Article

Trajectories and Risk Factors of Criminal Behavior among Females from Adolescence to Early Adulthood

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Abstract: Previous research suggests that social environmental and individual-level factors influence adolescent development and behavior over time. However, little attention has been devoted to examining how risk factors (*i.e.*, parental support, peer delinquency, self-control) affect trajectories of criminal behavior among female adolescents. Utilizing data from the National Longitudinal Study of Adolescent Health (n = 5138 females) and latent class analysis, three offending trajectories among females from late adolescence to early adulthood were identified: late escalators, late de-escalators, and stable low/abstainers. Next, the influence of social environmental and individual-level factors during adolescence (Wave 1) on these trajectories was assessed. Results identified key differences in the risk factors related to group placement. The implications of the findings for prevention and treatment services targeting adolescent females, and directions for future research, are discussed.

1. Introduction

It is well documented that the proportion of girls involved in the juvenile justice system has steadily increased over the past two decades. For example, from 1992 to 2011, the proportion of juvenile

arrests that were girls increased from 23% to 29% [1,2]. In response to these increases, federal and local initiatives, policy recommendations, and a range of funding opportunities have been created to address the needs of adolescent female offenders. For example, the Office of Juvenile Justice Delinquency Prevention (OJJDP) has devoted funding to prevention and intervention services designed specifically for girls since the late 1990s [3]. Along with these initiatives, a growing body of research has evolved that has examined gender differences in justice system involvement, theoretical explanations of delinquency, responsiveness to treatment, and equitable juvenile justice decision-making. Overall, this body of research suggests that specialized approaches to understanding, preventing, and responding to juvenile delinquency are warranted due to differences in boys' and girls' developmental experiences [4].

However, as Johanssan and Kempf-Leonard argued, "…the research about female risk factors for general delinquency, as well as research addressing girls' serious, violent, and chronic offending, has been insufficient" ([5], p. 217). One area where this argument applies is research devoted to understanding the developmental pathways of criminal behavior among adolescent girls. Therefore, using a large sample of female adolescents, this study seeks to expand the body of research on female offending by examining how individual-level risk and protective factors influence the development of different trajectories of offending throughout adolescence and early adulthood. Identifying the risk and protective factors associated with different trajectories of offending among females, specifically, will assist in the development of gender-specific prevention and intervention programs that are able to: (a) meet the needs of adolescent girls that are at risk for persistent offending; (b) ensure appropriate allocation of prevention resources so that agencies' treatment budgets are going towards programs that are able to meet the unique needs of adolescent girls (as well as boys); and (c) reduce costly justice system involvement, persistent criminal behavior, social instability, and poor outcomes among girls at-risk for delinquent behavior [6,7].

2. Trajectories of Criminal Behavior

In recent years, a large number of group-based trajectory studies have been conducted to describe the development and continuity of antisocial and delinquent behavior [8–10]. For example, in Moffitt's landmark study, she identified two trajectories of adolescent offending [11]. Life-course persistent offenders displayed an early onset of offending and continued to engage in criminal behavior throughout the life course. Adolescent-limited offenders engaged in delinquency during adolescence, but desisted as they got older. Moffitt also identified different risk factors for placement into each group [11]. Early onset of delinquent behavior, neuropsychological defects, and deprived family environments were important risk factors among the life-course persisters. Among adolescent-limited offenders, the imitation of delinquent peers was the strongest risk factor. More recently, a number of studies have identified more than two groups of offenders, providing support for Moffitt's concept of life-course persisters, while identifying greater diversity in offending trajectories [12]. For example, using data on boys and girls involved in the Seattle Social Development Project, Chung *et al.* identified five groups of offending trajectories: non-offenders, late onsetters, desisters, escalators, and chronic offenders [13]. Similarly, Fergusson and Horwood also identified five groups of offending trajectories using a New Zealand sample of children (boys and girls) that were followed from birth to

age 21. These groups included low-risk, early onset, intermediate onset, late onset, and chronic offenders [14]. More recently, Jennings and Reingle conducted a meta-analysis of 105 empirical studies that examined the number and shape of group-based trajectories of delinquency, violence, and aggression [15]. The 105 studies included samples of boys only, girls only, but consisted mostly of samples of boys and girls. Across these studies, 2–7 trajectory groups were identified with the majority identifying three or four groups. The number of trajectory groups identified in each study varied based on factors such as geographical location, sample, measurement, and length of observation.

Indeed, when studies rely on samples of both boys and girls, girls can be found in the same trajectories as boys [14–16]. However, gender differences in the level and duration of criminal behavior within offending trajectories are commonly identified [8,14,17–19]. For example, Pepler, Jiang, Craig and Connolly analyzed developmental trajectories of delinquency among adolescent girls and boys [20]. Adolescents were characterized into five different classes: low, moderate, late onset, early onset, and chronic. When compared within classes, girls differed from boys in their levels of delinquency. Girls in the "late onset" group displayed higher levels of delinquency after the age of 15 whereas girls in the "early onset" group tended to desist from delinquency sooner than their male counterparts and girls in the "moderate" group displayed higher levels of delinquency in early adolescence and peaked sooner than boys. Using data from the Philadelphia Collaborative Perinatal Project (CPP), Piquero and Chung found that once relevant controls (*i.e.,* income, family structure, WISC, mother's age at child birth, and disciplinary codes) were introduced in their study, the early onset and seriousness of offending relationship disappeared among the girls (but not the boys), leaving only a female late-onset group [21]. Using data from the National Longitudinal Study of Youth, Murphy, Brecht, Huang, and Herbeck found that age at which trajectories changed varied by gender with females in the "decreased" group declining at an earlier age [22].

In addition, research that has examined gender-specific trajectories has also identified important differences in the number and shape of offending trajectories [23,24]. Zheng and Cleveland (2013) examined gender differences in the development of violent and nonviolent delinquent behavior from ages 12–22 [25]. Females were categorized into three classes: low (60%), desister (30%), and decliner (11%). Males were categorized into four different classes: low (50%), desister (25%), chronic (13%), and decliner (12%). Males in the "desister" class reported more violent than nonviolent delinquency and more overall delinquency than their female counterparts. Also, males in the "decliner" class reported nonviolent and violent delinquency; while females primarily reported nonviolent behavior. Finally, the "chronic" class was gender-specific applying only to males.

In sum, previous studies based on boys and girls have documented important gender differences in the characteristics of offending over time, including the frequency of offending over time, age of onset, and patterns of desistence and persistence [12,22,25,26]. However, there is a lack of studies that are dedicated to the examination of female offending from adolescence to early adulthood. Given the recent increase in girls' involvement in the juvenile justice system, additional research is needed to fully understand the nature of offending trajectories among girls so that effective gender-responsive prevention and intervention programs can be developed. Therefore, the first goal of the current study is to examine offending trajectories from adolescence to early adulthood among a nationally representative sample of female adolescents.

Given the lack of research that has been devoted to studying offending trajectories among samples of female adolescents, there is also scant research on the risk and protective factors related to different delinquent pathways among girls. Research on the risk and protective factors related to general delinquency suggests that boys and girls share common risk factors such as parental responsiveness and acceptance, having delinquent peers, low school commitment, low self-control, low self-esteem, and abuse [27–30]. However, research also shows that certain risk factors for offending have a greater influence on girls compared to boys (and *vice versa*) [18]. For example, parenting practices have been shown to have a stronger effect on criminal behavior for girls compared to boys [27,30,31] while males have been found to be more susceptible to peer influences [7,29,32,33]. Individual-level risk factors such as low self-control, impulsivity, and early aggression have also been found to be stronger predictors of criminal behavior for boys [29,34–36], whereas mental health problems and suicide ideation are more prevalent among female offenders [30,37]. Studies examining gender differences in the impact of low self-esteem on delinquent behavior are mixed [38,39].

Yet, how these factors influence different developmental pathways of offending among female adolescents, including persistence and desistance, is not well understood. Only a handful of studies have examined the risk and protective factors associated with different trajectories of criminal behavior across gender [22,40–42] and these results are rather inconsistent. Based on previous research that has identified differences in the factors related to different offending trajectories among samples of boys and girls [12,18,20,24] as well as the extant body of research that documents gender differences in the risk and protective factors related to general delinquency [30–32], additional research is needed to fully understand the risk and protective factors related to different patterns of offending among female adolescents. This information is critical to developing prevention programs that are able to target the unique risk factors related to different "types" or patterns of offending among female adolescents. Therefore, the second goal of the current study is to examine the female-specific risk and protective factors, measured during mid-adolescence (Wave 1), related to different patterns of offending from adolescence through early adulthood.

In sum, the majority of studies on trajectories of adolescent offending involve samples of boys and girls [8,12–14,20,21]. This is a limitation to the current body of research on offending trajectories because a number of studies have revealed important gender differences in the characteristics of offender trajectories (length of offending, number of different pathways, proportion of individuals that fall within each trajectory), risk and protective factors related to juvenile delinquency, and responsiveness to intervention programs [13,17,33,43]. Due to these differences, the lack of research that focuses specifically on patterns of female offending during adolescence has led to limited knowledge about the factors that predict different offending trajectories among girls [44,45].

3. Current Study

In general, the current study seeks to add to the growing body of research on female offending. Specifically, the goals of the current study are to:

1. Identify different trajectories of offending from adolescence through early adulthood among a large, representative sample of female adolescents;

2. Identify the risk and protective factors that are related to membership in each trajectory during adolescence.

3.1. Methods

Data from the National Longitudinal Study of Adolescent Health (Add Health), a nationally representative study of more than 20,000 adolescents, was used in the current study. Add Health used a multi-stage stratified sampling design to select study respondents from 132 middle and high schools from 80 communities across the United States. The first wave was collected in 1994–1995 when the study respondents were in grades 7–12 (for details on the design of the Add Health data, please see [46]). To date, four waves of data have been collected. Wave 1 interviews were conducted in 1995, Wave 2 interviews were conducted in 1996, Wave 3 interviews were conducted from 2000 to 2001, and Wave 4 interviews were conducted from 2008 to 2009 [1]. Across the four waves, the broader Add Health study has included a number of data collection programs including in-school surveys, parent surveys, school administrator surveys, and in-home interviews. The current study uses data from female respondents that participated in all four waves of the in-home interview.

Given the complexity of the Add Health study design, sampling weights were applied to yield national population estimates. Therefore, cases that were missing valid Wave 4 weight components were excluded from the analyses (n = 380, 6.9% of the respondents that were under the age of 18) (see [47]). These exclusions yielded a final sample size of 5138 females that were involved in all four waves of the in-home interviews. The average age of the female sample was 15.2 (SD = 1.6) at Wave 1, 16.08 (SD = 1.6) at Wave 2, 21.5 (SD = 1.6) at Wave 3, and 28.1 (SD = 1.6) at Wave 4. Sixty-four percent of the girls included in the sample were White, 23% were Black, 6% were Asian, and 7% were an "other" race.

3.1.1. Variables [2]

Criminal Behavior. Criminal behavior was measured using 10 self-reported behaviors. The selection of the items was based on the inclusion of the behavior in all four waves of data collection. The 10 items included past year involvement in violence, property crime, and public disorder offenses. The five violence-related items asked respondents how many times in the past year they had gotten into a serious physical fight, hurt someone so badly they needed medical care, took part in a group fight, pulled a knife or gun on someone, and used a weapon to steal something. Property crime offenses included how many times in the past year respondents reported going into a house or building to steal something, stealing something worth more than $50, and stealing something worth less than $50. Additional items included how many times in the past year respondents sold marijuana or other drugs and deliberately damaged property that belonged to another person. All 10 items were originally coded on an ordinal scale ranging from never (=0) to five or more times (=3). Due to the low number of females that reported frequent engagement in each of the behaviors, all 10 items were recoded into

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[1] Response rates for each wave ranged from 77% to 89%.

[2] See Harris *et al.* for a detailed description of each of the study variables [46].

dichotomous indicators representing never (=0) and one or more times in the past year (=1). The means and standard deviations for each of the dichotomized offenses are reported in Table 1.

Table 1. Means and standard deviations for the offense items.

	Wave 1	Wave 2	Wave 3	Wave 4
	Mean (SD)			
Serious physical fight *	0.24 (0.42)	0.13 (0.34)	-	0.12 (0.15)
Hurt someone	0.11 (0.31)	0.04 (0.20)	0.02 (0.15)	0.01 (0.07)
Group fight	0.17 (0.38)	0.14 (0.34)	0.03 (0.18)	0.01 (0.11)
Pulled a knife/weapon out	0.02 (0.15)	0.02 (0.14)	0.01 (0.07)	0.01 (0.11)
Weapon to steal	0.03 (0.17)	0.02 (0.14)	0.01 (0.09)	0.01 (0.06)
Burglary	0.03 (0.18)	0.03 (0.16)	0.01 (0.10)	0.01 (0.06)
Stole something worth more than $50	0.03 (0.18)	0.03 (0.17)	0.02 (0.14)	0.01 (0.10)
Stole something worth less than $50	0.17 (0.36)	0.14 (0.35)	0.05 (0.22)	0.02 (0.15)
Sold drugs	0.04 (0.20)	0.04 (0.19)	0.04 (0.19)	0.02 (0.14)
Deliberately damaged property	0.13 (0.33)	0.09 (0.29)	0.05 (0.21)	0.02 (0.15)

Note: *The Wave 3 interview did not include a measure of past year involvement in a serious physical fight.

At each wave, the 10 items were summated into one overall general offending index ranging from 0 to 10 [3]. The average for the offending index at Wave 1 was 0.98 (SD = 1.49, factor loadings ranged from 0.48 to 0.58, alpha = 0.70), the average at Wave 2 was 0.67 (SD = 1.26, factor loadings ranged from 0.30 to 0.66, alpha = 0.68), the average at Wave 3 was 0.23 (SD = 0.69, factor loadings ranged from 0.30 to 0.67, alpha = 0.60), and the average at Wave 4 was 0.16 (SD = 0.54, factor loadings ranged from 0.30 to 0.60, alpha = 0.58) [4]. As can be seen, among the females included in the sample, the average level as well as the variation in offending revealed a linear decline across the four waves of data collection. The risk factors used to predict criminal behavior are discussed below. All of these risk factors were measured at Wave 1 of the in-home interview.

Parental Involvement. Parental involvement was measured using 10 items, five items referred to the mother figure (e.g., step mother, adoptive mother, foster mother) and five items referred to the father figure [8,49]. These items asked respondents if they had participated in the following activities with their mother/father figure in the last four weeks: gone shopping, played a sport, attended a religious service, worked on a school project, and gone to a movie, play, museum, concert, or sporting event. Responses were dichotomous representing that they had participated in the activity (=1) or had not participated in the activity (=0). If a respondent reported living with both a mother and father figure, the average of the 10 items was used. If a respondent reported living with only a mother-figure or only

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[3] The Wave 3 interview did not include a measure of past year involvement in a serious physical fight. Therefore, the wave 3 index ranged from 0 to 9.

[4] There were no significant differences in the four delinquency indices across the females included in the sample and those excluded (due to not participating in all four waves of data or having invalid sampling weights). In addition, the original Add Health investigators concluded that the bias due to nonresponse was small in magnitude. For the delinquency and violence indices specifically, they concluded that the bias was not significantly different from zero [48].

a father-figure, the sum of the five items was used (factor loadings for the father ranged from 0.98 to 1.0 and factor loadings for the mother figure ranged from 0.96 to 0.98, alpha = 0.89).

Parental Attachment. Parental attachment was measured using 10 items, five of which referred to the mother figure and five that referred to the father figure [49,50]. These items asked each respondent how he or she felt about their mother/father figure including whether the mother/father figure was warming and loving, if the respondent was satisfied with communication, and if he or she was satisfied with the overall relationship. Responses were dichotomous representing that they agreed with the statement (=1) or did not agree (=0). If a respondent reported living with both a mother and father figure, the average of the 10 items was used. If a respondent reported living with only a mother-figure or only a father-figure, the sum of the five items used (factor loadings for the father ranged from 0.47 to 0.61 and factor loadings for the mother figure ranged from 0.51 to 0.80, alpha = 0.88).

Parental Control. Parental control was measured using seven items that asked about respondents' freedom to make their own decisions about curfew on weekend nights, people they could hang around, what to wear, how much television to watch, what types of television programs to watch, what time to go to bed on week nights, and what to eat [49]. Each item was coded as a dichotomous variable. These seven items were summed to create an overall parental control scale (factor loadings ranged from 0.47 to 0.73, alpha = 0.78).

School Attachment. School attachment was measured using five items asking respondents if they felt close to people at their school, part of the school, happy to be at school, teachers treated them fairly, and safe at school [51,52]. These items were coded on an ordinal scale ranging from strongly agree (=1) to strongly disagree (=5). All five items were reverse coded and summed to create an overall school attachment index (factor loadings ranged from 0.72 to 0.86, alpha = 0.86).

Peer Substance Use. Similar to previous studies using the in-home interviews, peer substance use was used as a proxy for peer misbehavior [53–55]. Peer substance use was measured using three items that asked respondents about the substance use activities of their three best friends. Specifically, these items asked respondents to report how many of their three best friends smoked at least one cigarette a day, drank alcohol at least once a month, and used marijuana at least once a month. All three items were summed to create an overall peer substance use scale (factor loadings ranged from 0.81 to 0.85, alpha = 0.76).

Substance Abuse [5]. Substance abuse was measured using four separate items. The first measure asked respondents how many days, in the past 30 days, each respondent smoked at least one cigarette. The second measure asked "during the past 12 months, how many days have you gotten drunk or very high on alcohol". Responses were coded into five categories ranging from never to at least once per week. The third item measured the number of times each respondent reported using marijuana in the past 30 days. The final item measured the use of other, more serious forms of drug use. Three items

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[5] We chose to include substance use as a predictor of delinquent trajectories instead of a form of delinquent behavior for many reasons. Indeed, both substance use and delinquent behavior are forms of deviant behavior. However, there are also important differences in the characteristics of substance use and delinquent behavior that suggest that these behaviors are conceptually distinct. A number of studies have found substance use and delinquent behavior to be distinct dimensions of deviant or risk-taking behavior [56,57]. Since the goal of this study was to examine trajectories of delinquent behavior among girls over time, we felt that is was necessary to include substance use as a risk factor for delinquent behavior, rather than a form of delinquent behavior itself.

which asked respondents, how many times, in the past 30 days, they used inhalants, cocaine, or "other" drugs were used to measure use of more serious forms of drug use. Due to the low number of respondents that reported use, these items were summed and then dichotomized to represent never using other, more serious forms of substances (=0) or using other, more serious forms of substances one or more times in the past 30 days (=1).

Self-control. Following previous research using the Add Health data, we measured self-control using a behavioral measure that included 5 items which pertained to behavior at school [58,59]. These questions asked how often each respondent had trouble getting along with teachers, paying attention in school, getting homework done, getting along with other students, and keeping focused. Responses were measured on an ordinal scale ranging from never (=0) to everyday (=4). These five items were summed to create an overall proxy measure for self-control (factor loadings ranged from 0.56 to 0.80, alpha = 0.70). Higher values represent lower levels of self-control.

Depression. Depression was measured using a modified version of the Center for Epidemiological Studies-Depression Scale (CES-D), which is commonly used to measure depression in adolescents using the Add Health Data [60–62]. Seventeen items which asked respondents about their emotional status in the past week were included. Responses ranged from never or rarely (=0) experiencing these feeling to most of the time or all the time (=3). Some of these items included, having felt "fearful", "lonely", "sad", "felt people disliked you", and "felt as though you could not shake off the blues". These 17 items were summed to create an overall measure of depression (factor loadings ranged from 0.38 to 0.79, alpha = 0.87).

Self-esteem. Self-esteem was measured using three items which asked respondents about their feelings about oneself [52]. These items asked whether the respondent felt they had a lot of good qualities, liked themselves the way they were, and whether they felt loved and wanted. The three items were summed to create an overall self-esteem scale (factor loadings ranged from 0.80 to 0.88, alpha = 0.78).

3.1.2. Analysis

The analyses proceeded in several steps. First, bivariate correlations among the four self-reported offending indices were examined. Next, a series of latent class models (LCA) were performed to identify the best fitting model [6]. LCA estimates a model that extracts latent "classes" or categories based on patterns in observed indicators. The patterns are hypothesized to be related to some underlying unobserved factor (*i.e.*, trajectory) rather than being causally related [63]. Thus, based on the offending indices at each wave, identifiable "classes" or trajectories of criminal behavior were extracted [7].

The issue of class enumeration in mixture modeling remains unresolved. Therefore, the reliance on multiple criteria and theory to aid in selecting the appropriate number of classes is recommended [64]. The criteria used to determine the best-fitting model were the classification table based on class

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[6] Growth mixture models and latent class growth analyses were considered, but due to the low levels of delinquency found at each of the four waves, the low number of time points available, and the complex nature of measuring growth over time, a parsimonious LCA model was chosen.

[7] Missing delinquency data ranged from 0.8% in Wave 1 to 10% in Wave 4. All study participants had at least one wave of valid delinquency data. Mplus uses full information maximum likelihood to estimate the latent classes based on available information.

probabilities for the most likely latent class membership, the entropy score, the Bayesian information criterion (BIC), the Lo-Mendell Rubin (LMR), and the Lo-Mendell-Rubin adjusted likelihood ratio test (LRT) [64,65]. For the classification table, high diagonal values and low off-diagonal values indicate good classification quality. The values of entropy range from 0 to 1, with scores close to 1 indicating clear classifications [66]. For LMR and LRT, a significant p-value indicates that the specified model (with k classes) fits significantly better than a model with one less class (k-1). Furthermore, the substantive meaning of the classes was also considered. All latent class analyses were conducted in Mplus 6.0 using maximum likelihood estimation. Also, complex survey commands (*i.e.*, weighting) were used to account for the complexity of the Add Health survey design [47,67].

Once the most appropriate LCA model was selected, the posterior probabilities for most likely class membership were used to examine differences in the risk and protective factors (measured at Wave 1) that were related to each class. Independent analyses of variance (ANOVA) and chi-square tests of significance (χ^2) were used to examine the bivariate relationship between each of the risk/protective factors and class membership. Finally, the factors that were significantly related to class membership at the bivariate level were entered into a multinomial logistic regression model to identify which factors (at Wave 1), controlling for age and race, predicted latent class membership [8]. Specifically, the relative risk ratios (RRR) were used to identify significant relationships. All bivariate and multivariate models were conducted in Stata 13.0 using survey commands to account for the complexity of the Add Health study design [9].

3.2. Results

Table 2 provides the bivariate correlations among the four offending indices. Correlations ranged from 0.17 to 0.54 and were positive and significant ($p < 0.01$). Wave 1 offending and Wave 2 offending showed the strongest correlations and Wave 1 offending and Wave 4 offending showed the weakest correlation.

Table 2. Correlations among self-reported offending at Waves 1–4 *.

	Wave 1	**Wave 2**	**Wave 3**	**Wave 4**
Wave 1	-	-	-	-
Wave 2	0.54	-	-	-
Wave 3	0.19	0.22	-	-
Wave 4	0.17	0.19	0.26	-

Note: * All correlations were significant ($p < 0.01$).

The next step of the analyses involved comparing a number of latent class models to identify the best-fitting model. These results are presented in Table 3. As can be seen, the three-class solution was the best fitting model across all of the model fit indices. There was a significant decline in the BIC and

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[8] Age and race were included as control variables. Age was a continuous variable representing age at the time of the Wave 1 interview. The average age at Wave 1 was 15.2 (SD = 1.6). Race was a categorical variable coded as White (64%), Black (23%), and Other (13%).

[9] The correlations among the risk and protective factors ranged from −0.08 to 0.52 and all variation inflation factors were less than 2.0.

log likelihood, entropy was close to 1, and the LMR and LRT were significant suggesting that the two-class model can be rejected in favor of the three-class model. The results of the three-class LCA model are depicted in Figure 1.

Table 3. Model Fit Indices for the Latent Class Analyses (n = 5138).

	BIC	Log Likelihood	Entropy	LMR	LRT	Average Latent ClassProbabilities
2-Classes	49262.86	−24575.89	0.98	4435.82 ($p = 0.40$)	4334.36 ($p = 0.40$)	1.00, 0.95
3-Classes	45833.20	−21896.54	0.99	3472.38 ($p = 0.02$)	3392.96 ($p = 0.02$)	1.00, 0.99, 0.99
4-Classes	40083.29	−19943.39	0.98	5189.53 ($p = 0.68$)	5070.84 ($p = 0.68$)	0.91, 0.99, 0.99, 0.99

Figure 1. Offending trajectories of the three latent classes (n = 5138).
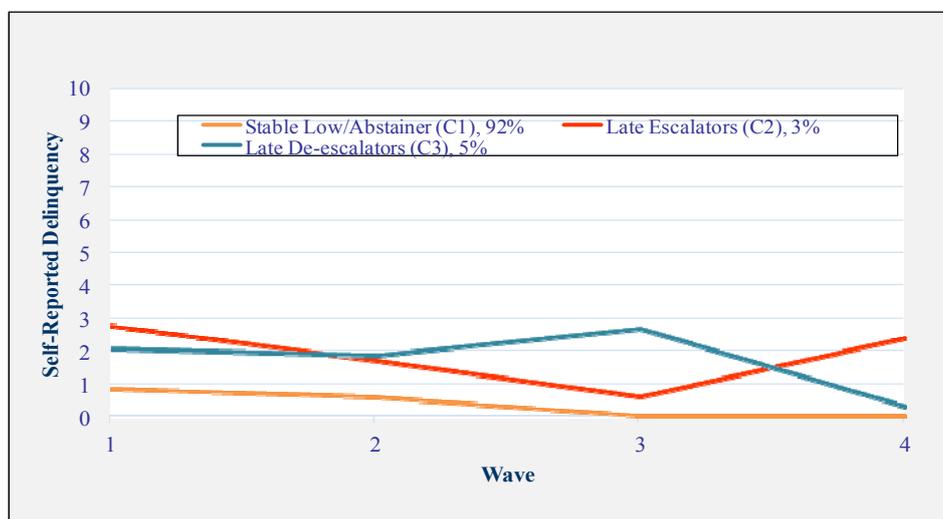
The first class, labeled "stable low/abstainers" accounted for the majority of the sample (92%). The girls in this group reported no to very low levels of criminal behavior across the four time points. The average level of offending ranged from 0.88 (SE = 0.03) at Wave 1 to 0.06 (SE = 0.01) at Wave 4. The second group, labeled "late escalators" accounted for 3% of the sample. The girls in this group reported the highest levels of criminal behavior at Wave 1 and steadily declined during Waves 2 and 3 but increased their criminal behavior at Wave 4 (Wave 1 mean = 2.80, SE = 0.22; Wave 2 mean = 1.71, SE = 0.23; Wave 3 mean = 0.66, SE = 0.11; Wave 4 mean = 2.52, SE = 0.08). The third group, labeled "late de-escalators" accounted for 5% of the sample. Girls in this group reported the highest average levels of criminal behavior at Wave 3 but showed a significant decline in criminal behavior at Wave 4 (Wave 1 mean = 2.09, SE = 0.12; Wave 2 mean = 1.89, SE = 0.12; Wave 3 mean = 2.72, SE = 0.02; Wave 4 mean = 0.37, SE = 0.01). Importantly, although there are meaningful differences in offending patterns across the groups, it is clear that none of the groups were characterized by a "high" or "chronic" pattern of criminal behavior. In fact, all three groups showed relatively low levels of criminal behavior across the four time points.

The next step in the analyses sought to identify which factors, measured at Wave 1, predicted group membership. Bivariate analyses, examining the relationship between group membership and each individual risk/protective factor, are presented in Table 4. Compared to the "late escalators", the "stable low/abstainers" showed significantly higher levels of parental involvement, self-control, and attachment to school and significantly lower levels of depression, peer substance use, marijuana use, cigarette use, frequency of getting drunk, and "other" drug use. Compared to the "late de-escalators", the "stable low/abstainers" reported significantly higher levels of self-control, self-esteem, and attachment to school and significantly lower levels of depression, parental attachment, and marijuana use. Compared to the "late-escalators", the "late de-escalators" reported significantly higher levels of parental involvement and significantly lower levels of depression, peer substance use, and cigarette use. Parental control and truancy did not significantly differ across the latent classes. Therefore, these two factors were not included in the multinomial logistic regression models.

Table 4. Bivariate analyses of the risk/protective factors and latent class trajectory.

	Mean (SD)	Mean (SD)	Mean (SD)
	C1	*C2*	*C3*
	Stable Low/Abstainers	*Late Escalators*	*Late De-Escalators*
Self-Control [a,b]	4.61 (3.17)	5.91 (3.54)	5.83 (3.32)
Depression [a,b,c]	10.50 (7.17)	14.02 (8.43)	11.98 (8.07)
Self-Esteem [b]	5.31 (1.82)	5.27 (1.98)	5.57 (2.03)
Parental Attachment [b]	14.85 (1.81)	15.11 (1.83)	15.14 (1.84)
Parental Involvement [a,c]	1.51 (1.02)	1.29 (0.92)	1.60 (1.06)
Parental Control	4.98 (1.66)	4.98 (1.74)	4.95 (1.64)
Peer Substance Use [a,c]	2.24 (2.52)	3.15 (2.77)	2.50 (2.70)
Marijuana Use [a,b]	0.82 (4.79)	2.50 (9.75)	2.15 (9.67)
Cigarette Use [a,c]	3.70 (8.96)	6.82 (11.52)	4.47 (9.21)
School Attachment [a,b]	18.10 (4.81)	17.32 (4.90)	17.43 (5.16)
Truancy	8.72 (13.24)	10.10 (16.05)	6.63 (6.99)
	Percentage	Percentage	Percentage
Frequency of Getting Drunk [a]			
Never	76.6%	58.8%	69.6%
1–2 times	11.7%	19.4%	14.3%
Less than once a month	4.9%	10.3%	6.3%
Two or more times per month	3.8%	5.5%	5.5%
At least once per week	3.1%	6.1%	4.2%
Use of Other Drugs [a]			
No	96.1%	90.9%	89.7%
Yes	3.9%	9.1%	10.3%

Notes: [a] Significant differences between the stable low/abstainers group and the late escalator group ($p < 0.05$); [b] Significant differences between the stable low/abstainers group and the de-escalator group ($p < 0.05$); [c] Significant differences between the escalator group and the de-escalator group ($p < 0.05$).

The results of the multinomial logistic regression, controlling for age and race, are presented in Table 5. Each column in the table represents a comparison of two of three groups. Compared to the "stable low/abstainers", the "late escalators" were significantly more likely to report higher levels of

depression and lower levels of self-esteem at Wave 1. For example, a one unit increase in depression led to 1.1 higher odds of being in the "late-escalators" group compared to the "stable low/abstainers" group. Compared to the "stable low/abstainers", the "late de-escalators" reported lower levels of self-control, higher levels of parental involvement, and the use of other drugs. For instance, use of other, more serious forms of substances at Wave 1 led to 2.1 higher odds of being in the "late de-escalators" group compared to the "stable low/abstainers". Finally, compared to the "late escalators", the "late de-escalators" reported significantly lower levels of depression, significantly higher levels of self-esteem, and higher levels of parental involvement at Wave 1. For example, a one unit increase in self-esteem was associated with 1.2 higher odds of being in the "late de-escalators" group compared to the "late escalators" group. Overall, these results suggest that different risk/protective factors present during mid-adolescence were related to different offending trajectories from mid-adolescence to early adulthood.

Table 5. Multinomial logistic regression predicting latent class trajectory controlling for age and race (n = 4814) *.

	Stable Low/Abstainers → Late Escalators	Stable Low/Abstainers → Late De-Escalators	Late Escalators → Late De-Escalators
	RRR (CI)	RRR (CI)	RRR (CI)
Self-Control	1.03 (0.97–1.09)	1.09 (1.04–1.14) ***	1.06 (0.99–1.13)
Depression	1.06 (1.03–1.08) ***	1.00 (0.98–1.03)	0.95 (0.92–0.98) **
Self-Esteem	0.84 (0.76–0.93) **	1.01 (0.93–1.11)	1.21 (1.06–1.38) **
Parental Attachment	1.00 (0.92–1.10)	1.07 (0.99–1.16)	1.07 (0.95–1.21)
Parental Involvement	0.87 (0.73–1.03)	1.17 (1.02–1.37) *	1.35 (1.08–1.67) **
Peer Substance Use	1.02 (0.95–1.05)	1.01 (0.94–1.08)	0.99 (0.89–1.09)
Frequency of Getting Drunk	1.18 (1.00–1.39)	1.08 (0.91–1.27)	0.91 (0.73–1.14)
Marijuana Use	1.01 (0.99–1.07)	1.01 (0.99–1.03)	1.00 (0.98–1.03)
Cigarette Use	1.02 (1.00–1.04)	1.00 (0.98–1.02)	0.98 (0.96–1.01)
Use of Other Drugs	1.50 (0.80–2.83)	2.09 (1.22–3.57) **	1.40 (0.63–3.07)
School Attachment	1.00 (0.95–1.05)	1.00 (0.96–1.04)	1.00 (0.95–1.07)

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

4. Conclusions

The current study sought to identify different trajectories of offending and to identify the risk and protective factors related to these patterns among a sample of females from adolescence to early adulthood. Our results identified three distinct offending trajectories: "late de-escalators", "late escalators", and "stable low/abstainers". The "stable low/abstainers" reported very low levels of criminal behavior across the four time points. The "late de-escalators" showed moderate levels of criminal behavior across the first three time points but substantially decreased offending by the time they reached their late 20s (Wave 4). The "late escalators" showed a decline in criminal behavior in their early 20s (Wave 3) but then showed a marked increase in offending by their late 20s (Wave 4).

Interestingly, a group characterized by chronic and stable offending was not identified in the current analyses. This is an interesting finding because it is inconsistent with a large number of studies involving samples of boys [11,68] and boys and girls [13,14] that identify a relatively small group of chronic, persistent offenders. Thus, a subgroup of life-course persistent offenders was not identified among the girls included in our study. On the other hand, however, the "late de-escalators" may best represent Moffitt's adolescent-limited offenders given the decline in criminal behavior around age 22 (average age). To a certain degree, these findings align with previous trajectory studies that relied on representative samples of girls. A number of studies have also found support for an adolescence-limited group [69–71]. However, this group accounted for 5% of our sample of girls. In other, nationally representative samples of girls, this group has been found to comprise 10%–12% of the sample. Furthermore, a small handful of studies have also identified a delayed or adult-onset group of female offenders similar to the "late escalators" found in our study [19,72–74]. These studies have found that the percent of the female sample included in this group ranges from 4% to 24%. Only 3% of the girls in our sample were included in the "late escalators" group. However, unlike the findings of the current study, most studies that rely on nationally representative samples do find a small group of life-course persistent female offenders. In general, the findings of this study highlight the importance of studying trajectories of behavior among girls separately and the need for additional gender-specific research to fully understand onset, persistence, and desistance of offending among girls.

Important differences in the risk and protective factors related to each trajectory were also found. In early adolescence (Wave 1), individual-level factors such as depression and low self-esteem were found to be significant predictors of placement into the "late escalators" group. In contrast, both individual- and environmental-level factors were found to be related to placement in the "late de-escalators" group. Parental involvement was an important predictor of placement in the "late de-escalators" compared to the "late escalators" and self-control and use of other drugs were significantly higher among this group compared to the "stable low/abstainers". Thus, our findings suggest that different factors spanning both individual and environmental domains are related to different patterns of offending among female adolescents.

Overall, a number of similarities in the risk and protective factors found in other studies of boys and girls were identified as important predictors of criminal behavior among the girls included in the current sample (e.g., parental involvement, self-control). In particular, the importance of individual-level factors such as depression and self-esteem in predicting different "types" or patterns of offending is an important finding and is consistent with previous research that shows that adolescent girls' behavior is more susceptible to factors such as mental health, self-identity, and suicidal ideation compared to their male counterparts [75–77]. Nevertheless, in a review of 12 gender-specific programs for female juvenile offenders to find "what works", Foley found that many programs focused on risk factors such as substance abuse or interpersonal skills but did not focus on mental health problems [78]. As a result, Foley argued that gender-specific programs "could do more to incorporate risk factors that have more impact on the lives of females than males" ([78], p. 268). Taken together, it is clear that there is a need to incorporate components of mental health assessment and intervention, confidence-building, and life skills into prevention and intervention programs targeting at-risk adolescent females.

Given previous research that suggests that parental attachment and control are strong predictors of female delinquency [28,79], it is surprising that these variables were not found to be significant

protective factors against criminal behavior. It is also surprising that alcohol or marijuana use did not significantly predict group membership. A strong link between the use of alcohol and marijuana and delinquency among boys and girls has been documented for quite some time [80–82]. Similarly, the insignificant relationship between truancy and group membership was also unexpected. Truancy, and other forms of status offending, are considered primary risk factors for other, more serious forms of deviant behavior [83]. One possible reason for the insignificant findings regarding parental attachment, parental control, substance use, truancy, and school attachment is the low levels of offending found across all three trajectories. Since the variability in criminal behavior across the three groups was low, the ability to empirically distinguish between these groups is reduced.

A number of additional limitations to the current study should also be mentioned. First, the Add Health data were collected over 10 years ago. Since this time, there have been a number of shifts in trends of female offending, substance use, and family functioning. Therefore, future studies should seek to replicate this study using samples of adolescent females from more recent years. Also, due to the low levels of self-reported offending reported at each of the four waves, we dichotomized the offenses. As a result, our offense indices measured versatility, but did not account for variations in the severity or frequency of criminal behavior at each time point. The inclusion of this information may provide a more detailed picture of the characteristics of trajectories of criminal behavior among girls from adolescence to early adulthood. There are also a number of additional risk and protective factors that have been found to be predictive of girls' delinquency that were not included in the current study. These factors include developmental factors such as puberty and genetics [84], neighborhood context [18,85], and romantic relationships. For example, recent studies have suggested that romantic partners also play a key role in risk for adolescent girls' behavior [86]. Therefore, future research should examine the role of same-sex, mixed-sex, and romantic relationships on trajectories of criminal behavior among females as well as the impact of developmental and community-level factors.

Moreover, our analyses only accounted for risk and protective factors measured at Wave 1 which provides information about the factors that influenced initial placement into these groups. Certainly, understanding which factors relate to group placement during early adolescence is critical to furthering our understanding of female offending and preventing future behavior. However, it is also important to understand what factors influence changes in offending at different developmental stages. For example, identifying what factors led to the de-escalation of criminal behavior among the "de-escalators" and what factors led to the escalation of criminal behavior among the "escalators" is also critical information regarding continuity and change in behavior over time. Future research should seek to explore the risk and protective factors that are related to the continuity, escalation, and de-escalation of behavior across different developmental periods. Indeed, the impact of different risk and protective factors, such as parenting, peers, and personality characteristics, has the potential to change in direction and magnitude as one progresses through different developmental stages [87,88].

It is also important to bring attention to the issue of reification. Reification occurs when an abstract concept is treated as concrete or regarded as a real entity. Based on the current analyses, one cannot conclude that the trajectories found in the current analyses represent actual types of female offenders in the population. Instead, latent subgroups are used to provide a useful heuristic for representing the heterogeneity in observed items across a sample of the population. They are not assumed to be empirical realities. Therefore, our findings provide a representation of the variability in offending

among females in the current sample, but do not suggest that these trajectories are concrete realities that can be used to categorize female offenders. In addition, due to the low levels of criminal behavior found across the full sample, small latent subgroups, such as a chronic offending group, may get overlooked [89]. Thus, conclusions about the shape of offending trajectories among female adolescents based on the current findings should be made with caution. Given the small number of studies using female only samples, as well as the low variability found among the criminal behavior items, the findings of this study are meant to be preliminary and to serve as a basis for future research that can replicate and/or expand upon our findings.

Regardless of these limitations, the present study contributes to the growing body of research on female offending by identifying the risk and protective factors associated with criminal trajectories across adolescence to early adulthood. The advantages of the current study are the use of a large, representative sample and an entirely female sample. A number of previous studies have focused exclusively on clinical or adjudicated samples of girls. Although these studies provide a significant contribution to understanding the needs of adolescent offenders, these studies are only able to provide an accurate understanding of offending trajectories among high-risk offenders. Thus, they are less able to inform the development of early prevention or intervention strategies that can target delinquency prior to the onset of serious misbehavior. Often, girls that are already involved in clinical treatment or the juvenile justice system are exhibiting serious forms of problem behavior and therefore do not provide an accurate representation of criminal trajectories among the general female adolescent population. For example, studies based on clinical or adjudicated females typically find that the percent of the sample that falls into a "life-course persistent" group is relatively high and the percent of girls that fall into a "low-offending" group is relatively low or nonexistent [90,91]. In contrast, the findings of this study as well as other nationally representative studies of female offending found a much higher proportion of girls fell into lower-risk trajectories.

In sum, our findings underscore the importance of gender-specific programming that is able to address the unique developmental needs of female adolescents and highlight differences in the risk and protective factors related to different offending trajectories. Thus, it is clear that applying a "one shoe fits all" approach, both within and across gender subgroups, to the prevention and treatment of criminal behavior will not be effective due to the unique developmental needs of adolescents. The findings of our study also accentuate the need for additional research focusing specifically on the development and continuity of criminal behavior among female adolescents and how this information can be translated into gender-specific programming based on the unique needs of adolescent girls. As Foley acknowledged, a great deal of research is needed to understand the development and continuity of delinquency among adolescent females and to develop, implement, and evaluate programs that will positively impact the lives of adolescent girls [78]. Future research can build on the current study by relying on more recent samples of adolescent females and by examining how various risk and protective factors, including developmental and community-level factors, relate to changes in offending at different stages of development.

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Author Contributions

Julie M. Krupa was responsible for the development of the research question and the literature review. She also prepared the data for analysis and conducted preliminary analyses. Kristina K. Childs performed further analysis and interpreted the results. Both authors contributed equally to the writing, editing, and revising of the manuscript.

Abbreviations

Add Health: National Longitudinal Study of Adolescent Health;
LCA: Latent Class Analysis;
LMR: Lo-Mendall Rubin;
LRT: Lo-Mendall Rubin Likelihood Ratio Test;
SE: standard error;
SD: standard deviation;
RRR: relative risk ratio.

Conflicts of Interest

The authors declare no conflict of interest.

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