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## Long Term Consequences of Membership in Trajectory Groups of Delinquent Behavior in an Urban Sample: Violence, Drug Use, Interpersonal and Neighborhood Attributes

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### Abstract

Research on stability and change in delinquent behavior over time has important implications for both the individual and the criminal justice system. The present research looks at this issue by examining the associations between the trajectories of delinquent behavior in adolescence and adult functioning. Data for the present study are from a four-wave longitudinal study of African American and Hispanic participants. Participants provided information at mean ages 14, 19, 24, and 29. We used growth mixture modeling to extract trajectory groups of delinquent behavior in adolescence and young adulthood. Regression analyses were conducted to examine whether memberships in the trajectory groups of delinquent behavior from mean age 14 to mean age 24 were associated with violence, substance abuse and dependence, partner discord, peer substance use, and residence in a high-crime neighborhood at mean age 29 when compared with the reference trajectory group of participants with low or no delinquent behavior. Four trajectory groups of delinquent behavior were identified: the no/low, the decreasing, the moderate, and the high persistent trajectory groups. Memberships in the trajectory groups were significantly correlated with variations in adult functioning. Memberships in some trajectory groups of delinquent behavior are significant predictors of later violent behavior, substance abuse and dependence, partner discord, peer substance use, and residence in a high-crime neighborhood. The findings reinforce the importance of investing in interventions to address different patterns of delinquent behavior. Findings are discussed in relation to previous investigations with non-Hispanic White samples.

### Keywords

trajectory groups; delinquent behavior; adult functioning

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Research on stability and change in delinquent behavior over time has important implications for the individual (Bergman & Andershed, 2009), the criminal justice system (Colman, Kim, Mitchell-Herzfeld, & Shady, 2008), and public health (Eme, 2010). According to Nagin and colleagues (Nagin, Farrington, & Moffitt, 1995) the developmental course of delinquent behavior follows multiple patterns rather than a single trajectory. That is, the population can be grouped into various distinct subgroups of delinquent behavior that may be associated with different outcomes (e.g., Bushway, Thornberry, & Krohn 2003; Odgers et al., 2007; Piquero, Farrington, Nagin, & Moffitt, 2010; Reef, Diamantopoulou, van Meurs, Verhulst, & van der Ende, 2010; Wiesner & Windle, 2004). Moffitt's influential theory of antisocial behavior originally proposed two different categories of antisocial behavior: life-course persistent and adolescent-limited offenders (Moffitt, 1993). More recently, Moffitt (2006) discussed the need for additional categories such as low-level chronic offenders and no/low offenders, and Farrington and colleagues (Farrington, Ttofi, & Coid, 2009) proposed a category of late-onset offenders.

Operating within a life-course perspective, we investigate the developmental course of trajectories of delinquent behavior starting in adolescence and extending into young adulthood, as well as the consequences in adulthood associated with specific trajectory group membership. More specifically, we will compare membership in the reference trajectory group of no/low delinquency with membership in each of the additional trajectory groups of delinquency identified with regard to subsequent functioning in wide-ranging intrapersonal, interpersonal, and contextual domains.

Several longitudinal studies in life-course criminology have established the significance of delinquent or antisocial behavior in adolescence as it relates to the intrapersonal outcome of criminal behavior in adulthood (Fergusson, Horwood, & Ridder, 2005; Loeber, Farrington, Stouthamer-Loeber, & White, 2008; Samuelson, Hodgins, Larsson, Larm, & Tengström, 2010). Our study extends this research by examining the generalizability of findings to an African American and Hispanic sample. Further, we examine violence in the late twenties as an outcome of earlier delinquent behavior. This is a significant developmental period in which to measure violence as it is past the normative peak of violent behavior (Fagan & Western, 2005).

Another intrapersonal outcome of interest is substance use. Jessor and his colleagues theorized that deviant behavior and substance use both represent related components of a syndrome of problem behavior (Jessor, Donovan, & Costa, 1991). As such, an examination into whether distinct patterns of earlier delinquent behavior have differential relations to subsequent substance use has important theoretical implications. Doherty and colleagues (Doherty, Green, & Ensminger, 2008) found a positive relationship between serious adolescent delinquency and the onset of marijuana and cocaine use in adolescence and young adulthood. Hayatbakhsh et al. (2008) found similar results in an investigation of cannabis use disorders. Odgers and colleagues (Odgers et al., 2008) examined trajectories of antisocial behavior beginning in childhood and extending to adulthood. Using a trajectory analysis, they found that members of the early onset persistent antisocial behavior trajectory group were more likely to demonstrate higher levels of illicit drug use than the low antisocial behavior group. We will extend this research by examining how abuse and dependence on marijuana and other illegal drugs in adulthood are tied to specific trajectories of delinquent behavior from adolescence to young adulthood.

With regard to an interpersonal outcome, the quality of partner relationships, Sampson and Laub (1997) reported that early delinquency can lead to weakened social bonds in adulthood. Colman and colleagues (Colman et al., 2009) supported this theory with their finding that externalizing behavior in adolescence was related to both unhappiness with

family life and relationship problems in adulthood. It is important to note that the findings of Colman et al. regarding adult relationship problems were only significant for earlier severe ratings of externalizing behavior in adolescence. We will build upon the work of Colman and colleagues by examining the specific associations between trajectories of delinquent behavior and subsequent relationship problems.

Peer relationships represent an additional interpersonal outcome. Previous research suggests that individuals who are delinquent tend to choose peers who are similar to themselves, and delinquent peers reciprocally encourage the individuals to become more delinquent and engage in drug use (Doherty et al., 2008; Ennett et al., 2006). We will examine which specific patterns of earlier delinquent behavior are related to later peer group membership.

One contextual outcome of interest is residence in a high-crime neighborhood. Individuals who persist in delinquent behavior into adulthood may be attracted to high-crime areas for a number of reasons, such as proximity to delinquent peers (McGloin & Stickle, 2011) or for social acceptance (Leverentz, 2011). Individuals with a history of delinquent behavior may also be attracted to high-crime areas because a poor educational/employment record has made it difficult for them to obtain gainful employment (Raphael, 2011) and therefore difficult to afford to live in more desirable neighborhoods. This outcome directly pertains to public health, as research has shown that individuals with a history of delinquent behavior are likely to engage in further delinquent behavior when placed in proximity to others who engage in delinquent behavior (Mennis & Harris, 2011), thus exacerbating the problem of neighborhood crime. We will examine whether membership in specific trajectory groups of delinquent behavior predicts residence in high-crime areas. This knowledge might contribute to a better understanding of the complex issue (Drakulich, Crutchfield, Matsueda, & Rose, 2012) of the exacerbation of crime in such neighborhoods.

The present research contributes to the study of trajectories of delinquent behavior in two important ways. First, this is one of a limited number of studies to examine a broad range of adult outcomes (intrapersonal, interpersonal, and contextual) in the late twenties. Second, delinquent behavior is traced prospectively over 10 years, starting in early adolescence and continuing into young adulthood among male and female African Americans and Hispanics living in an urban environment.

Our focus on an African American and Hispanic sample is particularly relevant for research on delinquent behavior. While there is a relatively high level of criminal arrests/incarceration of individuals belonging to these racial/ethnic groups in the United States (in comparison with the level for non-Hispanic White Americans; Walker, Spohn, & Delone, 2012), a relatively small amount of research has been done examining ethnic/racial differences in trajectories of criminal offending (Piquero, 2008).

One of the few studies on this topic (Le & Stockdale, 2011) identified a common pattern of delinquent offending across racial/ethnic groups from adolescence into young adulthood. However, in one of their two samples, these researchers also identified distinct trajectories for African American, Hispanic, and non-Hispanic White participants that differed in terms of mean delinquency scores and rates of change in adolescence. Specifically, both African American and Hispanic participants scored higher on delinquency throughout adolescence than non-Hispanic White participants. These disparate racial/ethnic findings suggest further research on this topic.

Conflict theory has members of the majority relegating members of minority groups to a socially, economically, and politically disadvantaged position as a means of social control (Walker, Spohn, & Delone, 2012). In the United States, African Americans and Hispanics represent the two largest racial/ethnic minority groups (Humes, Jones, & Ramirez, 2011). As

such, we will examine the trajectories of delinquency of our combined sample of African American and Hispanic participants as representative of trajectories of delinquency among American minorities. We will discuss the resultant trajectory groups in relation to trajectories established with primarily non-Hispanic White samples with the aim of contributing to the discussion on the validity of racial/ethnic disparity research in trajectories of delinquency.

We hypothesize that, for our sample: (1) There will be at least four trajectory groups of delinquent behavior (Farrington, Ttofi, & Coid, 2009; Moffitt, 2006; Odgers et al., 2007). They will include: (a) a no/low delinquent behavior group, which will be most prevalent, (b) a decreasing delinquent behavior group, (c) an intermediate group (i.e., late onset or moderate persistent delinquent behavior) and (d) a high persistent delinquent behavior group. (2) Membership in the intermediate trajectory group and the high persistent delinquent behavior trajectory group will be associated with greater adverse life-course outcomes (i.e., violent behavior, substance abuse and dependence, partner conflict, peer substance use, and adverse neighborhood factors) compared to membership in the no/low delinquent behavior trajectory group. (3) Membership in the decreasing delinquent behavior trajectory group will be associated with greater adverse life-course outcomes compared to membership in the no/low trajectory group.

## Method

### Sample and Procedure

Data for the present study are from a four-wave longitudinal study of African American and Puerto Rican participants. At time 1 (T1 in 1990), all of the African American and Puerto Rican students in grades 7–10 ( $N=1332$ , mean age=14,  $SD=1.3$ ) were recruited from 11 schools serving the East Harlem area of New York City. The schools were selected to be demographically representative of youth attending schools in the East Harlem area. Participating adolescents were given follow-up interviews at mean ages 19 (T2,  $SD=1.5$ ), 24 (T3,  $SD=1.3$ ), and 29 (T4,  $SD=1.7$ ) years. There were 838 participants interviewed at T4, 64% of the 1302 T1 participants living at this wave. Of the 838 T4 participants, 71 percent provided data at all four time points, and all the participants provided data at two or more time points. The participants without T3 data were not approached at T3 due to budget limitations on data collection at this wave.

At T1, structured questionnaires were administered to the adolescents in their classrooms. At T2 and T3, the majority of the participants were interviewed in person. Some of the participants who could not be interviewed in person were interviewed over the phone. At T4, 37% of the participants were interviewed in person, and the remainder were interviewed over the phone or given self-administered questionnaires. Comparing T4 participants who were interviewed in person, who were interviewed over the phone, and who were given self-administered questionnaires, there were no significant differences on the T4 variables or T1–T3 delinquent behavior trajectory group membership except for T4 marijuana dependence (dependence  $^2=11.2$ ,  $p<.01$ ). The participants who were interviewed over the phone (8%,  $SE=\pm 0.9\%$ ) were more likely to report marijuana dependence than those who were interviewed in person (5%,  $SE=\pm 0.7\%$ ) or given self-administered questionnaires (2%,  $SE=\pm 0.5\%$ ).

Of the 838 T4 participants, 59% ( $n=498$ ) of the participants were female, and 41% ( $n=340$ ) were male. Ethnically, 55% ( $n=460$ ) self-identified as African American, and 45% ( $n=378$ ) as Puerto Rican. Forty five percent of the participants reported a 12<sup>th</sup> grade education level or lower. Twenty two percent of the participants were cohabiting with partners. Another

22% of the participants were married and living together. The median annual personal gross income was between \$15,001 and \$22,500.

We used chi-square and *t* tests to assess possible attrition bias from T1 to T4 by comparing the T1 variables for the 838 adults with data at T4 to those who participated at T1 but not at T4. The male attrition rate (45%) was significantly higher than the female rate (30%,  $\chi^2(1) = 29.2, p < 0.001$ ), and the Puerto Rican attrition rate (41%) was higher than the African American rate (34%,  $\chi^2(1) = 7.2, p < 0.01$ ). There were no significant differences between those who participated at T4 and those who did not participate at T4 with regard to delinquent behavior at T1 ( $t = 0.1$ ), marijuana use at T1 ( $t = 0.3$ ), or peer marijuana use variables at T1 ( $t = 0.2$ ).

We also compared the 660 participants at T3 with the 178 participants who missed T3 on our outcome variables at T4. There were significant differences on: a) T4 marijuana abuse ( $\chi^2(1) = 7.07, p < 0.01$ , Present at T3 5.2%, Missing T3 1.2%), b) T4 marijuana dependence ( $\chi^2(1) = 7.00, p < 0.01$ , Present at T3 16.5%, Missing T3 9.4%), and c) T4 neighborhood crime and deterioration ( $t = 4.28; p < 0.001$ ; Present at T3 mean = 12.7, SD = 4.5; Missing T3 mean = 11.1, SD = 5.0). However, there were no significant differences at T4 on other illegal drug abuse ( $\chi^2(1) = 0.82, p = 0.36$ ), other illegal drug dependence ( $\chi^2(1) = 1.27, p = 0.26$ ), violent behavior ( $t = 1.59, p = 0.11$ ), partner discord ( $t = 1.70, p = 0.09$ ), peer marijuana use ( $t = 1.74, p = 0.08$ ), and peer other illegal drug use ( $t = 0.78, p = 0.44$ ). Delinquency is the only T3 scale that was imputed for the participants missing at T3.

We used the SAS MI procedure to deal with missing data. Rather than multiple imputation, we used Full Information Maximum Likelihood (FIML) imputation (Schafer & Graham, 2002) on a variable by variable basis, because the FIML imputed data are less likely to be biased even if the data are not missing completely at random (Myrtveit, Stensrud, & Olsson, 2001). As noted above, T3 delinquency data was missing for 178 individuals who were not invited to participate at T3 due to budget limitations. Less than 1% of all control and outcome measures were also missing for individuals who participated at T2 and T4, but skipped specific questions. FIML was used for all missing data.

The Institutional Review Board (IRB) of the Mount Sinai School of Medicine approved the study's procedures for data collections between 1990 and 2003, and the New York University School of Medicine's IRB approved the study from 2004 onward. A Certificate of Confidentiality was obtained from the National Institute on Drug Abuse of the National Institutes of Health. Written informed assent was obtained from all minors after the procedures were fully explained. Passive consent procedures were followed for parents of minors. For participants older than age 18, informed consent was obtained. Additional information regarding the study methodology is available from previous reports (Brook, Lee, Finch, Koppel, & Brook, 2011).

## Measures

The psychosocial variables investigated here have been found to be related to drug use and psychopathology in previous research (Brook, Whiteman, Czeisler, Shapiro, & Cohen, 1997; Crawford, Cohen, & Brook, 2001). At T1, T2, and T3 the respondents were asked 8 questions about the frequency of delinquent behaviors during the past 5 years (T1 Cronbach's alpha = .72), (T2 Cronbach's alpha = .79), and (T3 Cronbach's alpha = .76). A sample item was "During the last 5 years, how often have you gotten into a serious fight?" (Jackson, 1997). The trajectory analyses used the mean of the responses to the delinquent behavior items given by each participant at each wave. The response options for each of the items were: "never" (1), "once" (2), "twice" (3), "3 or 4 times" (4), and "5 or more times" (5).

Table 1 provides a description of the sample at each of the time points.

At T4, violent behavior was measured using a 5 item scale (Cronbach's  $\alpha=.74$ ). A sample item was "How often have you held a weapon to someone?" (Elliott, Huizinga, & Menard, 1989). With regard to the substance use domain, marijuana abuse and dependence were assessed using adapted items in accord with the criteria listed in DSM-IV-TR (American Psychiatric Association, 2000). For example, "In the past 5 years, did you have any legal problems because of your use of marijuana?" and "In the past 5 years, did you have unsuccessful attempts or a persistent desire to cut down or control marijuana use over a period of time?" Abuse and dependence on illegal drugs other than marijuana (e.g., cocaine, stimulants, barbiturates) were also assessed using items corresponding to the criteria listed in DSM-IV-TR. Since we only had two cases of the abuse of illegal drugs, this variable was deleted from the paper.

Partner relations were measured using a 5 item scale (Cronbach's  $\alpha=.81$ ). The participants were asked: "On average, how often do you have differences of opinion with your partner?" The peer domain included two items assessing the number of friends who have ever used marijuana and the number of friends who have ever used illegal drugs other than marijuana. Each item was rated on a 4 point scale (0=none, 1=a few, 2=some, 3=most; intercorrelation of items=0.36,  $p<.001$ ). The neighborhood measure was a 5 item scale (Cronbach's  $\alpha=.89$ ). A sample item was: "There is a lot of violence in your neighborhood." (Seidman, 1991). Each item was rated on a 4 point scale (1=not at all true, 2=not very true, 3=sort of true, 4=very true).

### Analytic procedure

We applied the SAS TRAJ procedure developed by Jones et al. (Jones, Nagin, & Roeder, 2001; Jones & Nagin, 2007) to explore the trajectories of the participants' delinquent behaviors over time using the censored normal distribution (White, Pandina, & Chen, 2002). We used the Bayesian Information Criterion (BIC) and the entropy measure to determine the number of trajectory groups for delinquent behavior. The model having the maximum value (i.e., smallest absolute value) of BIC and at least 5 participants in each trajectory was selected. Each participant was assigned to the trajectory group with the largest Bayesian posterior probability (BPP) for the participant. We used the BPP values of the trajectory groups as predictors in the logistic regression analyses (Satten, Flanders, & Yang, 2001).

Logistic regression analyses for binary outcome variables and multiple regression analyses for continuous outcome variables were conducted to determine whether memberships in the trajectory groups of delinquent behavior from T1 to T3 compared with membership in the reference trajectory group (i.e., no/low delinquent participants) were associated with violent behavior, substance abuse and dependence, partner and peer characteristics, and neighborhood crime at T4 controlling for gender and ethnicity. Marijuana use at T2 was used as an additional control variable to predict T4 marijuana abuse and dependence. Illegal drug use other than marijuana at T2 was used as a control for T4 dependence on illegal drugs other than marijuana. In the peer characteristic domain, T2 peer marijuana use and T2 peer other illegal drug use were used as additional control variables for predicting T4 peer marijuana use and T4 peer illegal drug use other than marijuana, respectively.

Within each logistic or multiple regression analysis, we conducted three comparisons consistent with our hypotheses: 1) membership in the high persistent delinquent behavior trajectory group versus the no/low delinquent behavior trajectory group, 2) membership in the moderate persistent delinquent behavior group versus the no/low delinquent behavior trajectory group, and 3) membership in the decreasing delinquent behavior group versus the no/low delinquent behavior trajectory group.

We also conducted three additional trajectory group comparisons which were not addressed in our hypotheses. These were comparisons between: 1) membership in the high persistent delinquent behavior group versus the decreasing delinquent behavior group, 2) membership in the moderate persistent delinquent behavior group versus the decreasing delinquent behavior group, and 3) membership in the high persistent delinquent behavior group versus the moderate persistent delinquent behavior group.

## Results

### Extracting trajectories of delinquent behavior

We computed solutions for 2 through 5 trajectories. The BICs and entropies for each solution were: 2 (-6457, 0.94), 3 (-6377, 0.95), 4 (-6295, 0.91), and 5 (-6256, 0.92). Although the 5 trajectory group model had the largest BIC (*i.e.*, smallest absolute value of BIC), it was not selected because two trajectory groups had only 1 estimated member, which was too small for analytic purposes. Instead, we chose the 4 trajectory group model (see Figure 1) which had the next largest BIC.

The no/low delinquent behavior trajectory group included participants who reported not engaging in or only minimally engaging in delinquent behavior (T1 mean=1.38, T2 mean=1.28, T3 mean=1.29). This was used as the reference group, with an estimated prevalence of 81.8% (n=696). The decreasing delinquent behavior trajectory group included participants who reported engaging in delinquent behavior more than twice on average in the past 5 years at age 14 (T1 mean=3.08), but not engaging in or minimally engaging in delinquent behavior in the past 5 years as of age 19 or age 24 (T2 mean=1.56, T3 mean=1.75). This group had an estimated prevalence of 4.1% (n=34). The moderate persistent delinquent behavior trajectory group included participants who reported little delinquent behavior at age 14 (T1 mean=1.79), and moderate delinquent behavior at ages 19 and 24 (T2 mean=2.34, T3 mean=2.01, corresponding to more than once in the past 5 years at each time point). This group had an estimated prevalence of 12.0% (n=90).

The high persistent delinquent behavior group included participants who reported engaging in moderate delinquent behavior at age 14 (T1 mean=2.40, corresponding to more than once in the past 5 years), and increased delinquent behavior from age 14 to age 19 and 24 (T2 mean=3.63, T3 mean=3.23, corresponding to more than twice in the past 5 years). This group had an estimated prevalence of 2.1% (n=18). There are no outliers in delinquent behavior among those 18 cases.

Table 2 reports the summary statistics when each participant was assigned to a trajectory group by the modal BPP.

The percent of African Americans was the same in each trajectory group ( $\chi^2(3) = 4.5; p = .21$ ). Females were more likely to be in the no/low delinquent behavior trajectory group (66% female) and less likely to be in the high persistent trajectory group (11% female) ( $\chi^2(3) = 84.4; p < .001$ ).

### Comparisons of each trajectory group to the no/low group on T4 outcome measures

Table 3 presents the adjusted odds ratios (AOR) and confidence intervals (CI) from the logistic regression analyses as well as the ordinary least square regression coefficients ( $\beta$ ) and CIs from the multiple regression analyses.

Membership in the trajectory groups was significantly correlated with many of the adverse outcomes. Memberships in the high persistent ( $\beta = -6.22, p < .001$ ) and moderate persistent ( $\beta = 3.16, p < .001$ ) delinquent behavior trajectory groups compared to the no/low delinquent

trajectory group were associated with more frequent violence toward others in the domain of violent behavior.

In the substance use domain, membership in the high persistent delinquent behavior trajectory compared to the no/low delinquent trajectory group was associated with an increased likelihood of marijuana abuse (AOR=3.86,  $p=.02$ ) and marijuana dependence (AOR=3.13,  $p=.04$ ). Membership in the moderate persistent delinquent behavior trajectory group compared to the no/low delinquent trajectory group was also associated with an increased likelihood of marijuana abuse (AOR=3.94,  $p<.001$ ), marijuana dependence (AOR=2.54,  $p<.01$ ), and dependence on illegal drugs other than marijuana (AOR =4.60,  $p<.01$ ). Membership in the decreasing delinquent behavior trajectory group compared to the no/low delinquent trajectory group was associated with an increased likelihood of dependence on illegal drugs other than marijuana (AOR=7.44,  $p<.01$ ).

In the partner discord domain, memberships in the high persistent ( $\beta=1.56$ ,  $p=.03$ ), moderate persistent ( $\beta=1.66$ ,  $p<.001$ ), and decreasing ( $\beta=1.18$ ,  $p=.04$ ) delinquent behavior trajectory groups compared to the no/low delinquent trajectory group were associated with the participants experiencing more extensive differences of opinion with partners.

With regard to the peer characteristics, membership in the moderate persistent delinquent behavior trajectory group compared to the no/low delinquent trajectory group was related to associating with having more peers who use marijuana ( $\beta=-0.49$ ,  $p<.001$ ). Memberships in the high persistent ( $\beta=-0.66$ ,  $p<.001$ ), moderate ( $\beta=-0.55$ ,  $p<.001$ ), and decreasing ( $\beta=-0.34$ ,  $p=.02$ ) delinquent behavior trajectories compared to the no/low delinquent trajectory group were also associated with having more peers who use illegal drugs other than marijuana.

In the neighborhood domain, membership in the moderate persistent delinquent behavior trajectory group compared to the no/low delinquent trajectory group was related to higher reported levels of neighborhood crime and/or deterioration ( $\beta=2.16$ ,  $p<.001$ ).

### Supplementary analyses

We also conducted three additional comparisons as supplementary analyses, though we did not hypothesize about the outcomes of these analyses. Memberships in the high persistent ( $\beta=5.57$ ,  $p<.001$ ) and moderate persistent ( $\beta=2.51$ ,  $p<.001$ ) delinquent behavior trajectory groups compared to membership in the decreasing delinquent trajectory group were associated with greater violence toward others. Membership in the high persistent ( $\beta=3.06$ ,  $p<.001$ ) delinquent behavior trajectory group compared with membership in the moderate delinquent trajectory group was also associated with greater violence toward others. Membership in the moderate persistent delinquent behavior trajectory group compared to membership in the decreasing delinquent trajectory group was related to having more peers who use marijuana ( $\beta=-0.50$ ,  $p=.02$ ).

### Discussion

The present study examined trajectories of delinquent behavior from adolescence to adulthood in urban African American and Hispanic youth, and their subsequent adult behaviors. At a descriptive level, as expected (Farrington, Ttofi, & Coid, 2009; Moffitt, 2006; Odgers et al., 2007), there are four trajectories of delinquent behavior. Further, our findings with regard to adult functioning indicate that membership in the trajectory groups of delinquent behavior is a significant predictor of later violent behavior, substance abuse and dependence, partner relationship problems, peer substance use, and residence in a high-crime neighborhood.



## Stability and Change in Delinquent Behavior

The four trajectories identified here (i.e., high persistent delinquent behavior, moderate persistent delinquent behavior, decreasing delinquent behavior, and no/low delinquent behavior) are consistent in direction with those proposed by Moffitt (2006) and are similar to, though not the same as, the trajectories identified in Moffitt's later collaborations with Odgers et al. using a primarily White, New Zealand sample (Odgers et al., 2007; Odgers et al., 2008). We did not identify the late onset trajectory group discussed by Farrington and colleagues (Farrington, Ttofi, & Coid, 2009), though this may be due to limitations with our T1 dataset, as discussed in the limitations section. The number of trajectories that we found is consistent with Piquero's 2008 (Piquero, 2008) review of research on trajectories of criminal activity, primarily performed with non-Hispanic White or mixed samples, in which 3–5 trajectory groups were most commonly observed. Future research would benefit from minority vs. majority group comparisons on trajectories of delinquent behavior within the same sample, as more explicit racial/ethnic comparisons could be made regarding mean scores and rates of change.

The least common trajectory group was characterized by high persistent delinquent behavior. The consequences of engaging in high persistent delinquent behavior may be reinforcing. For example, delinquents may obtain stolen goods or gain peer approval by engaging in delinquent behavior (Farrington, 1995) and therefore continue in these behaviors. The consequences of delinquent behavior may also result in being labeled delinquent or otherwise stigmatized. Stigmatization may make it more difficult for the delinquents to achieve their goals legally (Sampson & Laub, 1997). Consequently, they may continue to engage in delinquent behavior.

Members of the moderate persistent delinquent behavior trajectory group were similar to members of the high persistent group in that their behavior showed considerable stability from adolescence to young adulthood. Continuity in delinquent behavior over several maturational periods marked by considerable physical and psychological changes is in accord with the findings of Farrington et al. (Farrington, Ttofi, & Coid, 2009).

As regards the decreasing delinquent behavior trajectory group, Farrington and Ttofi, in their summary of Integrated Cognitive Antisocial Potential Theory (Farrington & Ttofi, 2012), explain that, according to this theory, members of this trajectory group initially share similar risk factors for antisocial behavior with members of the moderate and high persistent groups. These risk factors determine an individual's long-term antisocial potential. However, members of the decreasing trajectory group as compared with members of the persistent trajectory group may experience a decrease in their antisocial potential in response to changes in their social environment, such as marriage, or negative feedback from their earlier involvement in criminal activities.

Finally, the largest group was the no/low delinquent behavior trajectory group. The high prevalence of this group is consistent with the view of Roisman and colleagues (Roisman et al., 2010), who argue that adolescent antisocial behavior is not developmentally normative.

## Associations with Adult Functioning

The first of our associational findings examines violent behavior as an intrapersonal outcome of membership in the three trajectory groups of delinquent behavior compared to membership in the no/low delinquent behavior trajectory group. Results suggest that a form of delinquent behavior continues past young adulthood for members of the moderate and high persistent delinquent behavior groups, as they engage more frequently in violent behavior in adulthood. This is consistent with past research (Farrington, 1995; Fergusson et

al., 2005; Loeber et al., 2008; & Samuelson et al., 2010), and it contributes to a greater understanding of the generalizability of these findings to racial/ethnic minority groups.

We also found that members of the decreasing delinquent behavior trajectory did not engage in violent behavior in adulthood more frequently than the no/low delinquent behavior participants. Consistent with this finding, in our supplemental analyses, we found that membership in both the high persistent and moderate persistent delinquent trajectory groups was, in each case, associated with more frequent violence toward others when compared to membership in the decreasing delinquent trajectory group. Membership in the high persistent delinquent trajectory group compared with membership in the moderate delinquent trajectory group was also associated with more frequent violence toward others. These supplemental findings support a continuum of links over a range of delinquent behavior trajectories that connects a pattern of delinquent behavior from adolescence to young adulthood to violent behavior in adulthood among African American and Hispanic individuals.

Members in the high persistent and moderate persistent delinquent behavior groups compared to the no/low delinquent behavior group were also more likely to be abusers and dependent users of marijuana. This is consistent with the findings of Odgers and colleagues (2008) and indicates that the link between deviant behavior and substance use, hypothesized by Jessor et al. (1991), is so pervasive that it extends beyond use to the more stringent substance abuse and dependence diagnoses. Furthermore, moderate persistent delinquent behavior appears to be an important predictor of illicit substance dependence.

There are several possible explanations for the relationship between participation in high and moderate persistent levels of delinquent behavior and later illicit substance dependence. As we noted previously, Jessor et al. (1991) have supported the existence of a common underlying factor for both delinquent behavior and drug use. Another possibility is that the negative consequences of delinquent behavior, such as difficulty in keeping a job and increasing family conflicts, may lead to difficulty in coping, and ultimately, greater substance use or dependence (Farrington, 2009). Additionally, delinquent individuals are not likely to be tied to conventional institutions, such as churches and student groups, which can serve as constraining forces with regard to substance use (Hill, Burdette, Weiss, & Chitwood, 2009; Chilenski & Greenberg, 2009).

The decreasing trajectory group versus the no/low delinquent behavior trajectory group did not differ with respect to the likelihood of abuse and dependence on marijuana statistically, but did have higher rates than the no/low group as shown in Table 3. In contrast, the decreasing delinquent behavior trajectory group had a greater likelihood of dependency on illegal drugs other than marijuana. These findings are puzzling. Future research with larger samples may provide an explanation for these findings.

Memberships in the high persistent, moderate persistent, and decreasing delinquent behavior trajectory groups were associated with more extensive partner conflict than membership in the no/low group. These results indicate a more persistent link between delinquent behavior and relationship problems than found in previous work (Colman et al., 2009). The association between a history of delinquent behavior and partner conflict may be explained by the mechanism of Sampson and Laub (1997) which stated that involvement in delinquency throughout adolescence lessens involvement with social institutions and places strain on social relationships. Another possibility is that delinquent individuals are rejected by conventional partners and therefore are obliged to select non-conventional partners. Vitaro, Tremblay, & Bukowski (2001), for example, reported that children who displayed antisocial behavior experienced rejection by non-deviant friends. Individuals who are

antisocial may also voluntarily select others who engage in antisocial behaviors as partners because they are more comfortable with them. In both scenarios in which the antisocial individual selects an antisocial partner, the partner's antisocial tendencies increase the extent of conflict in the partner relationship (Jersild, Brook, & Brook, 1978). Thus, there may be a reciprocal relationship between the quality of the partner relationship and delinquent behavior, in which problems in the partner relationship may perpetuate the individual's delinquent behavior into the future (Laub, Nagin, & Sampson, 1998; Burt et al., 2010).

It is interesting to note that individuals who have decreased their involvement in delinquent behavior report experiencing more extensive discord with their partners when compared to members of the no/low trajectory group. It may be that a reduction in delinquent behavior creates friction with a partner who continues to engage in delinquent behavior. This would be consistent with the report of Homish, Leonard, Kozlowski, & Cornelius (2009) that discrepancies in substance use between partners were related to later dissatisfaction with the partner relationship.

Membership in the high persistent delinquency, moderate persistent delinquency, and decreasing delinquency trajectory groups, when compared with the no/low delinquency trajectory group, was associated with having more peers who have used illegal drugs other than marijuana. These findings are in accord with those of Oetting and Donnermeyer (1998) and Ennett et al. (2006), who noted that deviant norms are shared within the peer group. Delinquent individuals, on average, have more friends who also participate in delinquent behavior, and these peers who participate in delinquent behavior are also likely to use drugs. That individuals in the decreasing delinquent behavior trajectory group persist in their relationships with peers who use illegal drugs other than marijuana is consistent with our finding that membership in the decreasing delinquent behavior group is associated with a greater likelihood of dependence on other illegal drugs. However, our supplemental finding was that membership in the moderate persistent delinquent behavior trajectory group was related to having more peers who use marijuana when compared to membership in the decreasing delinquent trajectory group. This suggests that the association with others who use illegal drugs is limited when delinquent behavior is reduced.

Finally, membership in the moderate persistent delinquency group, when compared to membership in the no/low delinquency group, was associated with the report of more extensive crime and deterioration in their neighborhood of residence. This parallels the finding of Drakulich et al. (2012) that a high concentration of returning prisoners was associated with low collective efficacy and high levels of violent crime in the surrounding neighborhood. The current finding demonstrates that the link between persistent delinquent behavior and residence in a high-crime neighborhood extends to non-institutionalized samples as well.

Membership in the decreasing delinquent behavior group was associated with the same extent of neighborhood crime and deterioration as membership in the no/low delinquency group. It may be that individuals who desist from engaging in delinquent behavior by their late teens have done so by seeking out and engaging in prosocial groups such as churches and neighborhood organizations in neighborhoods high in collective efficacy (Hill et al., 2009; Chilenski & Greenberg, 2009). It may also be that individuals who primarily engaged in delinquent behavior in their youth but stopped after that are able to avoid the common problems of stigmatization and educational and employment missteps (Raphael, 2011) before they became major financial obstacles.

The present study has several limitations. First, there is some controversy in the field regarding whether our self-report measures of delinquency, which are standard in the field,

are sufficiently reliable for studying between-individual differences in crime over time (Lauritsen, 1998). Lauritsen suggests that this limited reliability may stem from testing and maturation effects. We were unable to test for these effects in our sample. However we do recommend that self-reports of behavior be compared with external records (e.g., police reports) whenever possible in future research.

Second, though group-based methods to estimate delinquency over the life-span have shown some degree of consistency, there are a number of factors that limit the generalizability of findings from specific trajectory analyses. These include the length of follow-up, the number and frequency of data collections, age of the participants at each data collection, the size of the sample, and the gender and the racial/ethnic breakdown of the sample. For example, though our study of male and female African American and Puerto Rican participants took place over 15 years, we based our trajectory analyses on only 3 time points. More frequent data collection during the important developmental periods from early adolescence to young adulthood might demonstrate further nuances in the shape of these trajectories and perhaps allow for identification of more trajectory groups. Additionally, as researchers (Lauritsen, 1998) have demonstrated that trajectories of delinquency differ by age cohort, future research might examine the replicability of our findings for participants at each of the ages within our T1 inter-quartile range of 13 to 15 years.

As our delinquency measure asked about the frequency of participation in delinquent behavior over the past five years at each wave, and the sample had an inter-quartile age range from 13 to 15 years old at T1, we should note an additional limitation with regard to the T1 delinquency scores. These scores may have been restricted, relative to T2 and T3 delinquency scores, because some participants were too young, at age 8 (from the lower quartile point), to have begun engaging in the specific delinquent behaviors assessed in this study. It is difficult to say how the trajectories might have been affected by the use of different time periods for delinquency.

Furthermore, the small size of our high persistent delinquent behavior trajectory group (n=18) may have limited the associational findings for this group in comparison to the no/low delinquent behavior group. Further research is necessary to address differences in the outcomes of high persistent and moderate persistent delinquent behavior trajectory groups suggested here.

Finally, a brief note with regard to attrition. While we have compared those seen at T4 with those who were not seen at T4 on the T1 variables available to us, we acknowledge that there are further comparisons (e.g., comparisons of the two groups in adulthood) that we are unable to make.

Despite these significant limitations, the study supports and extends the literature in a number of ways. We assess important characteristics of delinquent behavior at several developmental stages among an urban minority sample. A major contribution of the paper is a set of findings relating membership in trajectories of delinquent behavior to broad areas of adult functioning such as adult violence and substance abuse and dependence, relations with one's partner and peers, and living in particular environments. Our results indicate that the burden of problems associated with high and moderate persistent delinquent behavior is considerable. As noted by Odgers et al. (2008), once one takes into account all the aspects of the individual's life that may be affected by a history of delinquent behavior, the cumulative costs to the individual and society are much higher than typically estimated.

The results may have implications for prevention of a number of adverse outcomes in adulthood. In the present study, 75% of individuals who were delinquent at age 14 continued to engage in high or moderate persistent delinquent behavior throughout the course of the

study. An increased focus on universal prevention in early adolescence, before trajectory group membership is established, that is effective in eliminating the youths' likelihood of engaging in delinquent behavior is warranted. A universal prevention program would have the potential to reduce the prevalence of later substance abuse/dependence, violence, poor partner relationships, substance using peers, and residence in disadvantaged neighborhoods. However, it is important to note that other investigators have maintained that universal programs may not be effective for populations that are not "needy". From a policy perspective, according to Olds et al. (1999), programs directed at the most vulnerable populations are most desirable as demonstrated in the prenatal and Infancy Home Visitation by Nurses program. Piquero and colleagues (2009) provided evidence that early intervention in family/parent training was associated with reduced delinquency and crime at later stages of development. Further, a selective prevention program that targeted individuals engaging in high or moderate persistent levels of delinquent behavior in late adolescence could reduce the individuals' likelihood of engaging in behaviors associated with membership in these two groups, such as violence toward others in adulthood. From a clinical perspective, the benefits of interventions which serve to reduce the likelihood of youths becoming adults who engage in violent behavior and substance abuse and dependence, have difficulty with partner relationships, and associate with drug-using peers, are apparent. Future research should focus on serious criminal behaviors such as shooting someone with a gun. Related to this, as noted by Piquero et al. (2009), explication of the early family, peer, and cultural risk factors should be included in future investigations. Additionally, longitudinal studies of delinquency and violent behavior over the life-course are warranted. Moreover, from a policy perspective, the reduction in the prevalence of individuals who display continuous delinquent behavior over time should reduce the burden to society of violent behavior, substance abuse and dependence, familial instability, and the perpetuation of crime in disadvantaged neighborhoods.

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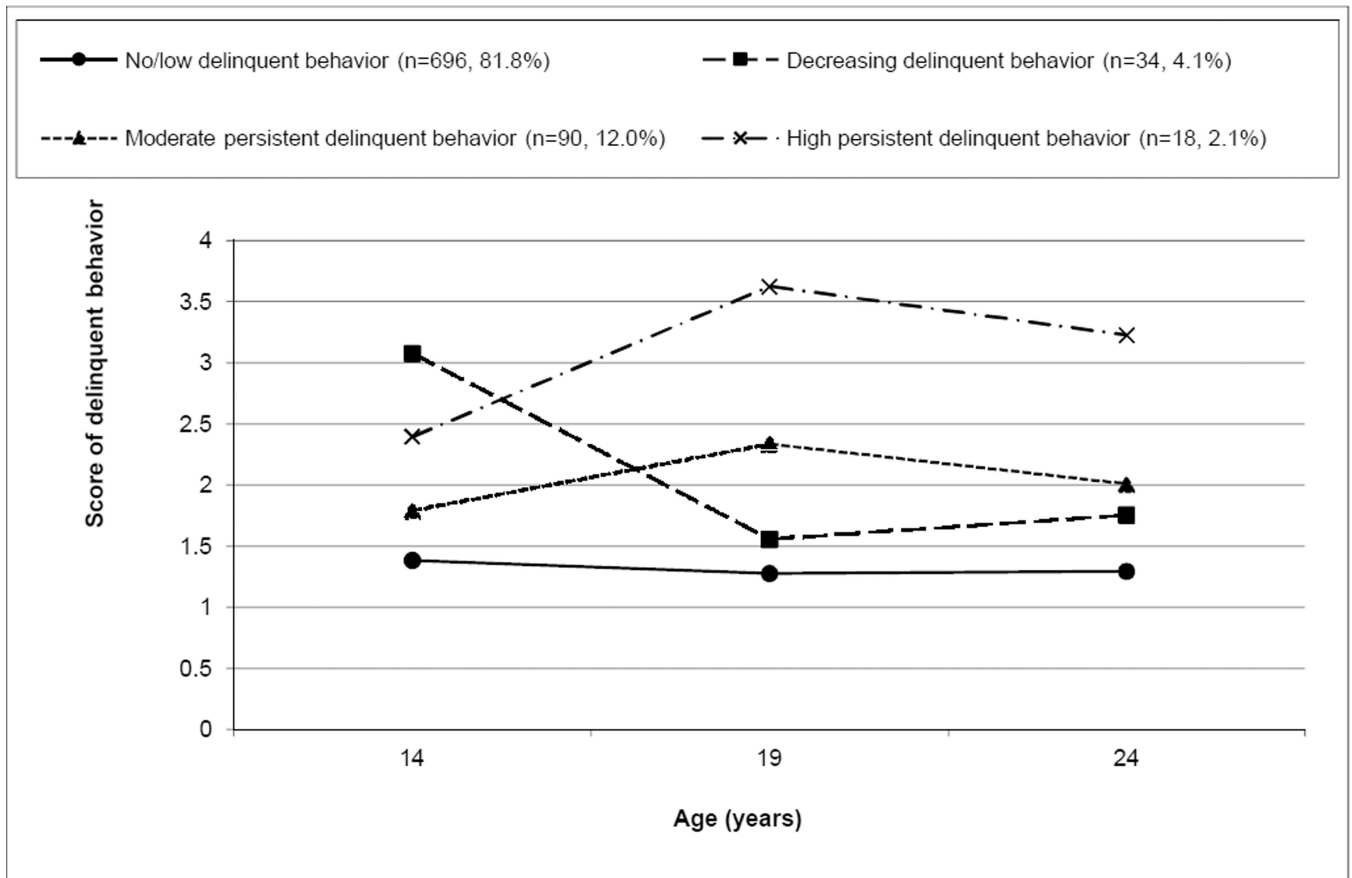
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**Figure 1. Trajectories of delinquent behavior**

Note. Delinquent behavior is a mean score representing the number of times the individual engaged in delinquent behaviors (e.g., fighting, theft, breaking and entering) during the past 5 years: “never” (1), “once” (2), “twice” (3), “3 or 4 times” (4), and “5 or more times” (5).

**Table 1**

Sample descriptive statistics by wave

	Number of participants	Gender		Ethnicity		Age			Delinquent behavior		
		Females	Males	AA	PR	Mean	SD	Inter Quartile Range	Mean	SD	Inter Quartile Range
T1	1332	713	619	696	636	14.1	1.31	13-15	1.52	0.57	1-1.8
T2	1190	649	541	631	559	19.2	1.49	18-20	1.45	0.59	1-1.6
T3	660	335	325	331	329	24.5	1.35	23-25	1.46	0.56	1-1.6
T4	838	498	340	460	378	29.2	1.72	28-30	NA	NA	NA

Note T1=time 1; T2=time 2; T3=time 3; T4=time 4;

AA=African American; PR=Puerto Rican; SD=Standard Deviation; NA=Not Applicable

The answer options for delinquent behavior were: "never" (1), "once" (2), "twice" (3), "3 or 4 times" (4), and "5 or more times" (5).

**Table 2**  
Group Percentages and Means (Standard Deviations) using Modal BPP Trajectory Assignment

Delinquent Behavior Trajectory Group	Demographics		Substance Use		Violent behavior	Partner relations	Peer characteristics		Neighborhood	Bayesian Posterior Probability
	Ethnicity	Gender	Marijuana	Abuse			Dependence on illegal drugs other than marijuana	Discord		
	AA	Female	Marijuana	Abuse	Dependence	Discord	Marijuana use	Illegal drug use other than marijuana	Neighborhood crime and deterioration	Bayesian Posterior Probability
High Persistent	33.3%	11.1%	11.1%	50.0%	11.1%	7.50 (2.77)	2.00 (0.91)	1.33 (0.91)	13.67 (4.33)	0.96 (0.08)
Moderate Persistent	54.4%	28.9%	11.1%	34.4%	7.8%	7.42 (3.46)	2.08 (0.88)	0.96 (0.90)	13.65 (4.65)	0.86 (0.16)
Decreasing	47.1%	23.5%	0.0%	26.5%	11.8%	7.35 (2.89)	1.62 (1.07)	0.94 (1.04)	13.38 (4.42)	0.86 (0.18)
No/Low	55.9%	66.4%	3.2%	10.3%	1.9%	6.55 (2.89)	1.30 (0.98)	0.44 (0.71)	11.90 (4.70)	0.97 (0.09)
Study Population	54.9%	59.4%	4.1%	14.4%	3.1%	6.70 (2.96)	1.41 (1.00)	0.53 (0.78)	12.19 (4.71)	NA
Comparison P-Value	.21	<.001	<.001	<.001	<.001	.02	<.001	<.001	<.01	NA

Note

1. The number of participants in the high persistent offender group=18, moderate persistent group=90, decreasing group=34, no/low group=696.
2. The cells without a % sign represent means.
3. Answer options for violence toward others (5-item scale) for each item; never (1), once (2), twice (3), 3 or 4 times (4), 5 times or more (5).
4. Answer options for discord (5-item scale) for each item; never (0), less than once or twice a week (1), once or twice a week (2), several times a week (3), almost every day (4).
5. Answer options for peer marijuana use (single item) and peer illegal drug use other than marijuana; none (0), a few (1), some (2), most (3).
6. Answer options for neighborhood crime and deterioration (5-item scale) for each item; not at all true (1), not very true (2), sort of true (3), very true (4).
7. We used T4 (mean age of 29) as the sampling base. Among T4 participants (N=838), there are 838 participants who participated in the longitudinal study at least twice from 1990 (T1) onwards. Among T4 participants, 71% participated in at least 3 points.
8. The comparison test was the 4x2 chi-squared test of independence for variables labeled with “%.” Otherwise, the comparison test was the F test from the one-way analysis of variance.

**Table 3** Adjusted Odds Ratios (Confidence Intervals) or Regression Coefficients (Confidence Intervals) for Membership in Trajectory of Delinquent Behavior to Predict Problems with Substance Use, Violent Behavior, Partner Relations, Peer Functioning, and Neighborhood Characteristics at T4.

Delinquent Behavior Trajectory Group (Independent Variable)	Dependent variables									
	Odds ratios			Regression coefficients				Neighborhood characteristics		
	Substance use			Violent behavior	Partner relations	Peer characteristics		Neighborhood characteristics		
	Marijuana Abuse	Dependence	Dependence on illegal drugs other than marijuana	Violence toward others	Discord	Marijuana use	Illegal drug use other than marijuana	Neighborhood crime and deterioration		
High Persistent Vs. No/Low	3.86 (1.29, 11.55)	3.13 (1.05, 9.37)	4.90 (0.88, 27.19)	6.22 (4.97, 7.47)	1.56 (0.12, 3.00)	0.08 (-0.38, 0.54)	0.66 (0.29, 1.03)	1.45 (-0.86, 3.76)		
<i>p</i> value	.02	.04	.07	<.001	.03	.73	<.001	.22		
Moderate Persistent Vs. No/Low	3.94 (2.06, 7.51)	2.54 (1.31, 4.91)	4.60 (1.46, 14.48)	3.16 (2.51, 3.81)	1.66 (0.92, 2.41)	0.49 (0.25, 0.73)	0.55 (0.36, 0.74)	2.16 (0.96, 3.12)		
<i>p</i> value	<.001	<.01	<.01	<.001	<.001	<.001	<.001	<.001		
Decreasing Vs. No/Low	1.83 (0.66, 5.04)	2.25 (0.85, 5.97)	7.44 (1.86, 29.76)	0.65 (-0.35, 1.65)	1.18 (0.03, 2.33)	-0.01 (-0.37, 0.35)	0.34 (0.05, 0.63)	1.29 (-0.55, 3.12)		
<i>p</i> value	.24	.10	<.01	.20	.04	.95	.02	.17		

Note

- <sup>1</sup>Each analysis was controlled for gender and ethnicity. The outcomes in the substance use domain had an additional control variable of marijuana or other illegal drug use at T2. Peer marijuana use and peer other illegal drug use at T4 also had an additional control variable of peer marijuana use or peer other illegal drug use at T2, respectively.
- <sup>2</sup>The number of participants in the high persistent group=18, moderate persistent group=90, decreasing group=34, no/low group=696.
- <sup>3</sup>We used T4 (mean age of 29) as the sampling base. Among T4 participants (N=838), there are 838 participants who participated in the longitudinal study at least twice from 1990 (T1) onwards. Among T4 participants, 71% participated in at least 3 points.