajectory compared with a chronic offending pattern since these social bonds are theorized to have an effect on criminal career desistance. Or in other words, while these groups may have relatively similar patterns of offending during adolescence, these life transitions will be related to desistance among the adolescent-limited/peaked offender group.
In short, recent theoretical and methodological advancements in criminological research permits me to examine the possible generalizability of formerly discussed offender groups (non-offenders, adolescent-limited/peaked offenders, and chronic offenders) and exploring a potential integration of macro-level and micro-level theories for explaining offending. These issues along with a description of the methodology and analytic procedures that will be utilized in this current study will be the focal point of the following chapter (Chapter 4) and the results chapter (Chapter 5) will involve a systematic exploration into the several key hypotheses mentioned below.

**Hypotheses and Expectations**

**Hypothesis #1:** According to Moffitt’s (1993) taxonomy and prior applications of trajectory analysis (for review, see Piquero, 2007), it is expected that the semiparametric Poisson-based regression analyses will produce three distinct classes of offenders including: 1) non-offenders; 2) adolescent-limited; and 3) chronic offenders.

**Hypothesis #2:** In accordance with the theoretical extensions provided by Moffitt (1994) and Moffitt et al. (1994), it is expected that sex with be a significant covariate for distinguishing group-based trajectories or in other words, males will be more likely to be in offending groups than females.

**Hypothesis #3:** In line with Sampson and Laub’s age-graded theory of informal social control, it is hypothesized that individuals who self-report having experienced these key life events (or stakes in conformity) will be less likely to be chronic offenders.

**Hypothesis #4:** It is expected that individuals whose neighborhood of origin is characterized by poverty/low neighborhood socioeconomic status and residential instability (i.e., *social disorganization*) will be more likely to be chronic offenders than adolescent-limited offenders or non-offenders.

**Hypothesis #5:** Macro-level and micro-level effects on the participation and frequency of offending will still be observed net of the effects of each other—or in other words, both macro-level and micro-level effects will be significantly related to latent class membership. However, the possibility of mediation will also be explored.
Figure 3-1. Integrated Theoretical Model: Social Disorganization, An Age-Graded Theory of Informal Social Control and Moffitt’s Developmental Taxonomy
CHAPTER 4
DATA AND METHODS

Introduction

The former two chapters (Chapters 2 and 3) provided the theoretical framework for explaining individual variations in offending and the latter chapter expressed how macro-level and micro-level factors could affect an individual’s pathway of offending and why males can be expected to be disproportionately found in chronic offending groups. This information along with the closing section of Chapter 3 that discussed prior applications of Nagin and Land’s (1993) group-based methodology all bear equal importance in framing the outline of this current chapter.

This chapter begins with a description of the data and sample for which all the analyses of this current study are based. This is followed by a section highlighting the macro-level and micro-level independent variables incorporated in this study to empirically test Sampson and Laub’s (1993) age-graded theory of informal social control and Moffitt’s (1993) taxonomy of adolescent-limited and life-course-persistent offending. The macro-level measures used in this study were developed with attention to those factors emphasized as having relatively strong effect sizes according to a recent meta analysis by Pratt and Cullen (2005) and the micro-level measures were theoretically-derived and based on prior empirical research. After the section describing the measures, a discussion of the specific group-based modeling technique (Nagin & Land, 1993) used in this current study to identify latent classes of offenders is presented.

Next, there is also a discussion devoted toward fleshing out the recent debate on the usefulness of the technique that has occurred between the originators of the methodological tool and some of its most vocal critics. This chapter will conclude with a description of the software and statistical procedures that will be used in order to estimate the group trajectories and then to
assess the relative strength of macro-level and micro-levels variables for predicting the likelihood of group membership.

Data Sources

The data used for these analyses were drawn from the first two birth cohorts collected by Shannon (1988, 1991) in Racine, Wisconsin. Racine was a Midwestern industrial city with an estimated population of 89,000 residents according to the 1960 U.S. Census. Shannon initially gathered detailed information on three births cohorts, the first being 1942, followed by a second cohort in 1949, and the third from the year of 1955.

Overall, official police contact data was collected on all of the individuals from each of the three cohorts from “birth” up until the end of the follow-up period (i.e., 1974) which yielded sample sizes of 1,352 for the 1942 cohort, 2,099 for the 1949 cohort and 2,676 for the 1955 cohort. In order to create a uniform baseline age of offending across cohorts, this current study only included information on police contacts after the age of six. More specifically, Shannon was particularly interested in adolescents that were defined as “continuous residents” of Racine through their eighteenth birthdays (regardless of their mobility within the city’s limits).

This continuous-residence data (which provides the data for the focus of this study) generated sub-samples of 633 for the 1942 cohort, 1,297 for the 1949 cohort, and 2,159 from the 1955 cohort. Of these sub-samples, Shannon (1988, 1991) selected random samples for the purposes of collecting in-person interview data for the first two cohorts that began on June 1, 1976 (when the 1942 cohort was age 34 and the 1949 cohort was 27 years of age).¹ Group-based offending trajectories will be estimated separately for the 1942 and 1949 continuous-resident subsamples presented below. A later section in this chapter entitled “Trajectory Estimation”

¹ According to Shannon (1988, 1991), the lack of continued federal funding restricted him from collecting interview data for the 1955 cohort.
provides a more thorough discussion of the various models and a tabular display can also be found below in Table 4-1. In addition, Table 4-2 illustrates the different years of observation that can be attributed to each of the data sources along with the corresponding ages of the Racine continuous-residents by cohort.

Thus, the final continuous-residence based samples previously alluded to involves taking the police contact and interview-level data separately for the 1942 and 1949 residents and merging this individual-level data with the limited available neighborhood-level data based on a unique Census block identifier for each individual. Once the individual and neighborhood-level data were merged and sample frequencies were conducted, it was observed that a number of individuals were missing information on all of the neighborhood-level variables of interest. Therefore, in order to create an accurate baseline and minimize missing data, we chose only to include the cases that had existing 1950 Census block information.\(^2\) This selection criterion left a total sample of 235 and 323 individuals for the 1942 and 1949 continuous-residents samples respectively. These samples were predominantly White residents (92% and 85%), followed by Black (6% and 11%), and the approximately remaining 3% of each sample were Chicanos. There was an almost even split as far as the sex composition between the males (47% and 53%) and the females (53% and 48%).

\(^2\) In order to incorporate change into the models (i.e., such as computing change scores for the Census measures by using 1960 data as well) would have resulted in the loss of more than 60 additional individuals which would have affected the stability of the trajectory models (see Nagin & Tremblay, 2005; Sampson & Laub, 2004). Preliminary comparisons indicated that the 1950 and 1960 block data were relatively similar; therefore, the 1950 Census measures were used with the intention to preserve any additional sample loss and to represent macro-level-level characteristics that existed closer to the early developmental years of the Racine residents that Moffitt (1993) has indicated as a crucial time period (see also Gottfredson & Hirschi, 1990). Prior research has shown the adverse effect of living in a low SES neighborhood on factors associated with life-course-persistent patterns of offending, especially in early childhood (see Brooks-Gunn et al., 1993; Chase-Lansdale et al., 1997; Duncan et al., 1994). The original principal investigator Shannon (1994:7) also indicated that if a researcher was interested in the ecological characteristics of which the cohort members spent their early childhood/juvenile years, then the 1950 Census data should be used.
Independent Variables

Macro-level independent variables

*Social Disorganization.* Based on the factors highlighted by Shaw and McKay (1942) that are believed to contribute to social disorganization and associated with crime (as defined as the breakdown of the formal and informal social networks for regulating neighborhood resident behavior), measures of neighborhood socioeconomic status (SES) and residential mobility were included.\(^3\) Neighborhood SES was measured directly by the average housing values of the residential properties on each block. Prior research has shown the positive effects of living in a high SES neighborhood has on academic achievement, verbal ability scores, and behavioral problems (see Klebanov et al., 1997). Residential mobility was indirectly measured by the percent of housing units on a block that were renter-occupied compared with those that were owner-occupied.\(^4\) Simcha-Fagan and Schwartz (1986:671) have argued that structural characteristics can affect an individual’s ability to form social bonds to the community. Individuals who rent as opposed to owning their property are less likely to develop the necessary ties (see Bellair, 1997; Granovetter, 1973) that are important for providing a mechanism of informal social control. Finally, percent overcrowding was Census-based measure indicating the percent of rooms within housing units on each block with more than one person per room.

Wilson (1987) has also attributed housing density to concentrated poverty, which has been

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\(^3\) Because of the sparse amount of U.S. Census data available in 1950 and relative homogeneity of Racine, this study was unable to include a measure for ethnic heterogeneity in order to provide a complete measure of social disorganization incorporating all of the processes that lead to crime.

\(^4\) The original measure of “social disorganization” used by Land (2000) was a scale created by Shannon (1988, 1991, 1994) where a rank of 1-26 was assigned to an individual to represent their “neighborhood SES” based on the average Census block characteristics of the area in which they lived. This measure was actually referred to by Shannon as a “natural area code” with no reference to social disorganization and given that the measures used (average dollar value of rent, average dollar value of owned property, percent lacking plumbing, percent overcrowding, and percent renter-occupied) did not load on one construct it is likely that Shannon’s (1988, 1991, 1994) “index” and Land’s (2000) later use of this index is not an entirely accurate proxy measure of social disorganization.
posed as a precursor of social disorganization. Dwelling units that are over-crowded also may lead to sense of “anonymity” between the residents because of their failure to interact with their neighbors (see Roncek, 1981; Sampson, 1995).

The results from principal components analysis confirmed that these three variables were measuring a similar construct (i.e., social disorganization) across the two cohorts as presented below in Table 4-3; therefore, the corresponding component loadings were utilized in order to construct the appropriate indexes.5 This procedure allows for preserving the integrity of the data by removing the potential of a partialing fallacy (Gordon, 1968) and reducing the potential for multicollinearity which is common in macro-level data (Land, McCall, & Cohen, 1990). Thus, positive z-scores were indicative of more socially disorganized areas.

Micro-level independent variables

Stakes in Conformity. Sampson and Laub (2005c) argue that involvement in institutions such as marriage and work provide both short-term and long-benefits for individuals. These life transitions can change an individual’s motivation for crime by re-focusing their attention toward spending time with their spouse and/or investing time in their job. These events are believed to foster an individual’s development of prosocial adult bonds. Prior research has shown support for the impact that these transitions can have on desistance from crime (Sampson & Laub, 1993; Warr, 1998) and other research has shown that the effect of these life transitions are age-graded (see Uggen, 2000).

Therefore, in accordance with Sampson and Laub’s (1993) theory and prior research (see Piquero et al., 2002) a stakes in conformity index was created for the two local life circumstances

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5 This procedure involves multiplying the raw variable scores by the standardized weights obtained as a result of the principal components analyses and then summing these values together to produce a single measure (see Kim & Mueller, 1985).
of marriage and employment. Each of these transitions are dummy-coded with 1 indicating if the individual self-reported having experienced the particular life transition by age 25 and 0 indicating if the individual failed to report having experienced the specific life transition by age 25. Therefore, the index ranged from 0 to 2, with 2 indicating that the individual reported having experienced both of these life circumstances.

**Sex.** Sex has long been recognized as one of the strongest predictors of involvement in delinquency and violent crime where crime rates have consistently shown higher prevalence rates of offending for males when compared with females (Rowe et al., 1995). Daly (1998) has also noted that self-report studies have repeatedly indicated that males report a higher prevalence (involvement) and incidence (number of acts) of offending. Wilson and Hernstein (1985) have commented on the strength of the relationship between sex and crime over time and cultures, and according to Gottfredson and Hirschi (1990), anywhere and everywhere males tend to commit more crime than females (with the exception, check fraud, shoplifting, and prostitution).

Additionally, Moffitt and some of her colleagues have suggested that life-course-persistent offending may be observed almost exclusively among males because neuropsychological disorders and childhood-onset conduct problems are more prevalent among males (Rutter, 1983; Singer et al., 1968; Werry, 1986). Female delinquency also tends to be more erratic when

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6 There were self-reported measures that existed in the data for yes/no responses to these life events; however, in order to ensure that the actual life transition occurred within the observation period of the data available for both cohorts, the experience of these life transitions after age 25 for the 1942 cohort were not included.

7 It is important to note up front that this measure is limited in that Sampson and Laub have argued that mere participation in life transitions may not be as important as the quality of the attachment to the various social institutions (i.e., marriage, work, etc.). Laub et al. (1998) also indicate that the inhibiting effects of life transitions are cumulative over time and it takes a while for individuals’ to express the necessary level of cohesion or attachment to affect their behavioral pathway of offending, or affect their desistance from crime. In the end, according to Piquero et al. (2002) it is likely that just being married or having a job is some kind of indication that individuals’ have developed some affective ties to their spouses and/or jobs or else they would not be likely to be involved in the life circumstance to begin with.
compared with male delinquency (Moffitt et al., 1994). Prior research has shown that females typically show less involvement in crime in both offender groups (adolescent-limited offenders and life-course-persistent offenders) when compared with males. Recent applications of Nagin and Land’s (1993) trajectory analysis have also shown distinct offender groups among females (see Cote et al., 2001; D’Unger et al., 2002; Fergusson & Horwood, 2002; Land, 2000; Piquero et al, 2005). Provided with this theoretical framework and building on the prior research mentioned above, a dichotomous variable representing the sex of the 1942 and 1949 cohort members was included with males coded as 1 and females coded as 0 as a covariate in the trajectory models as well as in the multinomial logit models presented in Chapter 5.

Black. Similar to sex, race has also been a long-standing correlate of crime (see Hawkins, 1995) and Moffitt (1994) has argued that the higher prevalence of both adolescent-limited and life-course-persistent offenders among Blacks may account for the racial variation in crime rates because the theoretical origins of the latter pattern of offending disproportionately affect Blacks because of the strong association between race and poverty. Prior research has shown a higher prevalence of life-course-persistent offenders among Blacks (Piquero & Buka, 2002), and other researchers have argued that the risk factors associated with life-course-persistent offending typically tend to be disproportionately concentrated among Blacks (see Piquero & Moffitt, 2004; Piquero et al., 2005).

Furthermore, macro-level research has indicated that Blacks were more likely than Whites and Hispanics to live in poor neighborhoods and be involved in more serious forms of criminality. Prior research has also shown that Blacks who reside in these areas are disproportionately affected by the burden of child-care and residential instability and these factors were strong predictors of delinquency and violence (for review, see Gephart, 1997).
Additional research utilizing trajectory analysis has also noted the increased likelihood of Blacks in chronic offending groups (see Land, 2000); therefore, it was necessary to include race. The original nominal level variable indicating the race of the 1942 and 1949 cohort members was recoded into a dummy variable with Blacks being coded as 1.

**Low SES Household.** This prestige-based measure will be included in order to provide an individual-level SES complement to the macro-level measures of neighborhood SES. Prior research has shown that individuals who are from low SES households in low SES neighborhoods tend to have the highest rates of offending and comparatively those from the high SES households in high SES communities have the lowest offending rates (Braithwaite, 1979; Reiss & Rhodes, 1961; Wikstrom, 1991a). Using trajectory analysis, McDermott and Nagin (1998; see also Land, 2000) have also shown that low SES is an important factor for predicting group membership, more specifically the likelihood of being classified as a chronic offender. Additionally, Brooks-Gunn and Leventhal (2000) have noted the importance of including this family-level measure when estimating neighborhood effects.

This variable was measured as a scale indicating the prestige of the head of the household’s occupation in the family in which the individual grew up. It ranged from a low of one to a high of nine with the following occupational types represented: (1) professional, technical, managerial; (2) clerical and sales; (3) craftsman, foreman; (4) operative; (5) maintenance and service; (6) private household labor; (7) industrial labor; (8) farm, agricultural labor; and (9) unemployed. Consistent with the direction of the macro-level social disorganization index, higher values indicated worse situations (i.e., growing up in lower SES households).
**Family Stability.** This measure was used to represent the stability of the family dynamic in which the cohort member was socialized. Most research has shown an established relationship between family stability and delinquency/crime (Glueck & Glueck, 1950; McCord & McCord, 1959; Goetting, 1994) and crime rates (Sampson, 1987). Studies have found that adolescents living with both biological parents have lower rates of offending when compared with those who reside in broken homes or reconstituted families. According to Gottfredson and Hirschi (1990:104), single-parent-headed households (usually by a woman) may be unable to provide the same amount of supervision because of the time constraints imposed on them and thus may be more likely to have negative responses to their children’s unwanted behaviors. Furthermore, this variable along with the following measure listed below (family structure) have been identified as key family-level variables when estimating neighborhood effects (see Brooks-Gunn & Leventhal, 2000)

Originally, this variable was based on a scale created by Shannon (1988, 1991) which combined responses to several items regarding family composition ranging from 1 to 20, where according to Shannon (1988, 1991), 1 represented the most stable family dynamic (two parents present during the entire childhood/juvenile period) and 20 the least stable family dynamic (lived only with grandparents, never with parents). For the purposes of this study and due to the little variability among the categories, the scale was collapsed into a dichotomous variable with 1 indicating the presence of two parents during the entire childhood/juvenile period and 0 indicating any other type of less stable family dynamic.

**Family Structure.** In order to account for the possible differential opportunities of parental supervision affecting individuals’ offending pathways (Gottfredson & Hirschi, 1990) along with having a complementary individual measure of household density to the macro-level
household density measure (percent overcrowding), a second measure of family dynamics was included to represent family structure. This was a measure of the number of children within each of the cohort member’s family (including the cohort member).  

**Differential Association.** Differential association theory (Sutherland, 1939, 1947) has long stressed criminal and deviant behavior is learned through exposure to and acceptance of definitions favorable to crime. Burgess and Akers (1966), and in later reformulations by Akers (1977), expanded on this idea by specifying the process in which learning occurs. Favorable definitions of crime and deviance are learned in a social setting where the imitation of criminal and deviant behavior also occurs. Delinquency, like any behavior, generates either beneficial or adverse consequences – positive or negative reinforcement. If delinquent or criminal behavior is reinforced either socially or non-socially, the behavior is likely repeated in the presence of cues to which it has been paired. Or in other words, Akers (1998:50) argues that the probability that individuals will engage in deviant behavior is increased when they differentially associate with others who commit the behavior and express favorable definitions toward it. Thus, based on research that has produced strong evidence for what is now termed the perceived “delinquent peer effect” (Felson & Haynie, 2002; Matsueda & Anderson, 1998; Schreck, Fisher, & Miller, 2003; Warr, 1993; Warr & Stafford, 1991), a measure was included with 1 indicating that the

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8 Overall, there was very little missing data at the individual-level (less than 1% for any of the variables used in the analyses). The only two variables that had missing data were family stability and family structure. In order to correct for the missing values, the method of group specific means were computed. In order to do this procedure the sample was sorted into five categories: 1) White males; 2) White females; 3) Black males; 4) Black females; and 5) Chicano males (there were not any Chicano females in the sample). For the few cases (n=4) where a missing value was recorded, the sex/race specific group means were imputed.
individual self-reported “peer influence” as the strongest contributing factor toward their delinquent/criminal behavior in junior high and high school.\(^9\)

**Formal Social Control.** This measure was a scale of the individual’s perception of the level of police patrol in their neighborhood during their junior high and high school years.\(^10\)

This indicator of institutionalized formal social control ranged from 0 representing “not at all” or “no police patrol,” 1 for “lightly patrolled,” 2 for “moderately patrolled,” to a high of 3 which indicated that the individual perceived their neighborhood as being “heavily patrolled” during their early to late adolescent years.\(^11\)

**Moved.** In order to provide a contextual measure of residential mobility to complement the compositional measure included in the social disorganization index, this variable was coded as 1 if the individual had moved within Racine during their juvenile years. It is likely that moving, particularly during the adolescent years, is likely to have an adverse effect on an

\(^9\) It is worth mentioning here that this is certainly a less than ideal measure of differential association and more direct measure would have been preferable; however, due to the limitations of data this measure was included as a control variable.

\(^10\) It is important to note that this measure is a weak measure of formal social control and that direct measures such as prior conviction or incarceration are optimal; however, there was only two items that allowed the individuals to report having received jail time as a result from their police contact and these questions were only in reference to their first and second police contact. Because only 1 to 4 individuals across the cohorts actually reported this as a response I made the determination to use the “police patrol” measure because there was a sufficient amount of variation in responses to this latter survey item. Additionally, this measure is also limited due to the fact that it was asking individuals to retrospectively answer this question based on their perceptions of how they felt as a middle and high-school juvenile (which is at least 10 years prior and for the 1949 cohort and 20 years prior to the date of the interviews in 1974 for the 1942 cohort) and it is also likely that those individuals who actually came into contact with the police may have had a bias toward reporting higher levels of neighborhood patrol. Future studies would benefit from incorporating more direct measures of formal social control such as those discussed by Sampson and Laub (1997) and De Li (1999), which relied on convictions and on court appearances and convictions, respectively.

\(^11\) Shannon (1988, 1991, 1994) originally developed a scale to assess formal social control, but this measure had a series of flaws, with the most serious being that the scale was constructed by summing self-reported responses of the cohort member’s perceptions of the (1) level of police patrol when they were in junior high and high school (1=heavily, 2=moderately, 3=lightly; 4=not at all); (2) their and a couple of their friends’ views toward the police in junior and senior high, (1=positive, 2=negative, 3=indifferent); and (3) to report whether or not they got into trouble with the police with a couple of their friends (yes/no). Even more oddly, this scale was constructed by coding an individual’s response as “1” if they had either negative or indifferent views toward the police, adding “2 points” if the individual reported that they and their friends got in trouble with the police, and adding “4 points” if the individual also responded that they perceived police patrol was either heavy or moderate during their juvenile years.
individual’s pattern of offending by disrupting the ability to form/maintain prosocial bonds with peers and their schools, which are important factors for inhibiting delinquency (see Hirschi, 1969; Akers, 1985).12

**Dependent Variables**

**Delinquent/Criminal Involvement.** The variable used to measure offending was the number of official police contacts for each individual from age 6 to age 25.13 The police contact measure was limited to those instances in which an individual came into contact with a Racine police officer specifically for a crime that he/she was suspected to have committed or did in fact commit. In addition, the official police contacts were also restricted to contacts that had true crime codes with a felony/misdemeanor distinction as well as contacts for status offenses to measure offending (i.e., excluding traffic offenses, and city ordinance violations) because (1) they are a more accurate official measure of “true” offending when compared with arrests and convictions; (2) they are closer in time to the actual criminal act than self-reported offending (see Hindelang et al., 1981; Thornberry & Krohn, 2003); and (3) the inclusion of status offenses increases the potential for identifying adolescent-limited offenders (see Moffitt, 1993).14

**Offending Group Membership.** The results of the semiparametric mixed Poisson-based regression models will guide the identification of the number of offending groups that exist within these data and the shapes of their offending trajectories. The identified latent classes of offenders will operate as the dependent variable for the estimation of the multinomial

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12 It is important to note that this measure is limited in that is was impossible to discern from the available data if the individual moved from a social disorganized area to a more or less disorganized area; therefore, it is important to interpret the findings with caution and keep in mind that the expectation is that moving is seen as having an adverse effect on offending patterns within this study.

13 This police contact data refers to the years that are consistently available for the 1942 and 1949 continuous-residents or up to and including age 25.

14 Prior trajectory analyses with Shannon’s (1988, 1991) Racine cohorts relied solely on felonies and misdemeanors (D’Unger et al., 1998) or everything including traffic offenses and “suspicion” contacts (Land, 2000).
(polytomous) regression models (Models 1 and 2), with the non-offender group omitted in order to serve as the reference category. The following sections describe the group-based modeling technique designed by Nagin and Land (1993) that will be utilized in this study for identifying the offender groups along with a discussion of the existing debate that has been ongoing related to the usefulness of the methodology.

**Study Limitations**

There are a series of limitations of the data source itself and the measures used in this study that are worth noting. First, the timeliness of the data is an issue since the cohorts themselves were born in the 1940s, socialized as children and/or adolescents in the 1950s and 1960s. Therefore, it is likely that these samples may not be generalizable to other cohorts from more recent time periods because they were born during WWII (e.g., 1942 cohort) or are from the baby-boomer generation (e.g., 1949 cohort) who grew up in the post-WWII era. Second, Racine, WI was a Midwestern industrial city with an estimated population of 89,000 residents, and it is not likely that the results from this study would apply to the larger metropolitan urban cities of today (i.e., cities with populations greater than 100,000).

Third, particularly during the time of data collection, Racine was a relatively homogenous city with limited numbers of minorities, and according to Shannon (1988), although the overall population did rise to 95,000 persons by 1970, this was followed by a decline to 86,000 persons by 1980. He attributed this population decline to a growing number of young people in need or work and increased female participation in the work force, but this was met with a decreased number of individuals leaving for retirement. Taken together, the results discovered here may not necessarily apply to areas with larger minority representation or dissimilar population shifts.
Noting the limitations of the cohort members and the location, there is also a series of limitations with the measures used in this analysis. First and foremost, the data available in the 1950 Census at the block level is very limited or in other words, there was not the typical “long list” of measures accessible to macro-level researchers today for this research, and there also was a noticeable amount of missing 1950 census data for the 1942 and 1949 continuous-residents.

With this in mind, the social disorganization measure used here is relatively weak in the sense that it is only measuring two (neighborhood SES and residential mobility) of the three elements that Shaw and McKay (1942) highlighted as important factors associated with the breakdown in informal social control and crime rates. Once again, Racine was a relatively homogeneous area, so it is likely that racial dissimilarity would be difficult to directly observe at the block level. Additionally, Sampson et al. (1997) have argued that what matters more than social disorganization is collective efficacy or what happens at the individual level as far as developing community ties and informal social control. There were not an available individual-level data that would allow for an investigation of this hypothesis, so caution should be noted that these individual-level processes are not accounted for in this study.

In addition, as footnoted earlier, the stakes in conformity index used to assess Sampson and Laub’s (1993) age-graded informal social control theory is limited in that it is a dichotomous index with a short range (0 to 2). More recently, Laub et al. (1998) have argued that mere participation in local life circumstances may not be as important as the quality of the attachment and that the inhibiting effects of life transitions on desistance are cumulative and gradual over time. Therefore, while this measure does not capture the level of attachment or cohesiveness of the relationship, it is likely that just being married or having a full-time job is indicates that some degree of attachment has already been formed or else the life transition would probably not have
occurred in the first place (see Piquero et al., 2002). The differential association measure is also noticeably weak.

Regarding the dependent variable (police contacts), there are also well known strengths and weaknesses from using either official data (police contact, arrest, conviction) or self-report data to measure criminal behavior. Under-reporting is one of the principal limitations of official statistics because the majority of police activity is a direct result of the willingness of citizens to report crimes (see Hindelang et al., 1981; Thornberry & Krohn, 2003). However, there are also extensive disparities in victim reporting based on various factors including: requirements for insurance companies, confidence or lack of confidence in police departments, etc. Furthermore, there are many offenders who will never come to the attention of law enforcement, such as shoplifters, burglars, or white-collar criminals (Junger-Tas & Marshall, 1999). This result might be due to the fact that more skillful and shrewd offenders are less likely of being arrested and/or may reflect the differences in police discretion and priorities across regions/agencies (Blumstein & Cohen, 1987).

One key advantage of self-report measures is that they often offer more comprehensive information than official data. They provide background and sociodemographic data on individual offenders, as well as personal characteristics. Research has indicated that self-reports are effective in answering questions of causality, motivation, change, and stability in criminal behavior (Junger-Tas & Marshall, 1999:296). Self-reports also tend to include both a broader range of deviant behavior and less serious types of crimes than official police records indicate (Blumstein, Cohen, Roth & Visher, 1986:32). Some examples of the types of crimes that are likely to be found in self-reports but not in official data are prostitution, drug abuse, public order crimes, and drunk driving.
Notwithstanding the mentioned benefits, there are several limitations to the self-report method. Under-reporting and poor recall of criminal activity are disadvantages because self-reports tend to be retrospective in nature (as was the case with the interviews in these data). In addition, some respondents may even inflate their actual level of criminal activity. Cross-study comparisons of self-reports may also be hindered due to differences in the wording of the questions, differences in the administration of the survey, or differences in time periods (Blumstein et al., 1986:33). Taking into account the noted limitations of police records and self-reported measures of offending, this study chose to measure police contacts because they are a (1) more accurate official measure of “true” offending than arrests and convictions, and (2) typically closer in time to the actual criminal act than self-reported offending which sometimes asks individuals to recall their past behavior in their lifetime, last twelve months, last six months, etc. (see Hindelang et al., 1981; Thornberry & Krohn, 2003).

Within the context of all of the above mentioned limitations surrounding the data, time period, samples, and the location along with the measurement shortcomings, the following section highlights the group-based methodology that will be used to estimate the group trajectories.

**Methodology**

**Group-Based Modeling**

Longitudinal research in its most basic form (as applied to the study of crime), involves the identification of a cohort at birth and following that group of individuals throughout their life, or at least long enough to capture the termination of the majority of criminal careers (Blumstein et al., 1986:104). The longitudinal method allows for a specified cohort’s level of involvement in crime to be traced as the cohort, itself, matures (Greenberg, 1985). This knowledge is crucial for detecting causal factors or sequences that associate individual characteristics or certain events to
consequential offending (Blumstein et al., 1988). Longitudinal data also permits the use of complex behavioral models because they allow one to examine the effects of missing or unobserved variables that may be correlated with crime (i.e., also known as the unobserved heterogeneity problem). It is often the case that even among people who have similar characteristics (race, age, sex) there is a substantial amount of heterogeneity. Thus it is important to utilize longitudinal models or run the risk of using misspecified models and producing inconsistent parameter estimates (see Nagin, 2005).

According to Nagin (2005:1-2), longitudinal data also provide researchers with the basis to study developmental trajectories. Most of the common methods for studying developmental trajectories, however, are those that are calculated to account for individual variability, which masks the possibility of observing meaningful subgroups within certain samples and populations. Furthermore, this over-reliance on traditional longitudinal approaches has led to much ad-hoc theorizing and classifying individuals on the basis of what could be random variation. Hence important developmentally distinct groups could be missed or misclassified.

The particular method used in this study to model the group-based offending trajectories was originally developed by Nagin and Land (1993) and is known by several different names including: group-based modeling, finite mixture models; trajectory analysis, and semiparametric Poisson-based regression analysis. It is important to note that this technique shares some similarities with the traditional group-based modeling approaches such as hierarchical linear modeling (Byrk & Raudenbush, 1987, 1992; Goldstein, 1995) and latent curve analysis (McArdle & Epstein, 1987; Meredith & Tisak, 1990).

Still, there are distinct differences. For instance, both hierarchical modeling and latent curve analysis assume continuous distribution functions. Trajectory analysis does not assume
this continuous distribution, but rather assumes that there exist distinct clusters of group-based trajectories that exhibit different etiological processes, and the methodology approximates the continuous distribution by identifying points of support (i.e., distinct groups or trajectories) (Nagin, 2005). These trajectory models are also based on a maximum likelihood (ML) function, which of course permits them to display the qualities of ML parameter estimates—they are consistent and asymptotically normally distributed (Cramer, 1946; Greene, 1990). Given the assumptions and statistical properties, this method assumes that individual differences in behavioral trajectories can be described as polynomial functions of age or time. The following formula presents the probability for belonging to a particular group:

\[ P(Y_i) = \sum_{j} \pi_j P_j(Y_i), \]

where \( P(Y_i) \) is the unconditional probability of observing individual \( i \)'s longitudinal sequence of police contacts, \( Y_i \), over time. It is equivalent to the sum across \( J \) groups of the probability of \( Y_i \) given \( i \)'s membership in group \( j \) weighted by the probability of membership in group \( j \) (see Nagin, 2005:25).

There are various forms and derivatives of the trajectory model, but the two most common parametric forms that are likely to apply to the data used for this study are the censored normal model (CNORM) and the zero-inflated Poisson model (ZIP). The CNORM model is appropriate for data where the outcome variable of interest is normally distributed but there exists clustering of the data at either the minimum or maximum (which typically occurs with offending data). This model can also be applied to data without censoring by assigning the scale maximum and minimum values to values that are respectively smaller and larger than any value observed in the data. The equations listed below correspond to the statistical derivations of the cases when (1)
the data are censored at the scale minimum; (2) normally distributed between the scale minimum and maximum; and (3) the data are censored at the scale maximum:

\[
p_j(y_{it} = S_{\text{min}}) = \Phi \left( \frac{S_{\text{min}} - \beta_j x_{it}}{\sigma} \right),
\]

\[
p_j(y_{it}) = \frac{1}{\sigma \left( y_{it} - \beta_j x_{it} / \sigma \right)} \text{ for } S_{\text{min}} \leq y_{it} \leq S_{\text{max}}, \text{ and}
\]

\[
p_j(y_{it} = S_{\text{max}}) = 1 - \Phi \left( \frac{S_{\text{max}} - \beta_j x_{it}}{\sigma} \right)
\]

where it is assumed that \( y_{it} \) is normally distributed with a mean of \( \beta_j X_{it} \) and conditional on age \( t \) with a standard deviation of \( \sigma \) and \( \Phi \) represents the cumulative distribution of a normal random variable. In addition, \( S_{\text{min}} \) represents the scale maximum and \( S_{\text{max}} \) represents the scale minimum (Nagin, 2005:30).

In contrast, the parametric form of the trajectory model that is needed for modeling count-based data such as the number of police contacts is the ZIP version, which was first presented in Nagin and Land’s original work and is based on the generalization of what Lambert (1992) called the zero-inflated Poisson (ZIP) distribution. Count-based models have been more frequently utilized in the social sciences in an effort to correct for the inefficient and biased estimates that are produced when linear regression is employed for modeling data where the dependent variable is measured as a count or frequency of an event (for review, see Long, 1997). Although the Poisson regression model is the most basic form of the count-based models, it is often not the most suitable model due to its primary assumption of mean variance equivalence, or equidispersion. It is more likely the case that, in practice and especially in criminological research, the distribution of the outcome variable is overdispersed, (i.e., the variance exceeds the mean); therefore, a more appropriate modeling procedure is recommended (Long, 1997:218).
The ZIP model allows for the assumption of a dual-state-system. A dual-state-system signifies two situations: one in a zero-contact state where the assumption is that a group of individuals exists that can be regarded as police-contact free, and the second state or non-zero contact state where the expected incidences of police contacts are assumed to follow some known distribution, such as the Poisson (Long, 1997; Lambert, 1992). Several other studies have also noted the practicality of the ZIP model when using count data with excess zeros (King, 1989; Land, McCall, & Nagin, 1996; Zorn, 1998).

The ZIP model takes the following form where the first term is the probability of no police contacts and the second term is the probability of the combined event’s being active and the probability of zero police contacts given \( \lambda_{jt} > 0 \) (Nagin, 2005:35).

\[
p^j(y_{it}) = (1 - \alpha_t) \left( \lambda_{jt} e^{-\lambda_{jt} / y_{it}} \right) \quad (y_{it} = 1, 2, \ldots),
\]

Once the parametric form of the trajectory model is established it is necessary to determine the functional form of the groups’ trajectories and there are three possibilities including a linear, quadratic, and cubic form (or age, age-squared, and age-cubed). Depending on the ages and the length of the observation period, it is unlikely that individual offending will have a linear form. Similarly, although the quadratic model is more often used in research (see Bushway et al., 2003:140), it only permits one major directional change in the trajectory, and it is likely that cohort members will and have undergone periods of intermittency in their involvement with the police. Intermittency periods refer to those points in time (i.e., years) where no official police contacts were recorded for any particular cohort members. Therefore, it is likely that the cubic model will demonstrate the best functional form of the trajectories. The CNORM and the ZIP equations that allow for all three of these possible functional forms are presented below:

\[
y_{it}^* = \beta_0 + \beta_1 \text{Age}_{it}^1 + \beta_2 \text{Age}_{it}^2 + \beta_3 \text{Age}_{it}^3 + \epsilon_{it} \quad \text{(CNORM)},
\]
\[ \ln (\lambda_{it}) = \beta_0 + \beta_1 \text{Age}_{it} + \beta_2 \text{Age}_{it}^2 + \beta_3 \text{Age}_{it}^3 + \epsilon_{it} \text{ (ZIP)}, \]

where \( \text{Age}_{it}^1, \text{Age}_{it}^2, \) and \( \text{Age}_{it}^3 \) are the cohort member’s \( i \)'s age, age-squared, and age-cubed respectively, \( t \) represents time, and \( \epsilon_{it} \) is a disturbance parameter that is assumed to be normally distributed and the \( \beta \)s are the parameters that determine the functional form of the trajectory (Nagin, 2005:28-33).

Finally, the exact number of groups is chosen based on an examination of the Bayesian Information Criteria (BIC) in order to maximize model fit. This process is necessary because conventional likelihood ratio tests cannot be used to assess whether the addition of another group adds any explanatory power to the model (see D’Unger et al., 1998). In the end, the exact determination of the number of groups is based on the ability of the model to find a relative convergence using all of the available information and by the utility of the groups for indicating distinct and homogenous trajectories, while also having a sufficient number of persons within each group to allow for further statistical analyses (Bushway et al., 2003:140; see also Brame et al., 2001). The BIC values can be relied on to determine the number of groups in both nested and unnested models (see D’Unger et al., 1998; Nagin, 1999), and the BIC values are estimated based on the following equation, where \( L \) is the maximum likelihood, \( n \) is the sample size, and \( k \) is the number of parameters (Nagin, 2005:64):

\[ \text{BIC} = -2 \log (L) + \log (n) \times k. \]

A Seductive or Useful Statistical Method?

More than thirty years has past since Hirschi (1969:53) initially provided the word of caution to criminologists when using offender typologies by asserting that “it begs the question of causal homogeneity by focusing exclusively on the question of behavioral homogeneity.” Criminologists have come a long way since Hirschi’s earlier remarks regarding offender
typologies; however, this does not mean that Nagin’s and Land’s latest methodological technique has been insulated from theoretical scrutiny. The group-based modeling technique has been the source of recent criticisms and counterpoints between its originators and two prominent life-course theorists, Sampson and Laub.

This debate began with the findings from an earlier study by Sampson and Laub (2003) questioning the stability of offending patterns over the life course and more specifically with an article published in the *Journal of Quantitative Criminology*, entitled “Methodological sensitivities to latent class analysis of long-term criminal trajectories.” The authors (Eggleston, Laub, & Sampson, 2004) argued that the “enthusiasm” for the use of Nagin and Land’s (1993) semiparametric group-based models has not been equally supplemented with robustness and sensitivity analyses that are often inherent in offending data.

They proceed by summarizing the obvious advantages of these models (see also Nagin, 2005) that include (1) the fact that they are designed for longitudinal data; (2) they lead to the ability to distinguish groups of offenders that are homogenous within their trajectory but distinct from other trajectories; (3) they provide an objective systematic criterion for establishing offending groups by using the Bayesian Information Criterion (BIC) rather than presupposing subjective sub-groups of offenders; (4) posterior probabilities are used to assess the precision of group assignment; and (5) this method accommodates missing data, whereby offenders that have unavailable information for several time periods are not excluded from the analysis (Eggleston et al., 2004:2).

Relying on 500 juvenile delinquents’ data from the archives of the classic Gluecks’ *Unraveling Juvenile Delinquency* research (1950, 1968), Eggleston et al. (2004:23) concluded that the length of follow-up can affect the trajectory patterns observed and argue that data that
focuses on say age 6 to 15 versus 10 to 32 may produce trajectories with different curves (i.e., shapes), peak ages of offending, and possibly membership to different offending groups. Additionally, they argue that research using trajectory analysis needs to attend to both incarceration and mortality information because these factors can also affect offending trajectories (see Piquero et al., 2001 for a similar discussion on the importance of accounting for incarceration data).

This article discussed above prompted an initial response by Nagin (2004) and a subsequent response by the Sampson, Laub, and Eggleston (2004) that were both printed in the same issue of the *Journal of Quantitative Criminology*. Nagin’s (2004) initial response indicated that he had no criticisms regarding the analysis conducted by Eggleston et al. (2004) and typically agreed with their findings; however, he did note some counterpoints to a few of their conclusions.

Specifically, Nagin (2004:28) argued that the criticisms offered by Eggleston et al. aimed at the trajectory model are limitations that plague all longitudinal data (i.e., projecting beyond the range of the data and missing data resulting from incarceration and/or death). Other researchers have also commented on the idea of career termination or false desistance resulting from death (see Reiss, 1989) or based on data that does not track the individuals throughout their entire life course (see Bushway et al., 2001; Piquero et al., 2003). Nagin concluded by reminding researchers that the groups that result based on the trajectory models must be understood as an approximation and this warning was already previously presented in Nagin and Land’s (1993) original work.

Sampson et al. (2004) reanalyzed the Gluecks’ data in response to Nagin’s comments and subsequently provided several more suggestions for future researchers relying on the trajectory
method. They also felt that the majority of their criticisms should also be heeded by any future criminological research incorporating longitudinal data. First, using random samples of varying sizes, they found that the number of groups only began to stabilize with samples of over 200. Other research has indicated that the number of identified groups is partly a function of sample size (see Nagin & Tremblay, 2001) and that the number of groups tends to be consistent with samples above this range (see D’Unger et al., 1998).

In their final remarks, Sampson et al. (2004:41) indicate that the larger problem with the use of trajectory analysis and inferences made from longitudinal data with short follow-up periods concerns the causal theory for using groups. They state that future research should resort to grounding all methods in strong theory and be wary of models that provide evidence of an existence of groups just because they are statistically discovered or what is referred to as the reification of groups (see also Laub & Sampson, 1993; Sampson & Laub, 1993).

As if this above exchange was not enough to settle the debate and prompt future longitudinal researchers to be mindful to theory and consider the estimation of groups in trajectory analysis as approximate, this dialogue was continued most recently in a 2005 issue in the journal of *Criminology*. Nagin and Tremblay (2005a:873) set forth with an attempt to debunk three commonly held misconceptions regarding trajectory analysis that originate from researchers’ failure to understand that the method results in an approximation of groups including: (1) the individuals actually belong to a trajectory group; (2) the number of trajectory groups is immutable; and (3) the trajectories of group members follow the group-level trajectory in lock step.

Regarding the first misconception, Nagin and Tremblay (2005a:882) state that trajectory groups are referred to as is they are real/true entities only for the purpose of “literary
convenience” in that it facilitates the ability to clearly discuss groupings of individuals that
display similar offending patterns. Since the discovering of trajectory groups is a statistical
approximation, they are not meant to be interpreted as factual representations of reality (a
common limitation of all statistical models). Similarly, this false understanding of the fact that
the method results in a statistical approximation of groups also has fostered the development of
the second misconception, i.e., that the number of groups in the sample is immutable.

According to Nagin and Tremblay (2005a: 888), the number of groups and the shapes of
their offending curves are not a fixed reality either. Instead, the number of groups and their
respective trajectories are influenced by the quality of the longitudinal data that are relied on for
the analysis. In this sense, the quality of the data refers to the sample size and the number of
observation periods, and obviously larger samples and longer follow-up periods are always the
most optimal. The research presented above also showed that the number of groups and the
shapes of their trajectories were relatively stable in samples that were larger than 200 cases
(D’Unger et al., 1998; Sampson et al., 2004).

Nagin and Tremblay (2005a:892) concluded by offering a couple of comments concerning
the final misconception (that individuals will follow their offending group’s trajectory in lock
step). First, the shape of the group’s trajectory within which the individual is assigned is
intended to reflect a behavioral process over time versus possible individual variation across this
identified pattern of offending. There will always be individual variation, just as there is
variation in offending if a researcher relies on other units of analysis (households, cities,
counties, etc). It is highly unlikely that any one particular member of any these aggregations will
exactly display the average offending rates of the group. In addition, there are also statistical
reasons why individuals within a group trajectory will deviate from the process captured over the entire period of observation, most notably involving sampling variation.

Notwithstanding this further attempt by Nagin and Tremblay to defend the methodology and to caution its users about the limitations of trajectory analysis, this article was inevitably met with a rejoinder by Sampson and Laub (2005a). In a departure from the previous dialogue of the debate as depicted in the *Journal of Quantitative Criminology*, this article had a much more forthright tone. Sampson and Laub (2005a:905) basically concluded by suggesting that trajectory analysis is just another “sexy” statistical tool much like path and factor analysis long ago, followed by event history analysis in the 1980s, and most recently preceded by LISREL and HLM in the 1990s.

Although, they did argue that the methodology has some uses, they believe that the larger problem is criminology’s obsession with statistical tools without attention to theoretical underlying processes that influence behavior. In a last attempt by Nagin and Tremblay to provide a response to Sampson and Laub’s critiques, Nagin and Tremblay (2005b) themselves were surprised by the tone of the latest rejoinder, and equally cautioned criminologists to be wary of “seductive” theories as well as “seductive” methodologies (especially when the critics are promoting a life-course theory that they themselves developed).

In another work, Sampson and Laub (2005b:41) did concede that they were not arguing that grouping techniques such as Nagin’s did not have any place in criminology, they were just trying to warn criminologists about the mistake of the reification of groups as a result of the application of the method, which Nagin (2005) himself also mentioned as a possible outcome. They argued that this mistake is comparable to researchers making errors in interpreting
regression results in causal versus associational terms (for further discussions also see Sampson & Laub, 2005b, 2005c; Maughan, 2005; Nagin & Tremblay, 2005c, 2005d; Raudenbush, 2005).

With these criticisms and limitations in mind, this chapter concludes with identifying the software that will be used to estimate the group-based offending trajectories. The final discussion is on the use of multinomial regression for assessing the relative strength of macro-level versus micro-level predictors for predicting latent class membership.

Analytic Procedure

Trajectory estimation

PROC TRAJ is the name of the computer software that will be relied on in order to estimate the offending trajectories for the 1942 and 1949 Racine continuous-resident samples by cohort and data source including sex as covariate. This is a special procedure that is obtainable as a macro-level function in SAS (Jones et al., 2001) and is made available for free use by the National Consortium on Violence Research. Although a relatively new procedure, PROC TRAJ has become a widely used method for investigating trajectories of development (Piquero, 2007) and has been applied to a variety of different research questions including criminal career desistance (Bushway et al., 2003), offense trajectories (Chung et al., 2002; Fergusson et al., 2000; Piquero et al., 2003), sex differences in mental health (Barrett & White, 2002), age-crime trajectories (McDermott & Nagin, 2002), and aggression toward mothers (Pagani et al., 2004).

While there have been two previous studies that have used PROC TRAJ with macro-level data, they relied solely on aggregate crime rates in Chicago census tracts (Griffiths & Chavez, 2004) or neighborhood street segments in Seattle (Weisburd et al., 2004). Therefore, this is possibly the first attempt to date (see Land, 2000 for a possible exception) that has utilized this method to estimate offending trajectories and then estimate models incorporating macro-level and micro-level characteristics for predicting group membership.
The initial trajectory models will be estimated separately for the 1942 and 1949 Racine continuous-residents including sex as a covariate in the trajectory estimation (Models 1 and 2).\textsuperscript{15} This will be followed by two models estimated similarly by cohort with sex as a covariate but only using the random subsamples of interviewed Racine continuous-residents from the 1942 and 1949 cohorts (Models 3 and 4). These models will allow a preliminary examination of the stability of offender groups across the cohorts and by data source. In other words, they offer a type of sensitivity analysis for the stability of group identification that Nagin and Tremblay (2005a) have argued has rarely been done in the trajectory literature (for exceptions see D’Unger et al., 1998; Sampson et al., 2004).

Finally, because the purpose of this study is to examine the importance of macro-level and micro-level factors in predicting longitudinal trajectories of offending, the 1942 and 1949 subsamples will be merged respectively with the sparse 1950 Census block data and an additional model will be estimated for each cohort with sex as a covariate (Models 5 and 6). These final trajectory models with the 1942 and the 1949 continuous-resident subsamples (merged with the interview and block data) are the basis for assessing the possible independent effects of macro-level and micro-level measures for predicting latent class membership (see also Table 4-1 presented above that graphically displays the trajectory analyses that will be estimated).

**Multinomial logistic regression**

After identifying the latent offender classes and establishing their respective participation and frequency rates of offending, multinomial logistic regression models will be estimated in

\textsuperscript{15} Ideally, race-specific models would also be estimated also; however, due to the homogeneity of Racine in the 1940s and the small numbers of non-Whites in the continuous-resident samples, race will remain a covariate in the multinomial regression models estimated in the following chapter.
order to evaluate the relationships among the macro-level and micro-level measures for predicting offender group membership within the context of a multivariate model with attention to the hypotheses presented at the end of chapter 3. This multivariate procedure will be used because the multinomial logit model is able to deal with dependent variables in which there is no hierarchical order to the responses and can handle both continuous and discrete independent variables, similar to ordinary regression models (Agresti, 1990). While dependent variables that are interval scales are completely appropriate for the common multiple regression technique known as ordinary least squares (OLS) and although this same technique is often used in cases where the dependent variable has ordinal outcomes that range from one to four (i.e., strongly disagree, disagree, agree, and strongly agree), this latter application is typically not correct.

There are a variety of assumptions associated with ordinary least squares regression including the assumptions of linearity, mean independence, homoscedasticity, uncorrelated disturbance (error) terms, and the assumption of normality (see Allison, 1999); however, the most important assumption that relates to the inappropriate decision to use OLS with categorical dependent variables is the assumption of linearity. If OLS is applied to an ordinal outcome variable, then there is the expectation that an increase or decrease of one unit on the scale is interpreted as having the same influence no matter where you begin on the scale. Similarly, there are cases when the dependent variable outcomes have no order at all in that they are nominal scales (Allison, 1999).

Although it is theoretically possible to assume some inherent degree of order to outcomes such as being a non-offender, adolescent-limited offender, and a chronic offender (i.e., 1, 2, 3) these offending groups are based on nominal typologies that are theoretically and methodologically driven. There is also the potential outcome of where more than these three
groups can be discovered and there is no logical way to order these groups, for instance early-onset adolescent-limited offenders, low-low chronic offenders, late-onset offenders, etc. Therefore, in this case the most appropriate modeling technique for the form of the dependent variable (i.e., group membership) in this study is what is referred to as the multinomial logit model.

Fundamentally, the multinomial logit model (MNLM) can be referred to as an extension of the typical binary logit model (0, 1) where binary logits are simultaneously estimated for all of the potential comparisons across the available categorical outcomes (offender groups in this case) (Long, 1997:149). For example, its results are similar to estimating binary logit models hypothetically comparing group 1 (non-offenders) against group 2 (adolescent-limited offenders), group 3 (chronic offenders) against group 1 (non-offenders), and then finally group 2 (adolescent-limited offenders) against group 3 (chronic offenders). This obviously can become much more work and present difficulty for explaining the results across these models as the number of groups increase. The multinomial logit model can be expressed in terms of the probability of observing outcome $m$ given $x$ (assuming $y$ is the dependent variable with $J$ nominal outcomes, i.e., adolescent-limited offender, chronic offender, etc.). The MNLM as a probability model takes the following form (Long, 1997:152):

$$\Pr (y_i = m \mid x_i) = \frac{\exp (x_i\beta_m)}{\sum_{j=1}^{J} \exp (x_i\beta_j)}.$$ 

Similarly, the MNLM can also be presented in the form of an odds model, where the odds of outcome $m$ versus outcome $n$ given $x$ is illustrated as follows (Long, 1997:154):

$$\Omega_m \mid n (x_i) = \exp (x_i\beta_{m \mid n}),$$

and, after several derivations, the odds of an outcome $m$ (being an adolescent-limited offender) versus outcome $n$ (being a non-offender) are expected to change by a factor of $\exp (\beta_{k, m \mid n})$. 

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multiplied by \( \delta \), controlling for the effects of the other variables in the model (Long, 1997:169). This odds model allows for a cleaner interpretation. For example, given this formula we could now hypothetically say that the odds of being an adolescent-limited offender relative to being a non-offender are 2.9 times greater for males, holding all other variables constant.

For all of the following multinominal analyses, latent class membership will be treated as the outcome variable with dichotomous variables representing each offender group and the non-offender group (group 1) will be left out as the reference group. The results of the multinominal logit models that provide the best model fit for these data will be assessed using the pseudo-R\(^2\) statistic which is bounded between the values of zero and one, with values closer to one indicating better model fit (Long, 1997). The multinominal analyses will be estimated separately by cohort for the 1942 and 1949 Racine continuous-residents (total=558 individuals) who had all of the available information (interview and block data) necessary to assess a theoretically integrated model for explaining group-based offending patterns.

The progression of the models will be as follows: Model 1 will be a baseline macro-level model where the effects of the social disorganization index (neighborhood SES and residential mobility) for predicting group membership will be determined. Model 2 will be estimated similarly to Model 1, although this model will only include the individual-level independent variables (life transitions, race, and low SES household, and sex). Finally, Model 3 will present the full model where both the macro-level and micro-level measures with be estimated simultaneously, which would allow for an exploration into the possible mediation effects of individual and family processes on the relationship between living in a social disorganized area and group membership. The results of all of these analyses will be discussed and elaborated on in Chapter 5.
Study Strengths

Notwithstanding the limitations noted previously in this chapter, there are several important strengths of this study that are worth mentioning. First, this study answers the recent calls among criminologists regarding moving toward theoretical integration of macro-level and micro-level levels of analysis (Sampson et al., 1997; Messner et al., 1989), specifically focusing on social disorganization theory (Shaw & McKay, 1942), Sampson and Laub’s age-graded theory of informal social control (1993), and Moffitt’s (1993) offender taxonomy. Furthermore, it approaches this process by employing a relatively new methodological tool that has gained a substantial recognition in the field as an appropriate modeling technique for identifying distinct behavioral patterns (for review, see Piquero, 2007).

Second, as an addition to the trajectory literature, this study provides an exploration into the importance of sex for distinguishing group-based trajectories. Third, prior studies that have estimated trajectories with the Shannon’s (1988, 1991) Racine cohorts have relied on only felonies and misdemeanors as the measure of offending (see D’Unger et al., 1998); therefore, this research also includes status offenses in the hopes to better capture adolescent-limited offending patterns. This study also improves by Land’s (2000) study by estimating a series of trajectory models as a “sensitivity” analysis to discover if similar offending trajectories are produced by cohort and data source. This is especially of concern once the Racine continuous-resident subsamples are merged with the interview level data, and subsequently, once the even fewer of the individuals are merged with the limited amount of available census data characterizing the community in which they were socialized. Finally, this study is perhaps the first one (see Land, 2000 for a possible exception) to use trajectory analysis along with multi-level regression models to predict the likelihood of exhibiting a distinct pattern of offending over the life-course.
Table 4-1. Resident Samples by Cohort, Size, Data Sources, and Offender Groups.

<table>
<thead>
<tr>
<th>Continuous-Resident Samples</th>
<th>Sample Size (n)</th>
</tr>
</thead>
</table>

1942 COHORT
- Continuous-Residents: 633
- Continuous-Residents (w/ Interview Data): 333
- Continuous-Residents (w/ Individual & Block Data): 235

1949 COHORT
- Continuous-Residents: 1297
- Continuous-Residents (w/ Interview Data): 556
- Continuous-Residents (w/ Individual & Block Data): 323

Table 4-2. Observational Periods of Data Sources by Cohort

<table>
<thead>
<tr>
<th>Data Sources</th>
<th>Years</th>
<th>1942 Cohort</th>
<th>1949 Cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Police Contact Data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1942 Cohort</td>
<td>1948-1967</td>
<td>6 to 25 years of age</td>
<td>6 to 25 years of age</td>
</tr>
<tr>
<td>1949 Cohort</td>
<td>1955-1974</td>
<td>6 to 25 years of age</td>
<td>6 to 25 years of age</td>
</tr>
<tr>
<td>Interview Data</td>
<td>1976</td>
<td>34 years old</td>
<td>27 years old</td>
</tr>
<tr>
<td>Census Data</td>
<td>1950</td>
<td>8 years old</td>
<td>1 year old</td>
</tr>
</tbody>
</table>

Table 4-3. Social Disorganization Index Factor Loadings by Cohort

<table>
<thead>
<tr>
<th>1950 Census Measures</th>
<th>1942</th>
<th>1949</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner-Property Value</td>
<td>-.774</td>
<td>-.818</td>
</tr>
<tr>
<td>% Renter-Occupied Units</td>
<td>.794</td>
<td>.794</td>
</tr>
<tr>
<td>% Overcrowded</td>
<td>.612</td>
<td>.665</td>
</tr>
<tr>
<td>Eigenvalue</td>
<td>1.61</td>
<td>1.75</td>
</tr>
<tr>
<td>% Variance Explained</td>
<td>53.47</td>
<td>58.04</td>
</tr>
<tr>
<td>N</td>
<td>235</td>
<td>323</td>
</tr>
</tbody>
</table>
CHAPTER 5
RESULTS

Introduction

This chapter begins with a description of the summary statistics and mean differences across the cohorts for all of the independent and dependent measures. Following this discussion is a presentation of the group-based trajectories for all of the samples of the 1942 and 1949 Racine continuous residents (full sample, sample with interview data, and sample with interview and block data). Included in the explanation of the group-based trajectory results is also a discussion of the effect of sex (being male) as a covariate for increasing the likelihood of being in an offender group as opposed to a non-offender group. This chapter concludes with an ANOVA presenting the mean covariate levels across groups for all variables used in the multivariate analysis by cohort. This is followed by an illustration of the multivariate results and a description of the impact of macro-level and micro-level factors for distinguishing between group-based trajectories. The multivariate analysis concludes with a presentation of the theoretically integrated model for predicting group membership.

Descriptive Statistics

Table 5-1 below presents the descriptive statistics that correspond to all of the macro-level and micro-level variables by cohort described previously that will be used in the mlogit analysis that follows and the zero-order correlations among the continuous measures can be found in Appendix A.

Independent Variables

As can be seen in Table 5-1 there was a variety of measures that significantly differed between the 1942 and 1949 Racine continuous residents that precluded the possibility of combining the cohorts in further analyses. Regarding the measures that were combined to create
the social disorganization index, there was evidence that while both cohorts were characterized by comparable measures of mean owner-property value (1942=$9,374; 1949=$9,196) and roughly equivalent percentages of renter-occupied units (1942=34.87%; 1949=34.99%), there was an indication that the 1949 cohort (M=1.89; SD=3.83) had a significantly greater percent of overcrowded units on average when compared with the 1942 cohort (M=1.48; SD=4.40).

Turning to the micro-level measures, there were fairly comparable sex percentages between the cohorts with 47% of the 1942 sample and 52% of the 1949 sample being male. While equivalent percentages of 1942 and 1949 Racine continuous residents reported having been employed prior to age 25 (94%), there was a significant mean difference in reporting whether or not they had also been married prior to age 25 with more of the 1942 residents (1942=77%; 1949=66%) reporting having experienced marriage. Once these measures were combined into the additive stakes in conformity index (range 0-2 life transitions), the 1942 cohort reported having significantly higher stakes in conformity (M=1.71; SD=0.45) when compared with the 1949 cohort (M=1.60; SD=0.63). Comparatively, the 1949 cohort was comprised of significantly more Blacks (11% versus 6%) and were more likely to have reported having moved at some point in their juvenile years (61% versus 49%). In addition, the 1942 cohort reported having been socialized in significantly lower SES households (1942=3.61; 1949=3.25) and were less likely to have grown up in a natural two-parent household (84% versus 89%) when compared with the 1949 cohort. Although, the 1949 cohort reported slightly greater numbers of children in their families, perceived more susceptible to differential association, and had higher perceptions of formal social control in their neighborhoods during their juvenile years, these differences were not significantly different.
Dependent Variable

The prevalence and incidence of police contacts for the 1942 and 1949 Racine continuous residents can also be found in Table 5-1. While the cohorts had relatively comparable prevalence estimates of having come into contact with the police with 37.9% of the 1942 residents and 41.2% of the 1949 residents having an officially recorded police contact, the 1949 cohort had significantly greater mean numbers of police contacts than did the 1942 cohort. On average, the 1949 residents had 2.33 police contacts (SD=6.71) whereas the 1942 residents had a 1.29 average number of police contacts (SD=2.63). Additionally, the 1949 cohort had accumulated a significantly greater total number of police contacts by age 25 (754 police contacts) when compared with the 302 accumulated police contacts for the 1942 cohort.

Trajectory Analysis

In order to aid in the substantive interpretation of the nature of the offending trajectories identified and estimated for the 1942 and 1949 Racine continuous residents, the predicted and average curves for each of the trajectories implied by the model are plotted in their corresponding figures presented below. The trajectory results are described in order of progression and by cohort, thus the first model is that which was produced using the full sample of 1942 continuous residents, the second model displays the results from a model relying on data for the 1942 continuous interviewed residents, and the third model illustrates the trajectories of the 1942 continuous interviewed residents with block data. This same process is then repeated for the 1949 Racine continuous residents (total=six models; 1942=3 models; 1949=3 models). Each model is discussed in terms of the various model selection criteria (Nagin, 2005), or more specifically: (1) the increase in the BIC value (as previously described in Chapter 4); (2) the posterior probabilities for group assignment; and (3) the model’s ability to demonstrate a
theoretically distinct and substantively meaningful number of groups. Finally, the models are described with attention to examining the effect of sex (being male) on group membership.

The model estimations began by fitting the 1942 Racine continuous residents' police contact data to a two group model and then comparing the BIC values from a three group model to the two group model. The three-group model proved a better fit and the analysis continued by adding groups and observing the improvement in the BIC values. The trajectory procedure ultimately arrived at a four-group solution because despite several attempts the model was unable to converge with a five-group model (see Table 5-2).

The average and the predicted curves are displayed below in Figure 5-1 and these plots illustrate that the predicted (smoothed) curves closely followed the “true” mean offending curves. The first group (G1) represents the overwhelming majority of the sample or 73.1% of all of the 1942 Racine continuous residents. Individuals in this trajectory group exhibit virtually no offending (as measured by official data) across the entire twenty years of observation (i.e., ages 6-25). The second group includes 8.8% of the sample and individuals in this group appear to demonstrate the type of offending that would characterize adolescent-limited offenders as described by Moffitt (1993) with their offending beginning in adolescence, reaching a peak by age 16 before declining and desisting prior to young adulthood. No individual in this group accumulated more than 10 police contacts by age 25 and the average number of police contacts for this group was 3.91 (SD=1.98). The third group, representing 13% of the sample, exhibit a low-level of chronic offending beginning in early adolescence (age 12) and continue to illustrate a non-zero rate of offending into adulthood and are still offending at age 25; however, no individual in this group accumulated more than seven police contacts during the twenty year period. Group 4 (5.1%) presents a sharp contrast to the other groups in that individuals in this
group begin offending relatively early in life (some even as early as age 7) and they maintain a relative high amount of police contacts throughout the remainder of the observation period but does decline in young adulthood. Although, it does appear that these individuals peak in late adolescence they still exhibit high levels of offending in early adulthood. No individual in this group accumulated less than 5 police contacts and a handful of offenders in this group had even amassed more than 20 police contacts before reaching age 26. Overall, this small group of offenders was responsible for 352 total police contacts between the ages of 6 and 25.

When turning to an examination of the mean posterior probabilities for group assignment (see Table 5-3), the mean assignment probabilities for each group are noticeably high suggesting that there was little ambiguity in the model when determining group assignments. For example, for G1, the mean posterior probability was .91, and the next highest was G3 with a mean probability of .07 of being assigned to G1; for group 2, the mean posterior probability was .84 (median=.87); for group 3 it was .85 (median=.93); and for group 4 it was .91 (median=.99).1

The results of this trajectory analysis provided evidence that sex was a highly significant covariate for determining group assignment (see Table 5-4). With G1 serving as the reference group (i.e., the non-offender group), being male significantly increased an individual’s likelihood for being assigned to any of the three offender groups (i.e., adolescent-limited/peaked, low-level chronic, and high-level chronic).

Table 5-5 illustrates the BIC criteria for assisting in model selection for the trajectory analysis using the reduced random sample of interviewed Racine continuous residents and the average and predicted group-based offending trajectories are displayed in Figure 5-2. These

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1 All average posterior probabilities are above the standard cut-off of .70 (Nagin, 2005). While there is always the possibility of mis-classification of individuals to particular trajectories none of the posterior probabilities in these data were below .80 thus indicating a high degree of discrimination between groups.
trajectories were similar to those produced in the previous analysis, although only three distinct groups were identified in this particular analysis.  

The first group represented the overwhelming majority of the Racine interviewed residents with 86.2% of the sample being classified as non-offenders with virtually no offending during the observation period. Comparatively, G2 represented 7.8% of the sample and individuals in this group appeared to display an offending pattern consistent with Moffitt’s (1993) adolescent-limited offender type wherein these individuals began offending in adolescence before peaking in mid-adolescence and showed evidence of desistance near age 19 with no individual in this group having any officially recorded police contacts after age 20. Individuals in this group had an average of 4.50 (SD=2.49) police contacts and no individual in this group accumulated more than 12 police contacts prior to reaching age 26. The third group, representing 6% of the sample, is recognizable by their early onset of offending (prior to age 10) and relatively high levels of offending throughout the rest of the observation period. Although there is evidence that this group’s rate of offending peaked in late adolescence/early adulthood they still maintained relatively high levels of offending through age 25. On average, individuals in this group had 7.85 (SD=3.42) police contacts and a handful of these offenders accumulated more than 10 police contacts between the ages of 6 and 25. Furthermore, this small group of chronic offenders was responsible for a total of 157 police contacts.

Similar to the results of the previous trajectory analysis, the posterior probabilities for group assignment were remarkably high providing evidence that the individual trajectories in these data could be assigned to a group-based trajectory with a relatively high degree of

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2 A four group model was not able to fit these data, thus the low-level chronic offending group was not identified in this stage of the analysis.
probability (see Table 5-6). Only in G2 did the mean posterior probabilities fall slightly below .90 but still remained well above the .70 cut-off (Nagin, 2005). Consistent with the previous model, the results in Table 5-7 indicated that being male significantly increased an individual’s likelihood of being assigned to either offender group (adolescent-limited/peaked or chronic) when compared with the non-offender group.

Table 5-8 presents the BIC model selection criteria for the trajectory analysis using the data from the 1942 Racine continuous interviewed residents with block data that provides the trajectories and groups that will be of interest in the 1942 ANOVA and mlogit analysis that follows. A three-group model once again provided the best fit for these data and the average and predicted offending curves are plotted below in Figure 5-3.

G1, representing 70.2% of the sample, are virtually a non-offending group with little to no police contacts during the ages of 6 to 25. The second group, representing 20% of the sample is similar to the adolescent-limited offender type proposed by Moffitt (1993) with the individuals in this group beginning to offend in adolescence before peaking around the age of 16 before declining and showing evidence of having desisted by 21. No individual in this group had accumulated more than 5 total police contacts during the twenty years of follow-up. Also consistent with the earlier analyses, the third group exhibited an early onset of offending (prior to age 10), relatively high levels of offending throughout adolescence before reaching a peak at age 16; however, these individuals continued to maintain comparatively high rates of offending into adulthood and through the age of 25, although the trajectory was declining. No individual in this group had accumulated less than 4 police contacts and a handful of these individuals had as many as more than ten police contacts prior to reaching age 26 (M=8.09; SD=3.30). This small number of Racine residents amassed 186 police contacts between the ages of 6 and 25.
Table 5-9 presents the posterior probabilities for group assignment and consistent with the two prior trajectory analyses using residents from the 1942 cohort, there was relatively little ambiguity when the model was determining group assignment with mean posterior probabilities as high as .91 (median=.99) for G3 and still comparatively high for G1 (M=.89; median=.97) and G2 (M=.89; median=.97). Additionally, the results indicated that sex (being male) significantly increased an individual’s likelihood of belonging to either an adolescent-limited/peaked or a chronic offending group when compared with membership in a non-offending group (see Table 5-10).

The next set of trajectory analyses involves data from the 1949 Racine continuous residents following the same progression of models that were estimated for the 1942 cohort: (1) continuous residents; (2) continuous interviewed residents; and (3) continuous interviewed residents with block data. The results of the BIC model selection criteria for the 1949 continuous resident sample is presented below in Table 5-11. This was the only sample in which a five-group model provided the best fit for these data, but this is not surprising given that prior researchers have shown evidence that the number of groups typically increase with sample size (D’Unger et al., 1998; Nagin & Tremblay, 2001; Sampson et al., 2004) and this was in fact the largest sample in this study (N=1,297).

The average and predicted curves for the 1949 continuous resident trajectory analysis can be found in Figure 5-4 and consistent with the analyses produced using data from the 1942 continuous residents, the predicted offending curves tended to closely follow the “true” offending curves. The first group, representing 57.1% of the sample, is purely a non-offender group as none of these individuals had any recorded police contacts throughout the entire twenty years of observation. The second group, representing 32.7% of the sample, exhibited very low
rates of offending over the entire observation period. There was a tendency for these individuals to peak at age 16 and then decline, but they still showed non-zero rates of offending through age 25. On average, individuals in this group had 1.98 (SD=1.24) police contacts and no individual in this group had more than 7 police contacts. G3, representing 2.6% of the sample, is an atypical group that is not identified in any of the other analyses presented in this study although this offender group has been the point of discussion in prior research (see D’Unger et al., 1998; Sampson and Laub, 1993). Individuals in this group are unique in that they had virtually no officially recorded police contacts until they reached adulthood (age 18) and their rates of offending increased rather noticeably in young adulthood. No individual in this group had less than 3 police contacts (M=6.53; SD=3.89) and a handful of these offenders had actually accumulated more than 10 police contacts despite the fact that their offending did not begin until young adulthood.

The fourth group, representing 5.7% of the sample, can be best described as an adolescent-peaked group (see D’Unger et al., 1998; Land, 2000) in that these individuals do not begin offending until early adolescence but offend at relatively high rates during mid-adolescence before peaking at age 15 and then virtually have desisted by age 23. No individual in this group had less than 6 police contacts and more than half of the individuals in this group had accumulated more than 10 police contacts (the majority of which were during mid-adolescence). G5, representing the smallest percentage of the sample (1.9%), exhibited a high-rate chronic pattern of offending that begins early on in life (prior to age 8) and their offending drastically increases well into adolescence before reaching a peak in late adolescence. These individuals still display high levels of offending throughout the remainder of the observation period or age 25. Individuals in this group averaged an alarming 32.48 (SD=10.30) police contacts and the
police contacts of this group ranged from a low of 22 to a high of 63 police contacts. This small group of offenders managed to accumulate 812 police contacts during the ages of 6 to 25!

The mean posterior probabilities for group assignment indicated that, like the trajectory analyses using the 1942 Racine continuous resident data, this model demonstrated the ability to determine group membership with a high degree of probability (see Table 5-12). G1 had the lowest mean probability (M=.84; median=.93), yet this was still way above the standard cutoff of .70 (Nagin, 2005). The mean posterior probabilities were remarkably high for the low (G2) and high-rate (G5) chronic offending groups indicating that these individuals’ trajectories faced little risk for mis-classification. According to the coefficients and their corresponding p-values produced for this sex covariate, there was evidence that for all of the offender groups except the late-onset offenders (i.e., adolescent-limited/peaked, low and high-rate chronic offenders) being male significantly increased the likelihood of group membership into an offender group compared with a non-offender group (see Table 5-13).

Table 5-14 presents the BIC model selection criteria for the 1949 continuous interviewed residents and similar to the interviewed 1942 sample only three trajectory groups were produced. This analysis failed to detect a late-onset or a low-rate chronic group as was the case in the prior 1949 continuous resident analysis. The average and predicted curves, as plotted in Figure 5-5, indicated that the following three trajectory groups could be identified: (1) non-offenders; (2) adolescent-peaked offenders; and (3) high-rate chronic offenders. G1 (75.1%) represented the overwhelming majority of the sample and exhibiting practically no offending across the twenty year time period. Comparatively, the second group (20.5%) did not begin offending until early adolescence before reaching a peak in mid-adolescence and then desists by their early 20s. Individuals in this group recorded an average of 4.32 (SD=2.81) police contacts with a range of 2
to 14 police contacts. G3, representing 4.3% of the sample, exhibited an early-onset of offending (prior to age 8) and increased their offending patterns throughout mid and late-adolescence before peaking at age 18. Nevertheless, these individuals still offended at relatively high rates by age 25, although showing evidence of desistance in young adulthood. All of the individuals in this group had accumulated at least 10 police contacts between the ages of 6 to 25 (M=23.21; SD=12.95) and this small number of offenders were responsible for 557 police contacts prior to reaching age 26.

Table 5-15 provides the mean posterior probabilities for group assignment and these results show a strong ability for discriminating across trajectory groups with no mean posterior probability less than .92 (G2). In fact, the mean posterior probabilities are remarkably high for G1 (M=.97; median=.99) and G3 (M=.99; median=.99). In addition, consistent with all of the prior trajectory analyses, being male significantly increased the likelihood for an individual being assigned to either an adolescent-limited/peaked or high-rate chronic offending trajectory when compared with assignment to a non-offending group (see Table 5-16).

Table 5-17 presents the BIC model selection criteria for the final trajectory analysis in this study using the data from the 1949 Racine continuous interviewed residents with block data that provides the trajectories and groups that will be of interest in the 1949 ANOVA and mlogit analysis that follows. Similar to the prior 1949 continuous interviewed resident analysis and consistent with the results of the comparable 1942 continuous interviewed residents with block data analysis, the procedure indicated that a three-group model provided the best fit for these data.

The average and predicted curves are displayed in Figure 5-6 below. The first group, representing the majority of the sample (75.2%), exhibits almost no offending throughout the
entire twenty year observation period. In contrast, G2 (20.4%) resembles the adolescent-limited/peaked group identified in the two previous trajectory analyses using the 1949 cohort data in that individuals in this group did not begin offending until adolescence but did not reach a peak in offending until 17 and then declined until appearing to desist by their early 20s. Furthermore, these individuals averaged approximately 5 (SD=3.45) police contacts and they had accumulated at least two police contacts between the ages of 6 and 25 with some of these group members having amassed as high as 14 police contacts. G3 (3.7%) exhibits the high-rate chronic offending patterns discussed previously in that these individuals begin offending early (prior to age 8) and increase dramatically during adolescence before reaching a peak in young adulthood (age 18). Yet, this group displays elevated levels of offending by age 25, but showed evidence of desistance. No individual in this group had less than 14 police contacts and the average number of police contacts for this group was 30.25 (SD=15.89). Overall, these handful of offenders had accumulated 363 police contacts between the ages of 6 and 25.

Table 5-18 displays the mean posterior probabilities for group assignment and Table 5-19 illustrates the effect of sex (being male) on group membership. Like all of the previous analyses, the mean posterior probabilities were noticeably high, ranging from .89 (G2) to .98 (G1) and as high as .99 for G3. This was an indication that there was little ambiguity in assigning individual patterns of offending to a group-based trajectory. Also, once again the results showed evidence that being male significantly increased an individual’s likelihood of being assigned to either an adolescent-limited/peaked or high-rate chronic offending group compared with a non-offending group.

With all of the trajectory analyses concluded, it is important to discuss these models within the context of the relative stability/instability of identifying offender groups across the various
data sources (continuous residents, continuous interviewed residents, and continuous interviewed residents with block data). A graphical display of the offender groups across the data source and by cohort are presented in Table 5-20. As can be seen there appears to be more similarities than differences in the offense trajectories across the data sources and between the 1942 and 1949 cohorts. First, in both of the original 1942 and 1949 continuous resident samples with the largest sample sizes (N=633 and N=1,297) produced the greatest number of groups. The four remaining trajectory analyses with reduced samples were only able to identify three groups, which is consistent with prior research that has indicated that the number of groups increases with the sample size (D’Unger et al., 1998; Nagin & Tremblay, 2001; Sampson et al., 2004). Second, in all of the analyses the non-offending group (G1) was always the most prevalent group in the sample (ranging from 57.1% to 86.2%) and similarly, the high-rate chronic offending group was always the smallest percentage of the offender groups (ranging from 1.9% to 9.8%). Third, the 1942 and 1949 original continuous resident samples also both identified a group that is atypical to what Moffitt’s (1993) taxonomy would expect or who have been classified as low-level chronic offenders who offend early and maintain low non-zero rates throughout the twenty year period of observation; however, this type of offender group has been observed elsewhere in previous trajectory analyses (see D’Unger et al., 1998; 2002).

Regarding the differences, first, the largest sample in this study (1949 continuous resident sample of 1,297 individuals) actually identified an additional atypical trajectory group or what others have referred to as a late-onset group (see D’Unger et al., 1998; Sampson & Laub, 1993) who do not begin offending until late adolescence/early adulthood, but offend at relatively high rates in adulthood. Second, while all of the analyses displayed an adolescent-limited/peaked group of offenders who was the largest group of offenders in four of the six analyses, in the 1949
trajectory analyses this group tended to resemble an adolescent-peaked group (D’Unger et al., 1998; Land, 2000) in that they still exhibited low rates of offending into early adulthood before desisting in the early 20s. The discussion in the next section now moves toward examining the results from the ANOVAs in order to further investigate what macro-level and micro-level factors are significant for distinguishing between offender groups.

**Analysis of Variance**

The results from the analysis-of-variance tests where the macro-level and micro-level risk/protective factors are compared across groups and by cohort are presented in Table 5-21. The group means of offending (number of police contacts) are also displayed in Table 5-21. The trajectory models displayed in Figure 5-3 (1942 cohort) and Figure 5-6 (1949 cohort) are those that all of the remaining analyses are based on. The first most obvious findings is that relatively all of the risk factors are concentrated among the offender groups and the protective factors are primarily found in the non-offender group (G1). More specifically, the risk factors tend to be heightened in the adolescent-limited/peaked groups (G2) and then further elevated in the high-rate chronic groups (G3) (G3 for both the 1942 and 1949 cohorts will be referred to interchangeably as high-rate or chronic offenders hereon). For the 1942 and 1949 cohorts, social disorganization, sex (being male), race (being Black), living a low SES household, living with natural parents, and perceived formal social control are distinguishing features of group membership. Additionally, whether an individual had moved during their juvenile years was a distinguishing feature for 1942 continuous residents, whereas stakes in conformity\(^3\) and family

\(^3\) In order to further explore the possible influence of marriage and employment on group-based offending trajectories, the mean age at time of marriage and first full-time job were computed and compared across groups and by cohort. Regarding the 1942 cohort, 83.0% of the non-offenders (G1), 70.2% of the adolescent-limited/peaked (G2), and 86.9% of the chronic offenders (G3) reported being married by age 25 and of those that reported being married, the mean age of marriage was 20.8 (G1), 21.6 (G2), and 20.7 (G3). In contrast, 97.6% of G1, all of G2, and 95.6% reported having their first full-time job by age 25 and the mean age of first full-time employment was 18.4 (G1), 18.4 (G2), and 18.0 (G3). When turning to the 1949 cohort, 72.7% of the non-offenders (G1), 63.6% of
structure (number of children in family) were also distinguishing features for group membership among the 1949 continuous residents.

While the preliminary results from the f-test in the ANOVAs revealed the concentration of risk factors among the offender groups, it was necessary to conduct Tukey’s B post hoc tests in order to determine which (if any) of the groups significantly differed from one another.

Concerning the 1942 cohort, individuals who were in either offender group lived in significantly more socially disorganized communities and both the adolescent-limited/peaked groups (G2) and the high-rate chronic groups (G3) had significantly more males and G3 was characterized by a significantly greater number of Blacks. G1 also had a significantly greater number of individuals reporting having grown up in a two natural parent household when compared with both G2 and G3. In addition, all of the groups’ mean number of police contacts significantly differed, or in other words G3 had significantly more police contacts than G1 and G2, and G2 had significantly more police contacts than G1.

When turning to the Tukey’s B post hoc tests results for the 1949 cohort, while individuals in G3 and G2 lived in more socially disorganized areas than G1 the groups means did not significantly differ. Comparatively, there was a host of individual level factors that significantly varied particularly when comparing G3 and G2 to G1. The offender groups had significantly more males and Blacks in addition to having a significantly greater number of children in the household and had significantly higher perceptions of formal social control (police presence) when compared with G1 (although G2 and G3 did not significantly differ from each other). The adolescent-limited/peaked (G2), and only 33.3% of the chronic offenders (G3) experienced marriage by age 25 and of those that reported being married, the mean age of marriage was 21.0 (G1), 21.1 (G2), and 21.3 (G3). Comparatively, 96.7% of G1, 95.5% of G2, and 91.6% reported having their first full-time job by age 25 and the mean age of first full-time employment was 19.0 (G1), 18.8 (G2), 17.3 (G3). Thus it appeared that typically fewer adolescent-limited/peaked offenders and fewer chronic offenders reported having experienced marriage and/or employment by age 25, yet there was not consistent evidence that the mean age of having experienced these life transitions varied greatly across groups and by cohort.
high-rate chronic offenders (G3) also had significantly lower household SES and less stakes in conformity than both G1 and G2. Furthermore, G1 was comprised of significantly more individuals that reported coming from a two natural parent household when compared with G2 and G3. Overall, similar to the 1942 ANOVA results, G3 had significantly more police contacts than G1 and G2, and G2 had significantly more police contacts than G1. It is now important to investigate if these same risk/protective factors that were shown to significantly distinguish group membership in these bivariate analyses are also significant for predicting group membership when estimated simultaneously, which now becomes the focus of the next section.

**Multivariate Analysis**

The following set of multinomial regression analyses are estimated in order to compare the ability of the macro-level and micro-level factors to differentiate among the offender groups. Each cohort-specific analysis (beginning with the 1942 cohort) will be divided into the following three separate stages: (1) macro-level level; (2) micro-level level; and (3) the integrated model. The first two regression analyses will assist in isolating the relative strength of prediction for the different levels of analysis (macro-level and micro-level) and the latter will allow for an assessment of the proposed integrated theoretical model for differentiating the non-offenders from the adolescent-limited/peaked and high-rate chronic offenders.4

According to the results from the first macro-level-only model, using data from the 1942 Racine cohort (see Table 5-22) there was support for the effect of social disorganization in differentiating the offender groups. Specifically, residing in a socially disorganized area nearly doubled the odds of an individual being assigned to an adolescent-limited/peaked group and

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4 Models were estimated using clustered robust standard errors in Stata 9.2.
more than doubled the odds of an individual being assigned to a high-rate chronic offending group relative to a non-offender group.\(^5\)

Comparatively, Table 5-23 presents the results from the micro-level-only model. First, the findings showed a robust effect for sex on the odds of being assigned to either type of offender group with being male nearly tripling the odds for being assigned to an adolescent-limited/peaked offender group and increasing the odds by more than six times for an individual being assigned to a high-rate offender group. Having been socialized in a natural two parent household yielded a significant protective effect on the odds of being assigned to adolescent-limited/peaked offender group by reducing the odds by 38%, and it produced a similar reduction in the odds (41%) of being assigned to a high-rate chronic offender group relative to the non-offender group. In addition, having moved during the juvenile years more than doubled the odds of being assigned to a high-rate chronic offending trajectory. Although the majority of the other individual level risk/protective factors were in the expected direction insofar as increasing or decreasing the odds for being in a particular group, being Black, living in a low SES household, stakes in conformity, number of children in the household, perceived delinquent peer influence, and perceptions of formal social control did not achieve statistical significance for distinguishing across trajectories.

Table 5-24 displays the multivariate results for the integrated theoretical model for predicting offender group membership. The findings suggest that once the macro-level and micro-level factors are estimated simultaneously, social disorganization is left only marginally

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\(^5\) Percent non-White was originally included in the analyses as a control variable, but it failed to exert any significant effects for predicting offender group membership. Models were also estimated using backwards deletion and the results confirmed that percent non-White did not influence trajectory group membership or increase the model fit, so it was dropped and not included in the analyses presented here. According to Sampson (1997) there has been little support for this construct in relation to offending when included with neighborhood poverty and residential instability and given the relatively high degree of homogeneity in these data, it is not surprising that this variable was non-significant.
significant (p<0.10) for increasing an individual’s odds for being assigned to an adolescent-limited/peaked offender group in relation to a non-offender group. In contrast, the effect of social disorganization on the likelihood of being assigned to a chronic offender group was completely mediated by the addition of the micro-level factors. Additionally, upon comparing the pseudo R-square statistics, it appeared that the addition of social disorganization did relatively little for providing a better model fit (McFadden’s increased .23 to .25; Nagelkerke increased .39 to .41). Overall, the same three micro-level variables that achieved statistical significance in the micro-level only model discussed above (sex and natural two parent household for both offender groups and having moved for the high-rate chronics only) still remained statistically significant distinguishing factors for group assignment.

The results of the multivariate analysis for distinguishing across trajectories based on data from the 1949 cohort are discussed below. Similar to the prior mlogit models presented above, the first model illustrates the effect of social disorganization alone, the second demonstrates the effect of only the micro-level factors, and the final model displays the findings from the theoretically integrated model for distinguishing across offender groups.

Consistent with the results of the macro-level-only model for the 1942 cohort, social disorganization statistically increased the odds for an individual being assigned to either an adolescent-limited/peaked offender group or a high-rate chronic offender group in relation to a non-offender group (albeit only marginally significant for the high-rate chronic offender group, p=.07) for the 1949 cohort. More specifically, living in a socially disorganized area approximately increased an individual’s odds one and a half times for being assigned to either offender group rather than to a non-offender group (see Table 5-25).
Table 5-26 reveals the results of the micro-level factors for predicting group membership for the 1949 cohort. There were several similarities as well as differences for these individual level factors for distinguishing across trajectories in the 1949 cohort analysis when compared with the 1942 mlogit analysis discussed previously. The key similarity is that a rather robust effect for sex was again found with being male more than doubling an individual’s odds of being assigned to an adolescent-limited/peaked group and increasing an individual’s odds nearly two and a half times for being assigned to a high-rate chronic offending group in relation to a non-offender group.

Additionally, both family-level factors (family stability and family structure) were found to be statistically significant distinguishing features of group assignment to an adolescent-limited/peaked offender group with residing with natural parents resulting in a 46% reduction in the odds and each additional child increasing an individual’s odds 1.36 times for being assigned to an adolescent-limited/peaked offender group. Being Black also marginally increased (p=.06) an individual’s odds of being assigned to an adolescent-limited/peaked offender group. Comparatively, although these two family factors nearly achieved statistical significance for increasing the odds of being assigned to a high-rate offender group [family stability (p=.14); family structure (p=.11)], residing in a low SES household was the more important distinguishing feature of group assignment to this particular group-based trajectory. An individual’s odds of being assigned to a high-rate chronic offender group in relation to a non-offender group increased more than two and a half times if they reported having been socialized in a low SES household. The remaining micro-level factors (stakes in conformity, differential association, perceptions of formal social control, and having moved during the juvenile years) were not statistically significant for distinguishing across trajectories.
The findings from the final mlogit model indicating the results of the theoretically integrated model for predicting group membership using the 1949 cohort (see Table 5-27) revealed similar results as to what was produced for the 1942 cohort. While social disorganization remained marginally significant for the adolescent-limited/peaked offender group in the 1942 analysis \( (p=.06) \), once the macro-level and micro-level factors were estimated simultaneously for the 1949 cohort, the effect of social disorganization for distinguishing across trajectories was no longer statistically significant for either offender group (although the odds were still in the expected direction). Comparatively, the micro-level factors that were statistically significant for predicting group membership in the previous micro-level-only model still maintained their significance in the integrated model. More specifically, being male more than doubled an individual’s odds of being assigned to either an adolescent-limited/peaked or a high-rate chronic offender group and family stability and structure were significant determinants of adolescent-limited/peaked offender group membership. Additionally, having resided in a low SES household more than doubled the odds of being assigned to a high-rate offender group. Overall, upon inspecting the change in the pseudo-R-squares as indicators of model fit, there was little gained from using a theoretically integrated model when compared with the micro-level-only model (McFadden’s increased from .19 to .20; Nagelkerke’s increased from .31 to .32).

**Conclusions**

The results from the series of analytical procedures yielded several substantively important findings. First, the six trajectory analyses (three for each cohort) provided evidence that non-offender, adolescent-limited/peaked offender, and high-rate chronic offender groups were recognized across all data sources (Racine continuous residents, Racine continuous interviewed residents, and Racine continuous interviewed residents with block data) and in both the 1942 and 1949 cohorts. Although the group percentages varied, there was support for hypothesis #1 in
that the semiparametric Poisson-based regression analyses produced these three distinct classes of offenders and that (1) the non-offenders were the most prevalent of the groups; (2) the adolescent-limited/peaked offenders were the most prevalent of the offending groups; and (3) the high-rate offenders were the least prevalent group of offenders but were characterized by a higher rate of mean offending across the observation period when compared with the adolescent-limited/peaked offender group. However, there were a few groups that were recognized in the larger sample trajectory analyses (low-level chronics and late-onsetters) who are not consistent with Moffitt’s taxonomy but have been discussed elsewhere (see D’Unger et al., 1998; Piquero, 2007; Sampson & Laub, 1993).

Support was also shown for the second hypothesis with sex being a significant covariate for distinguishing group-based trajectories. Specifically, in all of the six trajectory analyses, being male significantly increased the probability that an individual would be classified as either an adolescent-limited/peaked or chronic offender with the non-offender group serving as the reference group. The only exception was in the 1949 continuous resident sample (N=1,297). While there were more males in the late-onset offender group for the cohort, being male did not significantly increase the probability of assignment to this particular group-based trajectory.

Concerning hypothesis #3 that significant life transitions including marriage and employment can affect desistance from crime, there was limited support for Sampson and Laub’s age-graded theory of informal social control. There was descriptive evidence at the bivariate level suggesting that individuals in either offender group (adolescent-limited/peaked or high-rate chronic offender group) scored lower on the stakes in conformity index when compared with those individuals assigned to the non-offender group. The results from the ANOVA with the 1949 cohort also indicated that the stakes in conformity index was statistically associated with
group membership to a high-rate chronic offending trajectory with individuals in this group having significantly lower mean scores on the stakes in conformity index when compared with those in the adolescent-limited/peaked group and individuals in the non-offender group.

Qualified support was also shown for hypothesis #4 regarding the expectation that social disorganization would be a significant distinguishing feature for group assignment. Being from a socially disorganized area significantly increased the odds that an individual would be assigned to either an adolescent-limited/peaked offender group or a high-rate offender group in relation to a non-offender group in the 1942 and 1949 cohort mlogit analyses. The effect, however, was only marginally significant (p=.07) for distinguishing high-rate chronic offenders in the 1949 analysis. The results indicated that social disorganization did not significantly distinguish the adolescent-limited/peaked offenders from the chronic offenders.

Finally, there was little support provided for hypothesis #5 or the expectation that macro-level and micro-level effects on the participation and frequency of offending will still be observed net of the effects of each other. Although the results did indicate that once the multi-level effects were considered simultaneously, the effect of social disorganization still maintained a marginally significant effect for distinguishing the adolescent-limited/peaked offenders from the non-offenders in theoretically integrated mlogit analysis of the 1942 cohort, the majority of the effect appeared to be indirect. While the direction of the odds were in the expected direction for both the 1942 and 1949 mlogits (with being from a socially disorganized area increasing the odds of assignment to an offender group), an examination of the R-squares (McFadden’s and Nagelkerke’s) showed that the addition of the social disorganization index contributed relatively little for improving model fit. Once again, social disorganization was unable to significantly differentiate the adolescent-limited/peaked group from the chronic offending group.
Chapter 6 will provide a further discussion of the results from the series of analytical procedures and elaborate on the possible implications of the research findings. The chapter will also highlight the limitations of the current study, offer suggestions as to how future research can improve upon and extend the examination of integrated theoretical models, and close with a few final thoughts.
Table 5-1. Descriptive Statistics for the Macro-level and Micro-level Measures by Cohort

<table>
<thead>
<tr>
<th>Variables</th>
<th>1942</th>
<th>1949</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Independent Variables</strong></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td><strong>Macro-level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Disorganization Index</td>
<td>0.00 (1.00)</td>
<td>0.00 (1.00)</td>
</tr>
<tr>
<td>Owner-Property Value</td>
<td>9374.30 (2895.29)</td>
<td>9196.40 (2951.55)</td>
</tr>
<tr>
<td>% Renter-Occupied Units</td>
<td>34.87 (20.83)</td>
<td>34.99 (21.43)</td>
</tr>
<tr>
<td>% Overcrowded</td>
<td>1.48 (3.83)*</td>
<td>1.89 (4.40)*</td>
</tr>
<tr>
<td><strong>Micro-level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.47 (0.50)</td>
<td>0.52 (0.50)</td>
</tr>
<tr>
<td>Life Transitions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stakes in Conformity Index</td>
<td>1.71 (0.45)*</td>
<td>1.60 (0.53)*</td>
</tr>
<tr>
<td>Employment</td>
<td>0.94 (0.22)</td>
<td>0.94 (0.23)</td>
</tr>
<tr>
<td>Marriage</td>
<td>0.77 (0.42)</td>
<td>0.66 (0.47)</td>
</tr>
<tr>
<td>Black</td>
<td>0.06 (0.24)*</td>
<td>0.11 (0.31)*</td>
</tr>
<tr>
<td>Low SES Household</td>
<td>3.61 (2.08)*</td>
<td>3.25 (1.91)*</td>
</tr>
<tr>
<td>Family Stability (Natural Parents)</td>
<td>0.84 (0.37)*</td>
<td>0.89 (0.31)*</td>
</tr>
<tr>
<td>Family Structure (No. of Children)</td>
<td>3.74 (2.21)</td>
<td>4.02 (2.17)</td>
</tr>
<tr>
<td>Differential association</td>
<td>0.22 (0.42)</td>
<td>0.25 (0.43)</td>
</tr>
<tr>
<td>Formal Social Control</td>
<td>1.24 (0.96)</td>
<td>1.32 (1.03)</td>
</tr>
<tr>
<td>Moved</td>
<td>0.61 (0.49)*</td>
<td>0.49 (0.51)*</td>
</tr>
<tr>
<td>Police Contacts</td>
<td>1.29 (2.63)*</td>
<td>2.33 (6.71)*</td>
</tr>
<tr>
<td>Prevalence</td>
<td>37.9%</td>
<td>41.2%</td>
</tr>
<tr>
<td>Incidence</td>
<td>302*</td>
<td>754*</td>
</tr>
</tbody>
</table>

Note. The asterisk signs denotes significant mean differences between the 1942 and 1949 cohorts (p<.05). Listed below the social disorganization and stakes in conformity indexes are the values of the measures that were used to create each index prior to the data manipulations (principal components analysis for the social disorganization index and the additive index for experiencing either none, 1, or 2 of the life transitions).

Table 5-2. Tabulated Bayesian Information Criteria (BIC) for 1942 Racine Continuous Residents (N=633)

<table>
<thead>
<tr>
<th>Optimal # of Groups</th>
<th>BIC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cubic ZIP Model</td>
</tr>
<tr>
<td>2</td>
<td>-2453.58</td>
</tr>
<tr>
<td>3</td>
<td>-2437.23</td>
</tr>
<tr>
<td>4</td>
<td>-2399.77</td>
</tr>
<tr>
<td>5</td>
<td>False Convergence</td>
</tr>
</tbody>
</table>
Table 5-3. Mean (Median) Posterior Probabilities for Group Assignments: 1942 Racine Continuous Residents (N=633)

<table>
<thead>
<tr>
<th>Group</th>
<th>Prob (G1)</th>
<th>Prob (G2)</th>
<th>Prob (G3)</th>
<th>Prob (G4)</th>
<th>25th Percentile</th>
<th>75th Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (n=463)</td>
<td>.91(.99)</td>
<td>.02(.00)</td>
<td>.07(.01)</td>
<td>.00(.00)</td>
<td>.89</td>
<td>.99</td>
</tr>
<tr>
<td>2 (n=56)</td>
<td>.02(.00)</td>
<td>.84(.87)</td>
<td>.12(.08)</td>
<td>.03(.01)</td>
<td>.71</td>
<td>.98</td>
</tr>
<tr>
<td>3 (n=82)</td>
<td>.11(.03)</td>
<td>.04(.00)</td>
<td>.85(.93)</td>
<td>.01(.00)</td>
<td>.75</td>
<td>.98</td>
</tr>
<tr>
<td>4 (n=32)</td>
<td>.00(.00)</td>
<td>.04(.00)</td>
<td>.05(.00)</td>
<td>.91(.99)</td>
<td>.91</td>
<td>.99</td>
</tr>
</tbody>
</table>

Note: Minimum and Maximum values presented for the group/prob(group) combination.

Table 5-4. Coefficient Estimates for Effect of Sex (being Male) on Trajectory Group Membership: 1942 Racine Continuous Residents (N=633)

<table>
<thead>
<tr>
<th>Groupsa</th>
<th>Coefficient</th>
<th>SE</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cubic ZIP Model</td>
<td>2</td>
<td>2.861</td>
<td>0.566</td>
</tr>
<tr>
<td>3</td>
<td>2.721</td>
<td>0.508</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>4</td>
<td>2.642</td>
<td>0.642</td>
<td>&lt;0.001***</td>
</tr>
</tbody>
</table>

*a Group 1 (the lowest rate group) is the reference category of comparison.

Table 5-5. Tabulated Bayesian Information Criteria (BIC) for 1942 Racine Continuous Interviewed Residents (N=333)

<table>
<thead>
<tr>
<th>Optimal # of Groups</th>
<th>BIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cubic ZIP Model</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>-1164.02</td>
</tr>
<tr>
<td>3</td>
<td>-1148.61</td>
</tr>
<tr>
<td>4</td>
<td>False Convergence</td>
</tr>
</tbody>
</table>
Table 5-6. Mean (Median) Posterior Probabilities for Group Assignments: 1942 Racine Continuous Interviewed Residents (N=333)

<table>
<thead>
<tr>
<th>Group</th>
<th>Prob (G1)</th>
<th>Prob (G2)</th>
<th>Prob (G3)</th>
<th>25th Percentile</th>
<th>75th Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (n=287)</td>
<td>.98(.99)</td>
<td>.02(.00)</td>
<td>.01(.06)</td>
<td>.99</td>
<td>.99</td>
</tr>
<tr>
<td>2 (n=26)</td>
<td>.06(.00)</td>
<td>.89(.97)</td>
<td>.06(.02)</td>
<td>.77</td>
<td>.99</td>
</tr>
<tr>
<td>3 (n=20)</td>
<td>.00(.00)</td>
<td>.02(.003)</td>
<td>.98(.99)</td>
<td>.99</td>
<td>.99</td>
</tr>
</tbody>
</table>

Note: Minimum and Maximum values presented for the group/prob(group) combination.

Table 5-7. Coefficient Estimates for Effect of Sex (being Male) on Trajectory Group Membership: 1942 Racine Continuous Interviewed Residents (N=333)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Coefficient</th>
<th>SE</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cubic ZIP Model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2.873</td>
<td>0.711</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>3</td>
<td>2.123</td>
<td>0.638</td>
<td>&lt;0.001***</td>
</tr>
</tbody>
</table>

*p<.05  **p<.01  ***p<.001

a Group 1 (the lowest rate group) is the reference category of comparison.

Table 5-8. Tabulated Bayesian Information Criteria (BIC) for 1942 Racine Continuous Interviewed Residents with Block Data (N=235)

<table>
<thead>
<tr>
<th>Optimal # of Groups</th>
<th>BIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cubic ZIP Model</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>-960.81</td>
</tr>
<tr>
<td>3</td>
<td>-940.76</td>
</tr>
<tr>
<td>4</td>
<td>False Convergence</td>
</tr>
</tbody>
</table>

Table 5-9. Mean (Median) Posterior Probabilities for Group Assignments: 1942 Racine Continuous Interviewed Residents with Block Data (N=235)

<table>
<thead>
<tr>
<th>Group</th>
<th>Prob (G1)</th>
<th>Prob (G2)</th>
<th>Prob (G3)</th>
<th>25th Percentile</th>
<th>75th Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (n=165)</td>
<td>.89(.97)</td>
<td>.11(.03)</td>
<td>.00(.00)</td>
<td>.78</td>
<td>.97</td>
</tr>
<tr>
<td>2 (n=47)</td>
<td>.06(.00)</td>
<td>.89(.97)</td>
<td>.05(.01)</td>
<td>.80</td>
<td>.99</td>
</tr>
<tr>
<td>3 (n=23)</td>
<td>.00(.00)</td>
<td>.09(.01)</td>
<td>.91(.99)</td>
<td>.85</td>
<td>.99</td>
</tr>
</tbody>
</table>

Note: Minimum and Maximum values presented for the group/prob(group) combination.
Table 5-10. Coefficient Estimates for Effect of Sex (being Male) on Trajectory Group Membership: 1942 Racine Continuous Interviewed Residents with Block Data (N=235)

<table>
<thead>
<tr>
<th>Groups&lt;sup&gt;a&lt;/sup&gt;</th>
<th>coefficient</th>
<th>SE</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cubic ZIP Model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2.262</td>
<td>0.507</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>3</td>
<td>3.103</td>
<td>0.768</td>
<td>&lt;0.001***</td>
</tr>
</tbody>
</table>

<sup>a</sup> Group 1 (the lowest rate group) is the reference category of comparison.

* p<.05  ** p<.01  *** p<.001

Table 5-11. Tabulated Bayesian Information Criteria (BIC) for 1949 Racine Continuous Residents (N=1,257)

<table>
<thead>
<tr>
<th>Optimal # of Groups</th>
<th>BIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cubic ZIP Model</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>-7123.17</td>
</tr>
<tr>
<td>3</td>
<td>-6851.59</td>
</tr>
<tr>
<td>4</td>
<td>-6769.89</td>
</tr>
<tr>
<td>5</td>
<td>-6694.99</td>
</tr>
<tr>
<td>6</td>
<td>False Convergence</td>
</tr>
</tbody>
</table>

Table 5-12. Mean (Median) Posterior Probabilities for Group Assignments: 1949 Racine Continuous Residents (N=1,297)

<table>
<thead>
<tr>
<th>Group</th>
<th>Prob</th>
<th>Prob</th>
<th>Prob</th>
<th>Prob</th>
<th>Prob</th>
<th>25th Percentile</th>
<th>75th Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n=740)</td>
<td>.84(.93)</td>
<td>.15(.07)</td>
<td>.00 (.00)</td>
<td>.00 (.00)</td>
<td>.00 (.00)</td>
<td>.73</td>
<td>.93</td>
</tr>
<tr>
<td>(n=424)</td>
<td>.00 (.00)</td>
<td>.97(.99)</td>
<td>.02 (.00)</td>
<td>.02 (.00)</td>
<td>.00 (.00)</td>
<td>.98</td>
<td>.99</td>
</tr>
<tr>
<td>(n=34)</td>
<td>.00 (.00)</td>
<td>.08 (.01)</td>
<td>.89(.97)</td>
<td>.03 (.00)</td>
<td>.00 (.00)</td>
<td>.84</td>
<td>.99</td>
</tr>
<tr>
<td>(n=74)</td>
<td>.00 (.00)</td>
<td>.04 (.00)</td>
<td>.01 (.00)</td>
<td>.93(.99)</td>
<td>.02 (.00)</td>
<td>.91</td>
<td>.99</td>
</tr>
<tr>
<td>(n=25)</td>
<td>.00 (.00)</td>
<td>.00 (.00)</td>
<td>.02 (.00)</td>
<td>.01 (.00)</td>
<td>.98(.99)</td>
<td>.99</td>
<td>.99</td>
</tr>
</tbody>
</table>

Note: Minimum and Maximum values presented for the group/prob(group) combination.
Table 5-13. Coefficient Estimates for Effect of Sex (being Male) on Trajectory Group Membership: 1949 Racine Continuous Residents (N=1,297)

<table>
<thead>
<tr>
<th>Groups(^a)</th>
<th>Coefficient</th>
<th>SE</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cubic ZIP Model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1.272</td>
<td>0.132</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>3</td>
<td>0.508</td>
<td>0.353</td>
<td>0.150</td>
</tr>
<tr>
<td>4</td>
<td>2.700</td>
<td>0.432</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>5</td>
<td>2.714</td>
<td>0.741</td>
<td>&lt;0.001***</td>
</tr>
</tbody>
</table>

*\(p<.05\) **\(p<.01\) ***\(p<.001\)

\(^a\) Group 1 (the lowest rate group) is the reference category of comparison.

Table 5-14. Tabulated Bayesian Information Criteria (BIC) for 1949 Racine Continuous Interviewed Residents (N=556)

<table>
<thead>
<tr>
<th>Optimal # of Groups</th>
<th>BIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cubic ZIP Model</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>-2979.90</td>
</tr>
<tr>
<td>3</td>
<td>-2848.07</td>
</tr>
<tr>
<td>4</td>
<td>False Convergence</td>
</tr>
</tbody>
</table>

Table 5-15. Mean (Median) Posterior Probabilities for Group Assignments: 1949 Racine Continuous Interviewed Residents (N=556)

<table>
<thead>
<tr>
<th>Group</th>
<th>Prob (G1)</th>
<th>Prob (G2)</th>
<th>Prob (G3)</th>
<th>25(^{th}) Percentile</th>
<th>75(^{th}) Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (n=418)</td>
<td>.97(.99)</td>
<td>.03(.00)</td>
<td>.00(.00)</td>
<td>.98</td>
<td>.99</td>
</tr>
<tr>
<td>2 (n=114)</td>
<td>.06(.01)</td>
<td>.92(.99)</td>
<td>.02(.00)</td>
<td>.87</td>
<td>.99</td>
</tr>
<tr>
<td>3 (n=24)</td>
<td>.00(.00)</td>
<td>.01(.00)</td>
<td>.99(.99)</td>
<td>.99</td>
<td>.99</td>
</tr>
</tbody>
</table>

Note: Minimum and Maximum values presented for the group/prob(group) combination.

Table 5-16. Coefficient Estimates for Effect of Sex (being Male) on Trajectory Group Membership: 1949 Racine Continuous Interviewed Residents (N=556)

<table>
<thead>
<tr>
<th>Groups(^a)</th>
<th>Coefficient</th>
<th>SE</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cubic ZIP Model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1.712</td>
<td>0.272</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>3</td>
<td>2.774</td>
<td>0.738</td>
<td>&lt;0.001***</td>
</tr>
</tbody>
</table>

*\(p<.05\) **\(p<.01\) ***\(p<.001\)

\(^a\) Group 1 (the lowest rate group) is the reference category of comparison.
Table 5-17. Tabulated Bayesian Information Criteria (BIC) for 1949 Racine Continuous Interviewed Residents with Block Data (N=323)

<table>
<thead>
<tr>
<th>Optimal # of Groups</th>
<th>BIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cubic ZIP Model</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>-1816.65</td>
</tr>
<tr>
<td>3</td>
<td>-1747.74</td>
</tr>
<tr>
<td>4</td>
<td>False Convergence</td>
</tr>
</tbody>
</table>

Table 5-18. Mean (Median) Posterior Probabilities for Group Assignments: 1949 Racine Continuous Interviewed Residents with Block Data (N=323)

<table>
<thead>
<tr>
<th>Group</th>
<th>Prob (G1)</th>
<th>Prob (G2)</th>
<th>Prob (G3)</th>
<th>25th Percentile</th>
<th>75th Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (n=245)</td>
<td>.98(.99)</td>
<td>.02(.00)</td>
<td>.00(.00)</td>
<td>.98</td>
<td>.99</td>
</tr>
<tr>
<td>2 (n=66)</td>
<td>.11(.01)</td>
<td>.89(.98)</td>
<td>.01(.00)</td>
<td>.82</td>
<td>.99</td>
</tr>
<tr>
<td>3 (n=12)</td>
<td>.00(.00)</td>
<td>.00(.00)</td>
<td>.99(.99)</td>
<td>.99</td>
<td>.99</td>
</tr>
</tbody>
</table>

Note: Minimum and Maximum values presented for the group/prob(group) combination.

Table 5-19. Coefficient Estimates for Effect of Sex (being Male) on Trajectory Group Membership: 1949 Racine Continuous Interviewed Residents with Block Data (N=323)

<table>
<thead>
<tr>
<th>Groupsa</th>
<th>coefficient</th>
<th>SE</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cubic ZIP Model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1.493</td>
<td>0.364</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>3</td>
<td>1.887</td>
<td>0.790</td>
<td>0.016*</td>
</tr>
</tbody>
</table>

*p<.05 **p<.01 ***p<.001
a Group 1 (the lowest rate group) is the reference category of comparison.
Table 5-20. Trajectory Groups by Sample and Cohort

<table>
<thead>
<tr>
<th>Continuous-Resident Samples</th>
<th>Sample Size (n)</th>
<th>Non-offenders</th>
<th>Adolescent-Limited/Peak Offenders</th>
<th>Low-Level Chronic Offenders</th>
<th>High-Rate Chronic Offenders</th>
<th>Late-Onset Offenders</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1942 COHORT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous-Residents</td>
<td>633</td>
<td>463 (73.1%)</td>
<td>56 (8.8%)</td>
<td>82 (13.0%)</td>
<td>32 (5.1%)</td>
<td>--</td>
</tr>
<tr>
<td>Continuous-Residents (w/ Interview Data)</td>
<td>333</td>
<td>287 (86.2%)</td>
<td>26 (7.8%)</td>
<td>--</td>
<td>20 (6.0%)</td>
<td>--</td>
</tr>
<tr>
<td>Continuous-Residents (w/ Individual &amp; Block Data)</td>
<td>235</td>
<td>165 (70.2%)</td>
<td>47 (20.0%)</td>
<td>--</td>
<td>23 (9.8%)</td>
<td>--</td>
</tr>
<tr>
<td><strong>1949 COHORT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous-Residents</td>
<td>1297</td>
<td>740 (57.1%)</td>
<td>74 (5.7%)</td>
<td>424 (32.7%)</td>
<td>25 (1.9%)</td>
<td>34 (2.6%)</td>
</tr>
<tr>
<td>Continuous-Residents (w/ Interview Data)</td>
<td>556</td>
<td>418 (75.2%)</td>
<td>114 (20.5%)</td>
<td>--</td>
<td>24 (4.3%)</td>
<td>--</td>
</tr>
<tr>
<td>Continuous-Residents (w/ Individual &amp; Block Data)</td>
<td>323</td>
<td>245 (75.9%)</td>
<td>66 (20.4%)</td>
<td>--</td>
<td>12 (3.7%)</td>
<td>--</td>
</tr>
</tbody>
</table>
Table 5-21. Mean Covariate Levels by Trajectory Group Membership and Cohort

| Variables                          | G1 Mean | G2 Mean | G3 Mean | F-test | p-value | G1 Mean | G2 Mean | G3 Mean | F-test | p-value |
|-----------------------------------|---------|---------|---------|--------|---------|---------|---------|---------|--------|---------|---------|
| Macro-level                       |         |         |         |        |         |         |         |         |        |         |         |
| Social Disorganization            | -.18    | .41     | .50     | 10.65  | <.001***| -.09    | .28     | .29     | 4.38   | .01*    |         |
| Micro-level                       |         |         |         |        |         |         |         |         |        |         |         |
| Male                              | .31     | .79     | .91     | 33.79  | <.001***| .43     | .79     | .83     | 17.10  | <.001***|         |
| Black                             | .04     | .08     | .17     | 3.84   | .23     | .02     | .23     | .33     | 10.93  | <.001***|         |
| Low SES Household                 | 3.30    | 4.29    | 4.35    | 5.99   | <.01**  | 2.99    | 3.76    | 5.58    | 14.34  | <.001***|         |
| Stakes in Conformity              | 1.76    | 1.62    | 1.65    | 2.00   | .13     | 1.62    | 1.59    | 1.25    | 2.89   | .05*    |         |
| Family Stability (Natural Parents)| .90     | .72     | .70     | 6.49   | <.01**  | .94     | .76     | .67     | 12.96  | <.001***|         |
| Family Structure (No. of Children)| 3.69    | 3.57    | 4.48    | 1.46   | .24     | 3.80    | 4.16    | 5.17    | 6.11   | .01*    |         |
| Differential association          | .22     | .24     | .17     | 0.74   | .84     | .24     | .29     | .17     | 0.57   | .57     |         |
| Formal Social Control             | 1.14    | 1.43    | 1.61    | 3.56   | .03*    | 1.21    | 1.62    | 2.00    | 7.12   | <.001***|         |
| Moved                             | .59     | .60     | .83     | 2.47   | .08*    | .48     | .53     | .58     | 0.38   | .68     |         |
| Number of Police Contacts         | .12     | 2.04    | 8.09    | 492.99 | <.001***| .25     | 4.98    | 30.25   | 481.58 | <.001***|         |

*p<.10   *p<.05   **p<.01   ***p<.001
Table 5-22. 1942 Racine Continuous Interviewed Residents with Block Data: Odds Ratios and Probabilities for Macro-Level Predictors of Offending Group Membership

<table>
<thead>
<tr>
<th>Variables</th>
<th>Adolescent-Limited/Peaked Offenders</th>
<th>High-Rate Chronic Offenders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macro-level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Disorganization</td>
<td>1.97</td>
<td>&lt;.001***</td>
</tr>
</tbody>
</table>

Model Diagnostics
Chi-Square= 18.30***
-Log Likelihood= -176.95
McFadden’s R²=.06
Nagelkerke=.11

* p<.10   ** p<.05   *** p<.01   **** p<.001
Note. Reference category is group 1 (the non-offenders).

Table 5-23. 1942 Racine Continuous Interviewed Residents with Block Data: Odds Ratios and Probabilities for Micro-Level Predictors of Offending Group Membership

<table>
<thead>
<tr>
<th>Variables</th>
<th>Adolescent-Limited/Peaked Offenders</th>
<th>High-Rate Chronic Offenders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro-level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2.99</td>
<td>&lt;.001***</td>
</tr>
<tr>
<td>Black</td>
<td>1.01</td>
<td>.97</td>
</tr>
<tr>
<td>Low SES Household</td>
<td>1.38</td>
<td>.13</td>
</tr>
<tr>
<td>Stakes in Conformity</td>
<td>0.90</td>
<td>.57</td>
</tr>
<tr>
<td>Family Stability (Natural Parents)</td>
<td>0.62</td>
<td>&lt;.01**</td>
</tr>
<tr>
<td>Family Structure (No. of Children)</td>
<td>0.96</td>
<td>.80</td>
</tr>
<tr>
<td>Differential association</td>
<td>1.01</td>
<td>.97</td>
</tr>
<tr>
<td>Formal Social Control</td>
<td>1.13</td>
<td>.55</td>
</tr>
<tr>
<td>Moved</td>
<td>1.11</td>
<td>.61</td>
</tr>
</tbody>
</table>

Model Diagnostics
Chi-Square= 53.14***
-Log Likelihood= -143.38
McFadden’s R²=.23
Nagelkerke=.39

* p<.10   ** p<.05   *** p<.01   **** p<.001
Note. Reference category is group 1 (the non-offenders).
Table 5-24. 1942 Racine Continuous Interviewed Residents with Block Data: Odds Ratios and Probabilities for Macro-level and Micro-level Predictors of Offending Group Membership

<table>
<thead>
<tr>
<th>Variables</th>
<th>Adolescent-Limited/Peak Offenders</th>
<th>High-Rate Chronic Offenders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macro-level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Disorganization</td>
<td>1.50</td>
<td>.06*</td>
</tr>
<tr>
<td>Micro-level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2.87</td>
<td>&lt;.001***</td>
</tr>
<tr>
<td>Black</td>
<td>1.01</td>
<td>.99</td>
</tr>
<tr>
<td>Low SES Household</td>
<td>1.30</td>
<td>.27</td>
</tr>
<tr>
<td>Stakes in Conformity</td>
<td>0.92</td>
<td>.65</td>
</tr>
<tr>
<td>Family Stability (Natural Parents)</td>
<td>0.64</td>
<td>.01*</td>
</tr>
<tr>
<td>Family Structure (No. of Children)</td>
<td>0.95</td>
<td>.76</td>
</tr>
<tr>
<td>Differential association</td>
<td>1.01</td>
<td>.99</td>
</tr>
<tr>
<td>Formal Social Control</td>
<td>1.06</td>
<td>.79</td>
</tr>
<tr>
<td>Moved</td>
<td>1.03</td>
<td>.88</td>
</tr>
</tbody>
</table>

Model Diagnostics
Chi-Square= 55.47***
Log Likelihood= -141.56
McFadden’s R²= .25
Nagelkerke R²= .41

*p<.10   **p<.05   ***p<.01   ****p<.001
Note. Reference category is group 1 (the non-offenders).
Table 5-25. 1949 Racine Continuous Interviewed Residents with Block Data: Odds Ratios and Probabilities for Macro-Level Predictors of Offending Group Membership

<table>
<thead>
<tr>
<th>Variables</th>
<th>Adolescent-Limited/Peak Offenders</th>
<th>High-Rate Chronic Offenders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Disorganization</td>
<td>1.50 &lt;.01**</td>
<td>1.48 0.07+</td>
</tr>
</tbody>
</table>

Model Diagnostics
Chi-Square= 7.96*
-Likelihood= -207.61
McFadden’s $R^2=.02$
Nagelkerke $R^2=.04$

$p<.10$  $*p<.05$  $**p<.01$  $***p<.001$
Note. Reference category is group 1 (the non-offenders).

Table 5-26. 1949 Racine Continuous Interviewed Residents with Block Data: Odds Ratios and Probabilities for Micro-Level Predictors of Offending Group Membership

<table>
<thead>
<tr>
<th>Variables</th>
<th>Adolescent-Limited/Peak Offenders</th>
<th>High-Rate Chronic Offenders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>2.31 &lt;.001***</td>
<td>2.40 .01*</td>
</tr>
<tr>
<td>Black</td>
<td>1.38 .06+</td>
<td>1.20 .64</td>
</tr>
<tr>
<td>Low SES Household</td>
<td>1.26 .18</td>
<td>2.52 &lt;.001***</td>
</tr>
<tr>
<td>Stakes in Conformity</td>
<td>1.09 .62</td>
<td>1.13 .50</td>
</tr>
<tr>
<td>Family Stability (Natural Parents)</td>
<td>0.64 &lt;.001***</td>
<td>0.67 .11</td>
</tr>
<tr>
<td>Family Structure (No. of Children)</td>
<td>1.36 .04*</td>
<td>1.61 .14</td>
</tr>
<tr>
<td>Differential association</td>
<td>1.25 .16</td>
<td>1.01 .99</td>
</tr>
<tr>
<td>Formal Social Control</td>
<td>1.14 .43</td>
<td>1.14 .64</td>
</tr>
<tr>
<td>Moved</td>
<td>0.89 .47</td>
<td>0.79 .51</td>
</tr>
</tbody>
</table>

Model Diagnostics
Chi-Square= 76.67***
-Likelihood= -169.86
McFadden’s $R^2=.19$
Nagelkerke $R^2=.31$

$p<.10$  $*p<.05$  $**p<.01$  $***p<.001$
Note. Reference category is group 1 (the non-offenders).
Table 5-27. 1949 Racine Continuous Interviewed Residents with Block Data: Odds Ratios and Probabilities for Macro-level and Micro-level Predictors of Offending Group Membership

<table>
<thead>
<tr>
<th>Variables</th>
<th>Adolescent-Limited/Peaked Offenders</th>
<th>High-Rate Chronic Offenders</th>
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</thead>
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<tr>
<td>Macro-level</td>
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<td></td>
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<tr>
<td>Social Disorganization</td>
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<tr>
<td>Micro-level</td>
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<td></td>
</tr>
<tr>
<td>Male</td>
<td>2.33</td>
<td>&lt;.001***</td>
</tr>
<tr>
<td>Black</td>
<td>1.30</td>
<td>.13</td>
</tr>
<tr>
<td>Low SES Household</td>
<td>1.25</td>
<td>.21</td>
</tr>
<tr>
<td>Stakes in Conformity</td>
<td>1.10</td>
<td>.60</td>
</tr>
<tr>
<td>Family Stability (Natural Parents)</td>
<td>0.63</td>
<td>&lt;.001***</td>
</tr>
<tr>
<td>Family Structure (No. of Children)</td>
<td>1.33</td>
<td>.05*</td>
</tr>
<tr>
<td>Differential association</td>
<td>1.24</td>
<td>.19</td>
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<tr>
<td>Formal Social Control</td>
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<td>.58</td>
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<tr>
<td>Moved</td>
<td>0.86</td>
<td>.37</td>
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</tbody>
</table>

Model Diagnostics
Chi-Square= 79.26***
-Log Likelihood= -169.32
McFadden’s R²= .20
Nagelkerke R²= .32

+p<.10   *p<.05   **p<.01   ***p<.001. Note. Reference category is group 1 (the non-offenders).
Figure 5-1. 1942 Racine Continuous Residents Group-Based Trajectories (N=633)
Figure 5-2. 1942 Racine Continuous Interviewed Residents Group-Based Trajectories (N=333)
Figure 5-3. 1942 Racine Continuous Interviewed Residents with Block Data Group-Based Trajectories (N=235)
Figure 5-4. 1949 Racine Continuous Residents Group-Based Trajectories (N=1,297)
Figure 5-5. 1949 Racine Continuous Interviewed Residents Group-Based Trajectories (N=556)
Figure 5-6. 1942 Racine Continuous Interviewed Residents with Block Data Group-Based Trajectories (N=323)
CHAPTER 6
DISCUSSION AND CONCLUSION

Discussion

This research began by seeking to investigate the viability of integrated multi-level theory for explaining offense trajectories. It was expected that residing in a socially disorganized area early on in development would increase an individual’s likelihood for being in an offender group as opposed to a non-offender group. Particularly, living in a socially disorganized area should increase the odds for exhibiting a chronic-offending trajectory. Second, it was anticipated that certain individual and family-level factors would also elevate an individual’s likelihood for being an offender. Similar to the expectations regarding the influence of living in a socially disorganized area, the belief was that the micro-level factors would significantly distinguish adolescent-limited/peaked offenders and chronic offenders from the non-offenders. Furthermore, in accordance with Sampson and Laub (1993), it is was assumed that individuals who were more likely to report having experienced life transitions such as marriage and employment would be more likely to be in the non-offender group and the adolescent-limited/peaked group. Third, it was hypothesized that, once these factors were estimated simultaneously (macro-level and micro-level together in the same model), they would each contribute to predicting an individual’s odds for being in an adolescent-limited/peaked offender and chronic offender group relative to a non-offender group. In addition, sex (being male) was expected to be significant for amplifying an individual’s likelihood for being found in an offender group.

Overall, the findings from this analysis yielded varying levels of support for the various theoretical frameworks used. Support was shown Moffitt’s (1993) taxonomy of offending in that all of the trajectory analyses identified a non-offender, an adolescent-limited/peaked offender,
and a chronic offender group (with a declining trajectory in young adulthood). However, the semi-parametric Poisson based models also discovered two groups that were inconsistent with Moffitt’s prediction when relying on police contact data from the largest samples of the 1942 (n=633) and 1949 (n=1,297) Racine continuous residents. A low-level chronic offending group was identified in both cohorts who were characterized by an early onset of offending and maintained a fairly low level of offending (yet a non-zero rate) throughout the twenty year observation period (age 6-25). Comparatively, a late-onset offender group was discovered among the 1949 cohort who had virtually no involvement in offending until late in adolescence/early adulthood but showed relatively high rates of offending throughout young adulthood. In addition, the adolescent-limited/peaked group found in these analyses slightly differed from the group as theoretically discussed by Moffitt (1993) in that they were classified as adolescent-peaked and their offending patterns did not appear to desist until around age 21. While these groups are atypical insofar as Moffitt’s expectations, they have been discovered and the source of discussion elsewhere (see D’Unger et al., 1998; Land, 2000; Piquero, 2007; Sampson & Laub, 1993).

Also consistent with Moffitt and others (Rutter, 1983; Singer et al., 1968; Werry, 1986) that have argued that life-course-persistent offending may be observed almost exclusively among males and the prior research has shown that females typically show less involvement in crime in either type of offender group (adolescent-limited offenders and life-course-persistent offenders) (see Piquero, 2007), all of the trajectory results indicated that being male significantly increased an individual’s likelihood of being classified into any of the offender groups across all data sources (continuous residents, continuous interviewed residents, and continuous interviewed residents with block data) and by cohort. The one exception was the late-onset offender group
identified in the 1949 continuous resident analysis (N=1,297) where although there were more males in the group, sex was not found to be a significant covariate for distinguishing this offender group from the non-offender group. The mlogit results also re-affirmed the importance of sex for predicting group membership through the consistent and robust effect of being male on increasing the odds by at least two times for an individual exhibiting either an adolescent-limited/peaked or a chronic offending trajectory.

The results only revealed limited support for Sampson and Laub’s age-graded theory of informal social control and these findings were only evident at the bivariate level. In both cohort analyses, the non-offender group had the highest mean score on the stakes in conformity index when compared with either offender group, but only in the 1949 cohort analysis was the stakes in conformity index significantly associated with group membership.

In line with the expectation of the influence of social disorganization, there was a minimal amount of evidence that living in a socially disorganized area increased an individual’s odds for being in an offender group. The bivariate findings suggested that Racine continuous residents, whose individual offending pattern could be classified into a adolescent-limited/peaked or chronic offending group-based trajectory, tended to live in more socially disorganized areas than the non-offenders. The multivariate results confirmed that social disorganization was a significant predictor of group membership for both the 1942 and 1949 cohort. Although, living in a socially disorganized area failed to distinguish the adolescent-limited/peaked offenders from the chronic offenders.

Despite the fact that the bivariate and mlogit (macro-level-only) results indicated that social disorganization was a distinguishing feature of group membership, the findings from the mlogits, where both the macro-level and micro-level factors were estimated simultaneously,
failed to find much support for the usefulness of an integrated theoretical model for explaining group-based offending trajectories. Once the micro-level factors (particularly sex, natural two parent household, having moved, and low SES households depending on which cohort mlogit is being referred to) were added to the model, social disorganization failed to exert a significant independent effect on predicting group membership. Although, the various indicators of model fit (chi-square, log likelihood, and the pseudo R-square statistics) showed that the integrated model was a better fit, it appeared that the influence of social disorganization on increasing an individual’s likelihood for being in either an adolescent-limited/peaked or chronic offender group tended to be indirect in that it operated through individual and family-level factors. Overall, these findings tend to mirror those produced in prior multi-level studies that have shown that the addition of neighborhood level processes typically only increase the variance explained by 1% to 4% (see Cheong & Raudenbush, 2000; Duncan & Raudenbush, 1999; Elliot et al., 1996; Simcha-Fagan & Schwartz, 1986), although other studies have begun to find more support for school contextual effects ranging from a 6% to 7% increase in the variance explained (Anderson, 2002; Welsh et al., 1999).

Limitations

As with all research, there are a series of data limitations that are worth mentioning. First, the most apparent limitation relates to the era wherein these individuals were raised. These individuals were either born during WWII (1942 cohort) or baby-boomers (i.e., 1949 cohort) who grew up in the immediate post-WWII era. They were living their early years during the 1960s, which is a time characterized by large social change including the Civil Rights and Women’s Movement, Vietnam, riots, etc. Thus, it is likely that some of these findings may not necessarily generalize to individuals who were socialized in different periods of time, say the 1980s or 1990s. Second, the area of Racine itself was a Midwestern industrial city with a
relatively small homogenous population of predominantly White residents, and it is not likely that the results from this community context and demographic would apply to the larger more metropolitan areas of today or in communities/neighborhoods with an ethnically diverse population. Third, the substantial variety of the census-level measures that are typically used currently in macro-level analyses were not available at the block level in 1950. Among the measures that were accessible there was a rather noticeable amount of completely missing data which precluded the ability to use mean substitution to retain a greater number of individuals for the integrated theoretical models. Extending from this limitation, the generalizability of these findings may not be applicable or reproduced if different conceptualizations or aggregations were used to define the community/neighborhood such as cities, SMSAs, counties, police districts, etc.

Fourth, the social disorganization index used in this study was limited in that it did not include a measure for ethnic heterogeneity as discussed by Shaw and McKay (1942). Although some research has shown that rates of delinquency are lower in ethnically homogenous areas (see Lander, 1954), there is typically less support for the measure when compared with poverty and residential instability (see Sampson, 1997). Additionally, Bursik (1988) and Sampson and Groves (1989) have argued that various structural dimensions such as local friendship ties, organizational density, and participation in local formal and informal voluntary organizations are among the most important factors that affect delinquency rates. More recently, Sampson et al. (1997) have argued that collective efficacy and the ability to form social capital matters more than social disorganization, and Sampson (1997) has also indicated that one of the most important structural dimensions for controlling neighborhood delinquency is the community’s ability to supervise and control teenage peer groups, particularly gangs. Sampson and Groves
(1989) also identified additional factors including family disruption, urbanization, and rapid population change that can all impede the ability of a community to create informal networks of social control for supervising teenage peer groups. Unfortunately, there were not any data available to measure these important processes, so caution should be taken when interpreting these results.

Similarly, the stakes in conformity index used to assess Sampson and Laub’s (1993) age-graded theory of informal social control was limited since it relied on a dichotomous index ranging from 0 to 2. Laub et al. (1998) have argued that the quality or cohesiveness of the adult social bonds is what is more important than mere participation in these life transitions. Others, however, have argued that it is likely that being married and/or having a full-time job are probably indicators that some level of attachment has occurred in that it seems doubtful that these events would have happened at all if this was not the case (see Piquero et al., 2002).

It is also important to note that this research relied on official data of delinquency/crime as measured through police contacts. Despite the known strengths and weaknesses of official and self-report data when investigating criminal behavior (see Junger-Tas & Marshall, 1999), police contacts may be the better measure of “true” officially-based offending because they are typically closer in time to the actual criminal event than self-reported offending (see Hindelang et al., 1981; Thornberry & Krohn, 2003).

Finally, there are some limitations of the trajectory modeling procedure as it specifically pertains to this study. There was evidence provided from the sensitivity analysis conducted that data loss did not equally affect all of the trajectory groups. For instance, it appeared that once the multiple sources of data were merged together that the model only discovered three groups and that the high-rate offending group (also referred to as chronics) actually showed evidence of
a sharp declining trajectory in early adulthood and even perhaps an indication of desistance by age 25. Unfortunately, given the data limitations and the reliance on only official measures of offending to model the trajectories, this research is unable to answer the question of whether or not this is true evidence of desistance. Furthermore, there is also the possibility that these individuals in the high-rate offending group which accumulated a rather large number of police contacts over time had become incarcerated for some period of time by their young adulthood years, thus not providing them an opportunity to offend. This is also an empirical question that cannot be explored with this data. Lastly, once the individual and neighborhood level factors were estimated in multivariate models, the results indicated that while these risk/protective factors significantly distinguished the adolescent-limited/peaked offenders and the chronic-offenders from the non-offenders, these same variables (with the exception of sex) were not able to significantly distinguish the adolescent-limited/peaked offenders from the chronic-offenders. Once again, this is likely the result of the data loss that appeared to differentially affect offender groups.

**Directions for Future Research**

The findings from this research provided mixed results for the various theories including Moffitt’s developmental typology and the saliency of sex when distinguishing offender groups, Sampson and Laub’s age-graded theory of informal social control, and social disorganization theory. This research did generate some preliminary findings that can direct future research on integrated multi-level theoretical models.

Sex was found to be rather robust for significantly affecting group assignment when estimated as a covariate in the trajectory analyses. It also exerted a consistent independent effect for significantly increasing the odds for group assignment to either an adolescent-limited/peaked offender group or a chronic offender group. Future research would benefit from estimating sex-
disaggregated trajectories and then estimating mlogit models to see whether or not the macro-level and micro-level factors, such as those examined here, significantly differ across sex. Unfortunately, there were not enough individuals in the analyses relied on in this study to permit the estimation of sex-specific trajectories and make use of all of the risk/protective factors in the mlogit models. Further studies employing considerably larger samples would permit this type of analysis. It is worth noting that there are other theories that may account for sex differences as well. One such example may be power-control theory (Hagan et al., 1985). It is possible that parents and society socializes males and females differently and this may have an impact on sex-specific pathways of offending. This possibility should be further explored.

Larger samples with multi-level data would also allow future researchers to examine these effects on distinguishing between offender groups for groups that were uncovered in some of the trajectory analyses that were not consistent with Moffitt’s typology such as the low-level chronics and the late-onset offenders. It may be the case that social disorganization matters more so for influencing low-level chronic offenders with low yet relatively stable offending rates over the life-course. Similarly, it seems reasonable to assume that the absence of the various adult social bonds identified by Sampson and Laub (1993) or a low level of attachment to the institutions of marriage and employment may serve as explanations for a late-onset pattern of offending. Additionally, future studies investigating the chronic patterns of offending should rely on data from longer observational periods particularly through middle and late adulthood to see if these group-based offending patterns identified in this study continue beyond age 25.

This research relied solely on an official measure of crime to estimate offense trajectories and more specifically, police contacts. It would be interesting if future studies would attempt to reproduce these analyses using alternative official measures of offending such as arrest or
conviction records. Comparatively, it may also prove fruitful to examine the possible multi-level effects on life-course patterns of offending based on self-reported criminal involvement. Arguably, the best test would be to include some type of composite measure that represented a combination of official and self-reported offending.

As far as the relatively weak found support for the macro-level effects, it would likely be the case that future studies accounting for the processes identified by prior researchers (see Bursik, 1988; Sampson, 1997; Sampson & Groves, 1989; Sampson et al., 1997) such as family disruption (percentage of divorced or single-parent households), collective efficacy, social capital, supervision of teenage peer groups, and local participation in voluntary organizations may yield stronger support for macro-level influences on offending patterns and especially net of the effects of micro-level factors. Future mutli-level studies should also make use of other macro-level theoretical constructs to investigate their relative impact on trajectories of criminal behavior including routine activities theory (see Cohen & Felson, 1979; Kennedy & Baron, 1993) and urban disadvantage perspectives (see Krivo & Peterson, 1996; Parker et al., 2005).

With attention to these aforementioned suggestions, it would seem that perhaps the ideal research design for best examining the hypotheses highlighted in this research would be a prospective longitudinal design which would identify individuals at birth in different social contexts and follow them throughout their life-course and well into adulthood. Not only would official and self-report data be gathered on the individuals at various periods over their life-course, the optimal design would include both parent, teacher, and peer surveys throughout different developmental periods. Additionally, surveys administered to community residents over time would also allow for measuring the informal networks of social control, collective efficacy, and social capital. Finally, if spousal surveys in addition to self-reports were also
administered in adulthood this would provide worthwhile information in order to gauge the level of cohesiveness or attachment in the adult social bonds to better determine their effect in the desistence process.

Nevertheless, it is obvious that collecting research in this magnitude, for a lengthy period of time, involving a numerous amount of actors would require an enormous amount of monetary, individual, political, and community support, yet there are early indications that research similar to this magnitude (in a lesser degree) is possible and the preliminary findings leave hope for future research in integrative multi-level modeling (see related publications from the Project on Human Development in Chicago Neighborhoods).

**Implications**

Taken together, the findings from this research are intended to be preliminary and to offer a starting point to guide and direct future research on theoretically integrated approaches. Given the minimal significance of social disorganization in the baseline models, it is important that future studies further investigate other social processes that have been recently discussed by neighborhood-level researchers as perhaps being more important when estimating neighborhood effects (for review, see Sampson et al., 2002) before any concerted effort can be made toward informing policy. Nevertheless, it is important here to at least highlight some of the possible implications that research in this area may provide in the future.

Programs such as the Rochester Nurse-Home Visitation Program (see Olds et al., 1986) are likely to provide the most benefit in targeting the cumulative effects of both neighborhood disadvantage and factors particularly associated with chronic offending (i.e. low birth weight, birth trauma). The Rochester program involved random assignment of expectant mothers in a small semi-rural community to one of three conditions: (1) pre and post natal visits; (2) pre-natal only visits; and (3) minimal standard services. The results indicated that the mothers who
received the home visits faired significantly better than those that received the minimal amount of services and had higher levels of employment and fewer cases of child abuse and neglect. In an outcome evaluation of a similar program, Seitz et al. (1985) also found that pre and post-natal home visits to disadvantaged mothers reduced the impact of adverse risk factors and the children whose mothers participated in the program were rated as less aggressive and disruptive than children who were in the non-experimental group (see Provence and Naylor, 1983 for an extended discussion of the Yale Child Welfare Research Program).

Programs targeting poor urban children during the preschool years have shown to have a significant impact on reducing delinquent outcomes. Head Start is one of the most well-known of these type of initiatives and subsequent evaluations (see Darlington et al., 1980; Lee et al., 1990) have shown that the program was successful in producing short-term intellectual and social gains during the early preschool years and that Head Start youth were more likely to graduate high school. Other programs such as the Perry Preschool Project, which focused on early childhood education (ages 3 to 5), parent meetings, and home visits, have yielded a host of beneficial outcomes for program participants including better grades, higher standardized test scores, higher graduation and employment rates, and lower delinquency and arrest rates (see Berreuta-Clement et al., 1984; Schweinhart & Weikart, 1988). In addition, programs implemented in the later elementary/early adolescent years specifically directed at improving problem-solving and social competency among poor youth have been associated with decreased levels of aggression and problem behaviors (see Weissberg et al., 1981; Hawkins et al., 1991; Lochman et al., 1984; Sarason & Sarason, 1981; Hammond, 1991).

Family intervention programs facilitating the development of parental support networks and increasing the link between parents and community services as well as improving parent-
child interactions have provided mixed results for reducing delinquent involvement (see Dumas, 1989; Johnson & Walker, 1987; Hawkins et al., 1991), but Guerra (1997:290) has argued that these programs may not be as effective for urban minority disadvantaged youth because of cultural differences and the multiple stressors that plague the residents in these areas. Peer-based interventions like peer mentoring (Goldstein, 1978) and redirecting gang members toward more prosocial community activities (see Klein, 1971) have also yielded varying results in influencing an adolescent’s involvement in delinquency.

Residential relocation programs including the Moving to Opportunity for Fair Housing Demonstration (or MTO) and the Gautreaux Program have been shown to be beneficial. Gautreaux youth who moved to the suburbs substantially increased their educational attainment and job opportunities (see Rosenbaum, 1995; Rosenbaum & Popkin, 1991) and recent MTO evaluations have indicated that residential relocation was significantly related to decreased involvement in violence, better overall health, and lower victimization rates (see Katz et al., 2001; Ludwig et al., 2001). Leventhal and Brooks-Gunn (2003) have also highlighted the significantly lower levels of depression, anxiety, and/or dependency problems among MTO youth when compared with youth who remained in the disadvantaged areas. Other initiatives that focus on increasing neighborhood supervision of teenage peer groups and promoting civic participation are likely to provide noticeable benefits as well (see Sampson, 1997). Overall, these programs reviewed above provide suggestions for how future research targeting disadvantaged youth in disadvantaged areas can likely alleviate the conditions that plague residents of these communities and decrease the prevalence of life-course-persistent chronic patterns of offending.
Final Thoughts

Guerra (1997:300-301) perhaps best summarizes the direction for programmatic and policy initiatives in the following statement presented below if we as a community have any hopes for reducing the risk factors associated with both types of offending patterns identified by Moffitt, but particularly for prevention/intervention with chronic offenders:

It is likely that the most effective interventions will address multiple causal factors, be carried out in multiple contexts, and be extended in time over the course of development. Families, peers, schools, and communities must work in concert to provide opportunities for children to learn prosocial behavior and to create environments where prosocial behavior is modeled and reinforced.

It is important for researchers, policymakers, and even individuals to be aware that all of the abovementioned elements do not operate in isolation from one another. There are individual, family, and community factors that all have influence on life-course pathways of development. Sampson et al. (2002:474) also challenges neighborhood level researchers to move beyond mere structural compositional measures of neighborhood effects and give greater attention toward understanding "cultural, normative, and collective action perspectives that attach meaning to how residents frame their commitment to places." Spatial dynamics are also important to investigating the influence of neighborhoods on offending patterns. It is possible that while youth may reside in a disadvantaged area, they may spend more time in an adjacent neighborhood where there are stronger informal social ties and collective supervision of teenage peer groups. Thus, while compositional measures of disadvantage may be related to crime rates, without measuring the influence of spatial proximity to more advantaged areas the effect of neighborhoods might be overestimated.
It is clear that community and individualistic perspectives have their own shortcomings and limitations. Yet, it is also the case that perhaps by highlighting the strengths of each approach and seeking an understanding of their interactive influence on life-course developmental patterns of offending, future multi-level theoretical models can gain greater support within the discipline. Although the results here failed to offer much evidence of the saliency of this approach, research in this area is still an under-explored phenomenon. Future studies that are able to better capture the complex nature of macro-level and micro-level processes are needed before the usefulness of theoretical integration can be discounted.
### APPENDIX

#### ZERO-ORDER CORRELATIONS BY COHORT

**Table A-1. 1942 Cohort**

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Note. Significant effects (p<.05) are in italics.

**Table A-2. 1949 Cohort**

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Note. Significant effects (p<.05) are in italics.
REFERENCES


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BIOGRAPHICAL SKETCH

Wesley Glenn Jennings received his bachelor’s degree in psychology from the University of South Carolina in 2002. After completing his undergraduate education he continued on to receive his master’s degree in criminal justice in 2004 also from the University of South Carolina. Upon finishing his master’s degree he moved down to the University of Florida to pursue his doctorate in criminology. His research interests specifically include offense trajectories, sex offenders, and multi-level modeling.