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**IDENTIFYING AND UNDERSTANDING PATTERNS OF NONVIOLENT  
DELINQUENCY AND VIOLENCE FROM ADOLESCENCE TO YOUNG  
ADULTHOOD USING LATENT CLASS ANALYSIS**

A Thesis in

Human Development and Family Studies

by

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## ABSTRACT

From the group-based perspective and using Latent Class Analysis (LCA), the current research used data drawn from a nationally representative sample to identify developmental trajectories of antisocial behavior from adolescence to young adulthood. This research investigated the impact of separately considering nonviolent delinquency and violence on the identification of different trajectories using early family, neighborhood and school variables. Using only violence as response variable, previous studies found four common classes, namely *never*, *desister*, *decliner*, and *chronic*. Using both nonviolent delinquency and violence as response variable, I found one more distinct class, *nonviolent desister*. The new class was only found among females. The decliner and chronic class were only found among males. Discussion and implications were provided.

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## Chapter 1. Literature Review

Despite the fact that non-fatal violent crimes have decreased markedly in the past decade, antisocial behavior, including both nonviolent delinquency and violence, remains an issue for youth (NAHIC, 2007). It is generally found that antisocial behaviors, those actions and attitudes that violate societal norms and personal or property rights of others (Burt & Neiderhiser, 2009) peak in adolescence and young adulthood and decrease thereafter into adulthood (Archer & Coyne, 2005; Lee et al., 2007). Antisocial behavior has both current and future life implications. For example, it is found that violent children and adolescents have worse school achievement, peer and family relationships, more anxiety, depression and lower self-esteem (Craig, 1998; Donnellan et al., 2000), and are more likely to continuously be violent later in adulthood, and may involve in future social maladjustment (Crick, 1996). Thus, much attention and efforts are devoted to exploring risky factors associated with adolescent antisocial behavior and seeking preventive or remeditative strategies to address them.

Most research in this area is based upon the individual-level perspective. This perspective assumes that the antisocial behavior of the population conforms to a continuous distribution function (e.g. normal distribution) (Nagin, 1999), and that individuals differ in their relative positions in this distribution. Methods corresponding to this perspective include hierarchical modeling and latent growth curve analysis. The general idea underlying these methods is that individuals differ in their initial levels and growth rates but they generally share the same developmental trajectory.

Conversely, the group-based perspective makes a different assumption, stating that there are relatively homogeneous groups of developmental trajectories in the population (Nagin &

Tremblay, 2005). Different groups might conform to different distributions and thus show distinct developmental characteristics. Methods incorporating this perspective include semiparametric mixture models (Roeder et al., 1999) and Latent Class Analysis (LCA) (Lanza et al., 2007; Collins & Lanza, 2009). The main goal in these methods, instead of finding individuals' relative positions in the entire population, is to find the group to which each individual belongs and the attributes associated with that group.

The group-based perspective is not a new idea but has made its debut appearance in the literature in the late 1980s' (Patterson et al., 1989). In Moffitt's (1993) classic typology of the development of antisocial behavior, she proposed adolescence-limited versus life-course persistent patterns of antisocial behavior. The former indicates that some individuals' antisocial behavior peaks during adolescence and young adulthood, and desists thereafter as indicated by the finding from the individual-level perspective. The latter indicates that some individuals, although a small proportion, follow a life-course pattern in that they consistently commit moderate to high level of antisocial behavior. This small group actually is responsible for most crime and conviction records.

The group-based perspective is gaining more and more attention over this decade partly because of its relatively loose methodological and reasonable theoretical assumption. In addition to the two patterns proposed by Moffitt (1993), more classes are identified by recent research. Most commonly four classes are found. These are the never/low class, chronic class, low desister class, and high desister class. Individuals in the never/low class generally never or seldom commit any antisocial behavior, whereas individuals in the chronic class continuously commit moderate or high level of antisocial behavior (Nagin & Tremblay, 2005). The low and high desister classes resemble the adolescent-limited pattern in that their antisocial behavior peak in

adolescence and decrease thereafter. The difference between these two classes is that the high desister class usually started their antisocial behavior at an earlier age, peaked higher and desisted in a later age compared with the low desister class (Nagin & Tremblay, 2005).

The exact number of classes found in a particular study, their corresponding meanings and prevalence depends on the sample age range studied, specific outcomes focused on and genders included. For example, using physical aggression as outcome, Nagin and Tremblay (1999) found the four classes mentioned above among a 6-15 years old Montreal males sample. In contrast, using violent delinquency as outcome, in another study they found five classes among a 13-17 years old sample, with the new class titled the rising class which shows an increased pattern (Nagin & Tremblay, 2002). Using convictions as outcome, Nagin (2005) found four classes, never class, adolescent limited class, low chronic class, and high chronic class in a 10-30 years old sample. The prevalence of the commonly found four classes also varies among studies. The low class typically varies between 14% and 36% and the chronic class varies between 4% and 20% across samples. The moderate declining class varies between 30% and 50%, whereas the high declining class varies between 25% and 50% (Nagin & Tremblay, 2005; Nagin & Tremblay, 2005a).

Another reason of the group-based perspective's growing popularity is that it has many applications in developmental science and implications in prevention science and policy making. For example, after identifying different developmental trajectories, researchers try to predict these trajectories using preceding variables. Using this technique, poor parenting has been consistently associated with greater likelihood of chronic class relative to never class membership (Nagin, 1999; Wiesner & Windle, 2004; Nagin & Tremblay, 2005). This association has important implications for prevention research. Moffitt (1993) stated that these two patterns

have different etiologies, in that the adolescence-limited pattern mainly is influenced temporarily by environmental factors, whereas the life-course persistent pattern is more attributed to the cumulative interaction between genetic prepositions or neuropsychological problems and criminogenic environment. Thus, differentiation of different developmental classes may suggest different prevention strategies. We might take these preceding variables which have significant influence on antisocial behavior development as possible targets or mediators in the prevention process and thus prevent severe developmental outcomes by targeting these mediators.

In addition to predicting trajectories, researchers also may use these identified trajectories to predict later outcomes in late adolescence or adulthood, including gang membership and conviction. For example, chronic class membership is associated with gang membership status and violence (Nagin & Tremblay, 1999; Haviland & Nagin, 2005). Thus, these methods have substantial implications for making policy in terms of juvenile jurisprudence and sentencing.

Although these methods have been productive, previous research taking the group-based perspectives has several limitations. The first limitation is that most previous research does not specifically address the difference between nonviolent delinquency and violence. Most research simply used the average score of nonviolent delinquency and violence, or more often, only used an averaged violence score, such as physical aggression and conviction (e.g. Nagin, 1999). However, it has been pointed out that aggressive versus nonaggressive antisocial behaviors may involve etiological distinctions and different expressions of genetic influences and environmental influences during development (Burt & Neiderhiser, 2009). Nonaggressive antisocial behavior, or nonviolent delinquency, such as shoplifting, drinking or smoking, may be relatively easier to commit than those more serious aggressive antisocial behavior or violence, such as taking part in gang fight. Thus, it is probable that some individuals might get involved into some minor

nonviolent delinquency but never escalate serious violence. This distinction suggests that it may be beneficial to separately consider the developmental trajectories of nonviolent delinquency and violence. Nonviolent delinquency and violence may contribute unique information in identifying antisocial behavior trajectories within the group-based framework.

A second limitation is that most previous research does not particularly address the gender issue in that analyses are fit to samples made up of males and females (e.g. Nagin & Tremblay, 2005). Some may argue that antisocial behaviors are phenonologically different for males and females and their levels differ as well. It is generally found out that males have higher level of antisocial behavior than females (NAHIC, 2007), and females are less likely than males to get involved into serious antisocial behavior but more likely to commit indirect aggression (Archer & Coyne, 2005). Thus it is probable that more females than males would belong to a class where they commit only minor nonviolent delinquency but little violence. It is also possible that more males than females belong to the chronic class where they continuously commit moderate or serious level of antisocial behavior. One recent study actually found that the same classes of antisocial behavior can be found for both genders before mid-adolescence but the measurement was variant across gender after mid-adolescence and thus implied possible different classes across gender (Odgers et al., 2008). Thus, it may be informative to separately run the same analysis for males and females.

The third limitation in the existing literature is that, although aiming to identify lifespan developmental trajectories, most previous research limited their sample range to late adolescence (around 16 years old) (e.g. Nagin & Tremblay, 2005a). This may partly be attributed to available data. However, it would provide more confidence when talking about developmental trajectories,

especially when we talk about life-course-persistent pattern, if we can extend the age range from late adolescence to adulthood.

The current research tries to address the limitations mentioned above. There are four goals of this research. First, I try to identify developmental trajectories of antisocial behavior in a national representative sample longitudinally from adolescence to young adulthood. Second, I try to determine if considering nonviolent delinquency and violence separately can meaningfully improve trajectories identification by creating three different scales. Third, I try to address the gender-invariant issue by separately running analysis across gender. Forth, I try to explore possible predictors of developmental trajectories to provide potential targets for violence prevention research.

Because I used a relatively different sample from late adolescence to young adulthood which was rarely used in previous research, and that classes found in each study depend on particular sample, I don't have specific expectations concerning the classes I may find in the current study. However, I do expect to find the most commonly found four classes, the never/low class, the chronic class, the high declining class and the moderate declining class. Second, I expect that I might find more classes if I separately consider nonviolent delinquency and violence. Specifically, I expect that there may be a class in which individuals only commit nonviolent delinquency but no violence. Third, I expect that there may be gender-unique classes. Specifically, I expect that there may be more females than males in the class in which individuals only commit nonviolent delinquency but no violence. In addition, I expect that there may be more males than females in the chronic class where they continuously commit antisocial behavior.

Given that adolescents' antisocial behaviors are widely influenced by their family and school environments, I used four predictors from adolescents' neighborhood and family environment and two predictors from their school environment. The neighborhood predictor is neighborhood disadvantages. According to the social disorganization theory (Shaw & McKay, 1969), the lower levels of informal social controls caused by these disadvantages lead to escalated level of antisocial behavior. Correspondingly, previous research found that individuals living in a more disadvantaged neighborhood, such as high unemployment rate, low average household income, are more likely to commit antisocial behavior (Sampson, 1997). I thus expect in the current study that individuals from less disadvantaged neighborhood are more likely to be in any delinquent or violent class relative to the never class.

The three predictors from family environment are family support, family protection and parental talk. As found in Cleveland (2003), the protective role of family environmental influence is reinforced especially in disadvantage neighborhood. Previous research generally found that delinquents tend to have less parental-child communication (Clark & Shields, 1997; Griffin et al., 2000). More available family support, family protection resource and parental talk can better guide and supervise adolescents' development and protect them from possible negative influence from deviant peer, and prevent delinquents from exacerbating into extreme crimes (Patterson & Stouthamer-Loeber, 1984). I expect that individuals with more family support, family protection and parental talk are less likely to belong to classes that commit antisocial behavior.

Lastly, I used two school predictors, school problems and GPA. It is possible that individuals with lower GPAs and more school problems, such as school suspension and expulsion, are more likely to hang out with deviant peers, be influenced by them and commit

more deviant conducts and antisocial behavior (Dishion et al, 1995; Patterson et al., 2000). I expect that individuals with higher GPAs and less school problems are less likely to be in classes that commit antisocial behavior.

## Chapter 2. Method

### *Data and Sample*

In the current research I used the Add Health Dataset, which is a nationally representative longitudinal dataset. It includes three-wave In-Home Interviews among which the first wave was measured between April and December 1995 when respondents were in their adolescence. The second wave was measured approximately one year later between April and August 1996. The third wave was measured between August 2001 and April 2002. Thus, among the three waves, the first two waves occurred during adolescence and the last wave occurred in young adulthood. For more information about Add Health, please refer to <http://www.cpc.unc.edu/projects/addhealth>.

I selected the analysis samples from the dataset based mainly on two criteria. First, I only chose those respondents aged 15-16 years (mid-adolescence) at wave 1. The first reason is that due to study design, respondents who were in the 12<sup>th</sup> grade at wave 1 were not interviewed at wave 2. The second reason and probably the most important one, is that according to theory I assume the behavioral trajectories are strongly linked to age. In other words, if the general pattern of antisocial behavior development is that it peaks around mid-adolescence and desists thereafter, it would confound results if I include mid-adolescent and late adolescent respondents into analysis sample at the same wave. For example, a decline in nonviolent delinquency for 16 years old respondents from wave 1 to wave 2 would not be developmentally comparable to a similar decrease in nonviolent delinquency for 13 or 18 years old respondents on the same data collection years. Third, I chose this specific age group to make results comparable with previous research where most samples were around mid-adolescence.

The second selection criterion is that the respondents should not have missing values in wave 3, and at least have value for one of the first two waves. The reason is that I tried to classify individuals into different classes based on their adolescence and young adulthood antisocial behavior. I will lose half of the classification information if respondents don't have reports in wave 3 and the classification results will be highly unreliable.

After applying the second criteria, the sample size dropped from 6253 to 4611. The final analysis sample consists of 4611 respondents (male = 2105, 45.65%). The ethnic proportion is: White 54.67%, Hispanic/Latino 12.43%, African American 24.01%, Asian/Pacific Islander 5.81%, Indian/Native 2.34%, and Others 0.74%. The proportion of 15 years old adolescents is 46.19%.

### *Measurements*

#### **Nonviolent delinquency and violence**

I used self-reported nonviolent delinquent and violent actions to create three scales: a nonviolent delinquency scale, a violence scale, and a composite nonviolent delinquency and violence scale. Across three waves, there are five items measuring nonviolent delinquency and three items measuring violence. All items response range from never (0), once or twice (1), three or four times (2) to five times or more (3).

Items measuring nonviolent delinquency include: In the past 12 months, how often did you deliberately damage property that didn't belong to you, steal something worth more than 50 dollars, go into a house or building to steal something, sell marijuana or other drugs, steal something worth less than 50 dollars? The Cronbach alpha for the five-item nonviolent delinquency scale is between 0.69 and 0.72 across three waves. Items measuring violence

include: In the past 12 months, how often did you use or threaten to use weapon to get something from someone, take part in a fight where a group of your friends was against another group, hurt someone badly enough to need bandages or care from a doctor or nurse? The Cronbach alpha for the three-item violence scale across three waves is between 0.62 and 0.65. Table 1 presents the means and standard deviations of nonviolent delinquency and violence across three waves.

In addition to the separate nonviolent delinquency and violence scales, I used all eight items to create a composite scale. This scale was the average score of all eight items, whether nonviolent delinquency or violence. The reason I created this scale is that it corresponds to what most previous research has used and I wanted to make my results comparable.

After creating these scales, due to the strong positive skew of the distribution that could be expected with the nature of antisocial behavior, I trichotomized continuous values into three levels: never (0), mild (1) and moderate/serious (2). The other reason I did this is that according to the theoretical background, some individuals might simply try or experiment few antisocial behavior as demonstrated in the adolescence-limited pattern, whereas some individuals might consistently show mild/moderate level of violence as in life-course-persistent pattern. And there are also many individuals who never commit any delinquent action. Thus it would appear to be more meaningful to trichotomize than simply dichotomize scales into “yes” or “no”. We would also be able to apply never/mild/moderate/serious labels to different levels, rather than rely on the original metric of the scales. To make the meaning of each level comparable across waves, I used the same criteria for nonviolent delinquency and violence across three waves rather than using a coding scheme that maintains the same proportion in each level.

I used 0.6 as cutoff point between level 1 and 2 for nonviolent delinquency scales. Specifically speaking, all the values of 0 on nonviolent delinquency were coded into never level, indicating that individuals choosing this level had never committed any delinquency. All the values between 0 and 0.6 were coded into mild level, indicating that individuals choosing this level committed some but relatively few nonviolent delinquent acts. Any values equal or larger than 0.6 were then coded into the moderate/serious level, which suggests that individuals responding in this level committed substantial nonviolent delinquency instead of an occasional act as is shown in the mild level. The reason I chose 0.6 as cutoff point is that there are five items in the nonviolent delinquency scale, and thus the mean for individuals who reported only one or two occurrences of once/twice (1) out of the five items would be 0.2 or 0.4. Individuals who reported only once three/four times (2) would also get a value of 0.4 and I regarded them to be mildly delinquent. Any individuals reporting more nonviolent delinquency behaviors would get a value of 0.6 or higher and thus I regarded them as moderate/serious delinquent.

The cutoff point for violence scale is different from nonviolent delinquency to accommodate this scale having only three items. Out of the three items, if any respondents respond once/twice (1), the value were coded into mild level. Any other response, such as two out of three items responding once/twice (1) or one out of three responding three/four times (2) were coded into moderate/serious level.

The cutoff point for the composite scale has the same logic and meaning as for nonviolent delinquency although the actual value is different because there are eight items in this scale. The mean for individuals who reported only once or two times of once/twice (1) out of the five items would be 0.125 or 0.25. Individuals who reported only once three/four times (2) would also get a value of 0.25 and I regarded them to be mildly delinquent. Any individuals reporting

more nonviolent delinquency behaviors would have a value of 0.25 or higher and thus I regarded them as moderate/serious delinquent.

To help to better understand the meaning of each level after trichotomization, the descriptive statistics for each level of nonviolent delinquency and violence across waves are shown in Table 2. Take wave 1 nonviolent delinquency, for example. As is shown, the overall mean of wave 1 nonviolent delinquency before trichotomization is 0.179 out of 3, which is low. The mean of the “never” level is 0, which means that individuals in this level didn’t report committing any nonviolent delinquent acts in the past year. The mean of the “mild” level is 0.261, basically the same as the overall population level (0.23 SD higher). Thus this level appears quite normative. It actually indicates that individuals in this level show a similar level of nonviolent delinquency as the general population, which is quite low. The mean of the last level “moderate/serious” is 0.993, more than two standard deviations above the population mean. Thus, individuals in this level actually show quite high level and serious nonviolent delinquency. The distributions are the same for wave 1 violence and also for other two waves. These means are very important for interpreting results of the models to follow.

### **Adolescent predictors**

I used several predictors measured in wave 1 to predict developmental trajectories. Among these predictors are neighborhood disadvantage, protection, parental talk, school problem, GPA and family support.

#### Neighborhood predictor

Neighborhood disadvantage is a composite of three proportion scores: proportion of non-intact family households, proportion of low income families (less than 15,000 dollars) and

proportion of unemployment rate. Higher score indicates more disadvantages. Data were collected from the Census of Population and Housing 1990 measured at the Block Group level.

### Family predictors

Family support is the average score of two subscales. The first subscale contains four items, two for each parent. Respondents are required to rate from 1 (not at all) to 5 (very much). These two items for one parent are: How close do you feel to your mother, how much do you think she cares about you. The second subscale contains six items, three for each parent. Respondents rated from 1 (strongly disagree) to 5 (strongly agree). These three items for one parent are: You are satisfied with the way your mother and you communicate with each other, overall you are satisfied with your relationship with your mother, most of the time your mother is warm and loving towards you. Higher score indicates more family support. The overall Cronbach alpha is 0.88.

Protection is an average score of eight items. Example includes how much do you feel that adults/your parents/friends care about you? Respondents are required to rate on a five-point scale from 1 (not at all) to 5 (very much), with higher score indicating more protection. The Cronbach alpha is 0.79.

Parental talk is an average score of eight items, four for each parent. Items are: Have you talked about someone you're dating, or a party you went to/had a talk about a personal problem you were having/talked about your school work or grades/talked about other things you're doing in school in the past 4 weeks? Responses range between 0 (No) and 1 (Yes). Higher scores suggest more parental-child communication. The Cronbach alpha is 0.70.

### School predictors

School problems is an average score of three items. These items are: Have you ever repeated a grade or been held back a grade? Have you ever received an out-of-school suspension from school? Have you ever been expelled from school? Responses range between 0 (No) and 1 (Yes). Higher score suggests more problems. The Cronbach alpha is 0.48.

GPA is the average score of four grades in English/language, mathematics, history/social studies and science. Responses range from 1 to 4 with higher scores indicating higher GPAs. The Cronbach alpha is 0.75.

### *Analysis proposal*

In accordance with the group-based perspective, I tried to fit models using Latent Class Analysis (Collins & Lanza, 2009). This method assumes that there are mutually exclusive and exhaustive categories in the population and is especially useful for multiple items and categorical variables.

Using the three trichotomized segregated and combined scales for nonviolent delinquency and violence, I fit two different sets of models. In the first set of models I used the combined scale of nonviolent delinquency and violence to make it comparable with previous research (e.g. Nagin & Tremblay, 1999), expecting that I could find the four commonly found classes mentioned in introduction. In the second set of models, I used the segregated scales of nonviolent delinquency and violence, expecting that nonviolent delinquency and violence can separately provide meaning information in trajectories identification. As part of the second set of models, I also tested for gender invariance. Parameters were constrained to be equal in the gender-invariant model and were compared with the gender-variant model via fitting indices. If the measurement is gender-variant, separate models were fit within each gender group and

thereafter compared with each other. The final analysis step used the wave 1 predictors to conduct multinomial logistic regressions to predict different developmental trajectories.

All model fitting was conducted using PROC LCA 1.2.3 (The Methodology Center, 2009) in SAS<sup>®</sup> 9.2 (SAS Institute Inc, 2008). Nested models were compared with each other by using the difference between the fit statistic ( $G^2$ , minus twice the log likelihood) values to produce a  $\chi^2$  statistics. Other information criteria including AIC and BIC were used as well to help choosing the best fitting model, where I focus on BIC because it prefers the parsimonious model (the smaller the better).

## Chapter 3. Results

### *Trajectory identification*

#### Model 1: 3-item aggregated scale of nonviolent delinquency and violence

In this set of models, I ran analysis using the aggregated scale of nonviolent delinquency and violence. There are three items in this model, one for aggregated score of nonviolent delinquency and violence in each wave. By doing this, I want to make the results comparable with prior research and to see if I can also find the commonly found four classes.

Table 3 shows the frequency description across three waves for the aggregated scale of nonviolent delinquency and violence. As is shown, both in adolescence and young adulthood, the majority reported no nonviolent delinquent or violent acts in the past year. Across waves, the proportion in the never level increased whereas the proportion in the mild as well as the moderate/serious level decreased, suggesting that violent level decreases both across adolescence and from adolescence to young adulthood.

Using LCA, I identified four classes for the overall sample according to the smallest BIC criterion. Corresponding model fit indices are displayed in table 4. I was unable to test the gender-variance issue here because models did not have enough degree of freedom. Table 5 provides prevalence and conditional response probabilities for each class in the 4-class model. Table 6 provides the mean (SD) of antisocial behavior across classes and waves, as well as the prevalence of each class in the population. Figure 1 plots these means across waves. I will interpret these results and the meaning of each class according to estimates in table 5 together with descriptive statistics in table 6.

Note that during preliminary analysis the results showed that some prevalence was lower than 3% among group. For example, the prevalence of third class is about 2% among females. Because of the instability of the prevalence, they were restricted to be zero in following analysis for easier interpretation. Conditional response probabilities don't change much after this parameter restriction and I only report the results after restriction here. Model 2 took the same restriction.

For the first class, its prevalence among males is 39.19% and 64.23% among females, indicating that males have a 0.39 probability of belonging to the first class while females have a 0.64 probability of belonging to this class. All of the probabilities of responding "never" are between 0.83 and 0.88 which are bolded in table 5 in the first column. Within this class, individuals tend to report no nonviolent delinquency or violence across all three waves. Means in the first column of table 6 confirm that individuals in this class have a low average level of nonviolent delinquency and violence. Thus, I labeled this class as "never", indicating that respondents of this class relatively committed no nonviolent delinquency or violence from adolescence to young adulthood.

For the third class, the prevalence is 11.80% among males but 0% among females. Thus, this class is unique to males. However, the response probabilities within this class are not as clear as are in the first class. It helps to interpret these response probabilities together with table 6. In the adolescence period (wave 1 and wave 2), individuals in this class tend to report moderate/serious level of nonviolent delinquency and violence with the probabilities ranging from 0.52 to 0.80. In young adulthood, however, they tend to report mild level of nonviolent delinquency and violence (0.47). Together with the information in table 6, it indicates that individuals in this class actually show the highest level of nonviolent delinquency and violence

in adolescence and declined to a lower level in young adulthood. Thus, I labeled this class as “decliner”.

The interpretations of response probabilities for the second and fourth class follow the same rules. The prevalence of the second class is 30.17% among males and again 0% among females, suggesting that this class is unique to males as well. For the second class, it is clear that individuals in this class tend to report consistently mild level of nonviolent delinquency or violence from adolescence to young adulthood (between 0.51 and 0.67). Thus I labeled this class as “chronic”. For the fourth class, its prevalence is 18.84% among males and 35.77% among females. Individuals in this class tend to report no nonviolent delinquency or violence in young adulthood (0.76). However, they tend to report mild level of nonviolent delinquency or violence in adolescence as did in the second class. Means in table 6 suggests that individuals in this class reported relatively mild level of nonviolent delinquency and violence in wave 1 and decreased in wave 2 and further desisted into the same level as the never class did in young adulthood. Thus, I labeled this class as “desister”.

Taking together, I found the four commonly found classes, never, chronic, decliner and desister. I further found that the prevalence of each class is different across gender. Especially, the prevalence of the chronic and decliner class is zero among females, indicating possible gender-variance. I further tested this potential gender-variance in the second model.

#### Model 2: 6-item segregated scales of nonviolent delinquency and violence

In this set of models, I ran analysis using the segregated scales of nonviolent delinquency and violence. Altogether there are six items in each model, one for nonviolent delinquency and one for violence in each wave. By doing this, I want to see if separately running latent class

analysis with multiple items can provide more information concerning trajectories identification. Another goal in this analysis is to investigate gender-invariance.

As would be expected, the frequency table 7 suggests a similar pattern as shown by the aggregated scale. The majority reported no nonviolent delinquent or violent acts all through three waves. In addition, this proportion increased over years, indicating that the overall level of nonviolent delinquency and violence decreased. The converse of this pattern could be found in mild level and moderate/serious level in that proportion in each of these two levels decreased.

According to table 8, BIC suggests a five-class model for the overall sample. However, the gender-variant test is significant,  $\chi^2(1329) = 1263.9, p < .001$ . This significance indicates that these five classes may have different meanings across genders. Alternative explanation may be that some classes may be unique to a gender group but do not exist in the other gender group. To explore the possibilities, I separately ran the same analysis using the same scales for males and females. According to table 9, for males group, four-class model describes the sample best. Table 10 provides prevalence and conditional response probabilities for each class. I will interpret these results and the meaning of each class according to estimates in table 10 together with descriptive statistics in table 11, which provides means and standard deviations of each class across waves to help label the classes more conveniently.

For the first class, its prevalence among males is 46.21%. All of the probabilities of responding “never” are between 0.84 and 0.94 which are bolded in table 10 in the first column, indicating that individuals among males have a 0.46 probability of belonging to the first class. Within this class, individuals tend to report no nonviolent delinquency or violence across all three waves. Means in the first column of table 11 confirm that individuals in this class have a

low average level of delinquency and violence. Thus, I labeled this class as “never”, the same meaning as its counterpart in the first model.

For the fourth class, the prevalence is 12.58%. However, the response probabilities within this class are not as clear as are in the first class. It helps to interpret these response probabilities together with table 11. In the adolescence period (wave 1 and wave 2), individuals in this class tend to report moderate/serious level of nonviolent delinquency and violence with the probabilities ranging from 0.48 to 0.76. In young adulthood, however, they tend to report no violence (0.46). Together with the information in table 11, it indicates that individuals in this class actually show the highest level of nonviolent delinquency and violence in adolescence and declined into lower level in young adulthood. Thus I labeled this class as “decliner”.

The prevalence for the second and third class is 27.57% and 13.64% respectively. For the second class, it is clear that individuals in this class tend to report no nonviolent delinquency or violence in young adulthood (0.92 and 0.79). However, their probabilities of reporting no nonviolent delinquency or violence in adolescence are much lower compared to the first class. Means in table 11 suggests that this class relatively reported mild level of nonviolent delinquency and violence in wave 1 and decreased in wave 2 and further desisted into the same level as the never group did in young adulthood. Thus, I labeled this class as “desister”. The third class generally showed the same pattern as the desister class except that in young adulthood they continued to report relatively mild/moderate level of nonviolent delinquency and violence. Thus, I labeled this class as “chronic”.

Figure 2 plots the means of nonviolent delinquency and violence of each class across waves. Nonviolent delinquency and violence of the same class are in the same color. The lines

with squares plot nonviolent delinquency. The lines with triangle plot violence. The following figures use the same symbols.

The interpretations of the results follow the same rules for females group. According to table 12, LCA found a 3-class model. The interpretations of the first two classes are the same as for males group, namely “never” and “desister”. They generally showed the same pattern of response probabilities as shown in table 13 and the same average level of means as shown in table 14. The trajectories plotted in figure 3 are consistent with our interpretation as well. However, they do have different prevalence compared to males group. The prevalence of the never class among females is 64.68%, which is higher compared to 46.21% among males. The prevalence of the desister class is 27.57%, which is generally the same as is 24.25% among males.

However, the third class of females group showed a distinct pattern not observed among males. Individuals in this class tend to report no nonviolent delinquency or violence in young adulthood (0.74 and 0.88). In adolescence, however, they tend to report moderate/serious level of delinquency but no violence. The means in the last column of table 14 also confirm that individuals in this class show relatively high level of nonviolent delinquency but mild level of violence in adolescence and decreased in young adulthood, although not completely desisted. Thus, I labeled this class as “nonviolent desister”.

After looking at classification results separately by gender, now I turn back to the analysis in overall sample and reconsider the gender-invariance issue. As is shown in table 15, the prevalence of each class within each gender group indicates that this gender-variance is more due to unique classes in specific gender groups than to different meanings of the same classes to

different genders. Four classes are found among males, but only three classes are found among females. Among the four classes among males, two classes, the decliner class and the chronic class, are unique to males because their prevalence among females is zero. In contrast, the fifth class, the nonviolent delinquent desister class is also unique to females because its prevalence among males is zero as well.

Because the response probabilities of the two classes common to both genders (the never and desister class) are estimated together rather than separately by gender, their prevalence changed somewhat compared with previous results in table 10 and 13. For males, the prevalence for the never (46.21%), desister (27.57%), chronic (13.64%) and decliner class (12.58%) changed to 36.44%, 19.87%, 23.85% and 19.84% respectively. For females, the prevalence for the never (64.68%), desister (24.25%) and nonviolent desister class (11.07%) changed to 66.08%, 17.66%, and 16.26% respectively. However, the mean levels of nonviolent delinquency and violence in each class as indicated in table 16 and plotted in figure 4 suggests that these classes in the overall analysis are consistent with what I found in each gender group. Thus, I use these results in my further analysis.

Being labeled by the same interpretation rules applied in the first model, all of the four classes hold the same meanings as their counterparts in the first model. Interestingly, among males I again found four classes, and their prevalence are parallel with that in the first model, 39.19% vs. 36.44% for never class, 18.84% vs. 19.87% for desister class, 30.17% vs. 23.85% for chronic class, and 11.80% vs. 19.84% for decliner class. Among females however, I found only two classes in the first model, the never class (64.23%) and the desister class (35.77%). Notice that the prevalence of the never class among females is comparable with its counterpart in the second model (66.08%).

To briefly relate these findings with previous research, the chronic class resembles the life-course-persistent pattern to some extent. However, the meaning of this class is quite different from the life-course-persistent pattern and I will address this shortly in discussion section. Also, the never class resembles the never/low class identified by prior research (e.g. Nagin & Tremblay, 2005a). The decliner and the desister classes stand for the adolescent-limited pattern, though decliner's overall level stayed relatively high. The nonviolent delinquent desister class found herein is a relatively novel class because the present study is the first one known to investigate the possible different contribution of nonviolent delinquency and violence in class identification, and I will shortly address this class as well as its meaning in the discussion section.

#### *Trajectory prediction*

After identifying developmental trajectories, I conducted multinomial logistic regressions to predict different trajectories using several preceding variables measured in adolescence. Since I propose that using segregated scales of nonviolent delinquency and violence can meaningfully improve trajectories identification and this proposition appears to be supported by the results, I here focus on the prediction of the classes from the second set of models. I chose the never class as the reference because I am interested in variables that prevent individuals from any nonviolent delinquent or violent acts. Table 17 and table 18 provide the standard regression coefficients and odd ratios from logistic regressions for males and females group separately for the first model. Table 19 and table 20 provide the standard regression coefficients and odd ratios from logistic regressions for males and females group separately for the second model. As noted, all predictors are significant at the 0.001 level.

Among males, early neighborhood disadvantage can significantly predict later developmental trajectories. Individuals from more disadvantaged neighborhoods are more likely to be in the never class rather than any of the other three classes (9 odds, 1.75 odds and 10.75 odds). Individuals with more family support are less likely to be in the decliner class (1.27 odds in the never class), but more likely to be in the desister and chronic class (1.84 odds and 1.34 odds) relative to the never class. Protection also can significantly predict trajectories. Individuals with more general protection are more likely to be in the never class relative to any other three classes (4.83 odds, 2.46 odds and 2.14 odds). Individuals with more parent talk are more likely to be in the desister, decliner, and chronic classes (4.5 odds, 2.04 odds and 1.66 odds) relative to the never class. Individuals with more school problems are more likely to be in the decliner and desister class (11.07 odds and 11.36 odds) but less likely to be in the chronic class (1.81 odds in the never class) relative to the never class. At last, individuals with higher GPAs are less likely to be in any of the three classes relative to the never class (2.02 odds, 2.15 odds and 1.34 odds in the never class).

The female analyses reveal somewhat different results. Females with greater neighborhood disadvantage are more likely to be in the desister class (11.80 odds) but less likely to be in the nonviolent desister class (1000 odds in the never class) relative to the never class. Females with more family support (1.20 odds and 1.71 odds), more family protection (1.68 odds and 2.79 odds) or higher GPAs (1.86 odds and 1.82 odds) are less likely to be in any of the two classes relative to the never class. Females with more parental talk (1.67 odds and 1.60 odds) or school problems (17.28 odds and 4.22 odds) are more likely to be in the two classes relative to the never class.

Table 17 and table 18 present regression results of the aggregated scale models by gender. The results among the males group are generally the same as those for segregated scales models. The exception to this similarity is that in the first model individuals with more family support are less likely to be, instead of more likely to be, in the desister class relative to the never class. The results among the females group are similar except that females with greater neighborhood disadvantage are less likely rather than more likely to be in the desister class relative to the never class.

*Supplementary analysis concerning the meanings of classes*

To better understand the meaning of each class, I conducted further supplementary analyses to calculate the proportions of some young adulthood outcomes, which are shown in table 21. It shows that, compared to the never class, relatively fewer males in the chronic and decliner classes were currently married or had at least a child during the measurement in the third wave. Compared to the never class, fewer individuals in the decliner and desister class got a high school diploma or went to college. More individuals in the desister class had at least a child and more females in the nonviolent desister class went to college. Thus it shows that generally individuals in the decliner and desister class showed maladaptive adjustments in their young adulthood, whereas individuals in the chronic class showed generally normal developmental outcomes.

## Chapter 4. Discussion

In the current study, I tried to identify developmental trajectories of antisocial behavior, mainly focusing on nonviolent delinquency and violence, using the group-based perspective. To summarize my main results: using a national representative longitudinal dataset from adolescence to young adulthood, I identified four developmental trajectories of antisocial behavior for males and three developmental trajectories for females, by using segregated scales of nonviolent delinquency and violence. Gender-variance is more due to unique classes in specific gender groups than to different meanings of the same classes to different gender groups. The four classes among males are never (36.44%), desister (19.87%), decliner (19.84%), and chronic (23.85%), among which the decliner and chronic classes are unique. The three classes among females are never (66.08%), desister (17.66%), and nonviolent desister (16.26%), among which the nonviolent desister class is unique.

Using the aggregated scale of nonviolent delinquency and violence, I found the same four classes among males, and their prevalence are parallel with that in the segregated scales model, 39.19% for never class, 18.84% for desister class, 30.17% for chronic class and 11.80% for decliner class. Among females however, I found two classes only, the never class (64.23%) and the desister class (35.77%). Thus, by separately considering nonviolent delinquency and violence, I found one new class among females, the nonviolent desister. In other words, nonviolent delinquency and violence contribute unique information in trajectory identification in that they can further separate the nonviolent desister from the normal desister among females.

I further conducted a logistic regression with adolescent family, neighborhood and school variables to predict these classes. Especially, the results show that family and neighborhood can

tell some classes from others, among which are family support, parent talk, protection and neighborhood disadvantage, as well as school problems and GPAs. Specifically speaking, in both groups, contrary to my expectation, except for the female desister class, in all other classes, individuals with greater neighborhood disadvantage are more likely to be in the never class which committed no antisocial behavior instead of more likely to be in any delinquent or violent class.

Except for the male desister and chronic, consistent with my expectation, individuals with more family support and protection are more likely to be in the never class than in any other delinquent classes. However, contrary to my expectation, in all classes, individuals with more parental talk are more likely to be in any delinquent or violent class rather than be in the never class. At last, except for the male class, individuals with less school problems and higher GPAs are more likely to be in the never class rather than in any violent or delinquent class.

The results for the second model are generally the same, except that males with more family support are less likely to be, instead of more likely to be, in the desister class relative to the never class, whereas females with greater neighborhood disadvantage are less likely rather than more likely to be in the desister class relative to the never class.

Consistent with my first expectation, I found those four commonly found classes, although their trajectories and overall level may differ slightly. The never class resembles never/low class. Individuals in this class reported no any nonviolent delinquency or violence in the past year. Females have a higher prevalence than males (36.44% vs. 66.08%) and this could be attributed to the fact that males usually involve in more antisocial behavior than females (Archer & Coyne, 2005). This prevalence is comparable with some previous research (e.g.

69.5% in Nagin & Tremblay, 2005; 46.3% in Haviland & Nagin, 2005). The decliner and the desister classes stand for the adolescent-limited pattern, though decliner's overall level stayed relatively high. They also resemble the low and high desister class found in Nagin's (1999) or moderate and high declining class found in Nagin and Tremblay's (2005). Actually, it is individuals in the decliner class who reported the most nonviolent delinquency and violence in the population, although they decreased over time. The prevalence of the desister class in male and female group is generally the same (19.87% vs. 17.66%) and comparable with previous research (e.g. Nagin, 1999).

The chronic class resembles the life-course-persistent pattern. However, the meaning of this class is quite different from the life-course-persistent and is more similar with the lower class (36.3%) found in Nagin and Tremblay (2002). Some may argue that the prevalence of the chronic class (23.85%) may be too high compared with the life-course-persistent pattern (around 10%) found in previous research. This might be an artifact of trichotomization. If we refer back to table 2, the mild level actually means the same as the average level in the population which is low itself. So individuals in the chronic class actually just consistently reported the same frequency of antisocial behavior as the overall population or just once or twice in the past year. Thus this class is not as severe as the life-course-persistent pattern indicates. However, the main goal of LCA is to identify different trajectories, which is supported in the results. This model is generally consistent with some previous research using different methods (Nagin & Tremblay, 1999; Broidy et al., 2003; Nagin & Tremblay, 2005).

Broidy et al. (2003) found these similar four classes for boys' physical aggression between 6 and 12 years old with comparable prevalence. However, they didn't particularly address the nonviolent delinquency and violence thus they didn't find the nonviolent desister

class in girls. Nagin and Tremblay (1999) also found those four similar classes for boys' physical aggression between 6 and 15 years old using a Canadian sample. Among Odgers et al. (2008) work, they found similar developmental trajectories of antisocial behavior across gender, but in a limited age range between 7 to 15 years old.

Consistent with my second expectation, I found a new class after separately considering nonviolent delinquency and violence. Individuals in the nonviolent delinquent desister class (16.26%), which has never been found previously, showed similar developmental trajectory of nonviolent delinquency as did in the desister class but they reported no violence over time. Also consistent with my third expectation, there are gender-variant classes in our sample. Specifically, the nonviolent desister class is unique among females, while the decliner class (19.84%) and the chronic class are unique among males. This may be because females are less likely than males to involve in serious violence and are less likely to continuously commit antisocial behavior.

I found basically the same prevalence of each class, except for the female desister class, in the first model using aggregated scale of nonviolent delinquency and violence, and this again convincingly consolidates my results and previous research. Other than prevalence, the results reminded us of another more important issue: do we really need to separately consider the information of nonviolent delinquency and violence to identify developmental? Results from the second model suggest the value of using violence in trajectory identification, by separately considering it in tandem with nonviolent delinquency. I didn't find the nonviolent desister class among females in the first model, which has meaning in real life and useful implications. Instead of simply classifying as desister, a small proportion of females were classified as nonviolent desister. It suggests that there are some subgroups in the female desister class and are worthy of

our attention and further exploration, given that they might involve different underlying mechanisms.

The results from trajectory prediction further consolidate my argument that these classes may involve different mechanisms. To point out first, as interpreted ahead, the chronic class doesn't necessarily mean the most serious class since their levels are relatively the same as the average population levels across waves. It is the decliner class that appears the most problematic here. This may be because they started at the highest level in adolescence and did not completely desist into zero but slight lower than, or around the average score of, the population. So it is the decliner class that committed the most antisocial behavior here.

Generally speaking, consistent with my expectations, individuals with more family support and general protection are more likely to be in the never class relative to any other delinquent or violent class. This conforms to our intuition that individuals with more protection and family support are less likely to progressively develop into serious outcomes. The situation is basically the same for school predictors. Individuals with less school problems or higher GPAs are more likely to be in the never class relative to any other delinquent or violent class. However, it is also possible that these predictors are more likely to be outcomes of being non-violent instead of the reason of it. For example, Taylor et al. (2007) argued that aggressive individuals may experience difficulty learning, which may lead to poor school performance.

However, contrary to my expectation, individuals with more parent talk are less likely to be in the never class relative to any other violent classes. One tentative explanation is that these parental talks are in response to children's antisocial behavior (Stattin & Kerr, 2000). In other words, parents may increase their parental monitoring actively to their violent or bad-behaved

children by talking more to them about their performance in school. Further research is needed to look more into this finding.

The influence of neighborhood disadvantage needs more attention and interpretation. According to the results, also contrary to my expectation, individuals from more disadvantaged neighborhood are more likely to be in the never class rather in any other delinquent or violent class. Thus it seems that growing up in a less advantaged neighborhood can prevent individuals from developing into showing more antisocial behavior. This finding seems counterintuitive too and my tentative explanation concerns future uncertainty, which is defined as the adolescent's perception of the instability of his or her individual future (Caldwell et al., 2006; Borowsky et al., 2009). It is possible that individuals grow up in a more advantaged neighborhood hold a more certain attitude towards future and believe that their future will shine whatever they do. Conversely, individuals from less advantaged neighborhood might not show much antisocial behavior because they are clear that their future is determined largely by their own performance record. However, individuals from extremely disadvantaged might show the same as or even more antisocial behavior than individuals from advantaged neighborhood because they believe whatever they do they won't have a bright future. Thus, the association between future uncertainty and antisocial behavior might be nonlinear and future uncertainty mediates the influence of neighborhood on antisocial behavior. Further research is needed on the association between future uncertainty and antisocial behavior.

### *Limitations*

This research has several limitations worthy of attention and future study. The first limitation mainly concerns the issue of measurement and there are few points here. First, this

dataset doesn't have any specific information on antisocial behavior between 1996 and 2002, which actually is a quite large time span. It would be better for the trajectory identification if I had more available data. Second, even I particularly addressed the issue of nonviolent delinquency and violence, it is admitted that the severity of violent actions across items is different. For example, though all regarded as violence, getting into a serious fight really means different from shooting or stabbing someone. It may show an even informative pattern if I can dive into it. Third, as I have already stated in measurement section, in order to keep comparable of antisocial behavior across developmental stages, I used the same item in each wave measurement in three scales. Here in this study I didn't use all items available. But it might be one possible exploration for future study to use all items aiming to gain as much information on antisocial behavior as I could.

Second, trichotomization may invoke some argument. First of all, I didn't dichotomize scales because simply dichotomizing scales into yes or no would be insufficient as it would be impossible to differentiate classes showing different levels of antisocial behavior, such as the decliner versus desister class. Admittedly, the criteria I used during trichotomization were somehow arbitrary and can be changed. As already mentioned ahead, the meaning of the "mild" level is a little bit different. This level actually shows the same level of antisocial behavior of the average population and thus should not be taken as the same serious as the life-course-persistent pattern indicates. Similarly, the "moderate/serious" level actually stands for a somewhat extreme violent level.

### *Implications*

The current research has several implications in developmental research as well as for prevention science. First of all, I found out that separately considering nonviolent delinquency and violence can meaningfully improve our knowledge of developmental trajectory identification. One more class among females is identified, the nonviolent desister. Future research should consider antisocial behavior separately instead of simply using only one average score.

Second, I used a dataset longitudinally from adolescence to young adulthood and found similar classes identified in previous research. Thus the present study extends sample's age range further into young adulthood and is more confident when talking about life-course-persistent developmental pattern.

Third, I explicitly tested the gender-invariant issue. It is more due to unique classes in specific gender groups than to different meanings of the same classes to different gender groups. In addition to the two common shared classes, males group has two unique classes and females group has one unique class.

Fourth, and probably most important, I found that some variables can predict developmental trajectories, among which are family support, general protection and parental talk. This finding highlights the needs of more attention on early family dynamic processes and indicates the possible role these processes may play in prevention science. For example, less parental talk can predict higher probability of being in the nonviolent group. Thus, parental talk might be a possible target of violence prevention programs, especially for family-based programs.

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**Appendix A****Tables**

Table 1.

Mean (SD) of nonviolent delinquency and violence across waves in raw score

	Nonviolent delinquency	Violence	Aggregated
Wave 1	0.176(0.363)	0.197(0.391)	0.184(0.324)
Wave 2	0.138(0.323)	0.130(0.315)	0.135(0.273)
Wave 3	0.099(0.263)	0.081(0.252)	0.093(0.217)

Table 2.

Mean (SD) of nonviolent delinquency and violence across levels after trichotomization

	Wave 1		Wave 2		Wave 3	
	Nonviolent delinquency	Violence	Nonviolent delinquency	Violence	Nonviolent delinquency	Violence
Overall	0.179(0.364)	0.202(0.398)	0.138(0.323)	0.132(0.316)	0.096(0.257)	0.079(0.247)
Never	0	0	0	0	0	0
Mild	0.261(0.092)	0.334(0.006)	0.264(0.094)	0.335(0.014)	0.255(0.090)	0.335(0.018)
Moderate/Serious	0.993(0.492)	0.992(0.519)	0.972(0.460)	0.961(0.455)	0.868(0.386)	0.941(0.442)

Table 3.

Frequency of antisocial behavior across levels and waves after trichotomization

	Never	Mild	Moderate/Serious
Wave 1 delinquency & violence	52.03%	38.56%	9.40%
Wave 2 delinquency & violence	62.38%	30.77%	6.85%
Wave 3 delinquency & violence	72.39%	23.27%	4.34%

Table 4.

Model indices for models with different class numbers (gender invariant)

No. of Classes	df	AIC	BIC	G <sup>2</sup>	Frequency	p-value
2	39	471.73	561.84	443.73	97/100	
3	31	254.50	396.10	210.50	49/100	
<b>4</b>	<b>23</b>	<b>107.33</b>	<b>300.41</b>	<b>47.33</b>	<b>99/100</b>	<b>p = .002</b>
5	15	91.92	336.50	15.92	69/100	p = .387

Table 5.

## Four-class model of antisocial behavior development

	Probability of responses			
	Class 1	Class 2	Class 3	Class 4
Prevalence for male	39.19%	30.17%	11.80%	18.84%
Prevalence for female	64.23%	0%	0%	35.77%
Wave 1 delinquency & violence	<b>0.83 (0)</b> 0.17 (1) 0.00 (2)	0.30 (0) <b>0.67 (1)</b> 0.03 (2)	0.02 (0) 0.18 (1) <b>0.80 (2)</b>	0.14 (0) <b>0.70 (1)</b> 0.17 (2)
Wave 2 delinquency & violence	<b>0.88 (0)</b> 0.12 (1) 0.00 (2)	0.45 (0) <b>0.51 (1)</b> 0.04 (2)	0.13 (0) 0.35 (1) <b>0.52 (2)</b>	0.30 (0) <b>0.57 (1)</b> 0.13 (2)
Wave 3 delinquency & violence	<b>0.87 (0)</b> 0.13 (1) 0.00 (2)	0.26 (0) <b>0.60 (1)</b> 0.14 (2)	0.26 (0) <b>0.47 (1)</b> 0.27 (2)	<b>0.76 (0)</b> 0.21 (1) 0.03 (2)

Table 6.

Mean (SD) of antisocial behavior by class

	Classes			
	Never	Chronic	Decliner	Desister
Wave 1 delinquency & violence	0.202 (0.402)	0.764 (0.425)	1.810 (0.452)	1.201 (0.453)
Wave 2 delinquency & violence	0.113 (0.317)	0.635 (0.482)	1.512 (0.703)	1.101 (0.476)
Wave 3 delinquency & violence	0.139 (0.351)	1.195 (0.397)	1.156 (0.617)	0.182 (0.448)

Table 7.

Frequency of nonviolent delinquency and violence across levels and waves after trichotomization

	Never	Mild	Moderate/Serious
Wave 1 delinquency	65.53%	22.70%	11.77%
Wave 2 delinquency	73.12%	17.43%	9.45%
Wave 3 delinquency	79.53%	12.84%	7.63%
Wave 1 violence	68.51%	17.49%	14.00%
Wave 2 violence	77.89%	13.13%	8.98%
Wave 3 violence	85.99%	8.37%	5.64%

Table 8.

Model indices for models with different class numbers

No. of Classes	df	AIC	BIC	G <sup>2</sup>	Frequency	p-value
2	1431	2317.62	2484.96	2265.62	100/100	
3	1417	1953.39	2210.84	1873.39	36/100	
4	1403	1719.90	2067.46	1611.90	87/100	
<b>5</b>	<b>1389</b>	<b>1585.09</b>	<b>2022.75</b>	<b>1449.09</b>	<b>35/100</b>	
5(invariant)	1329			1263.80		<i>p</i> =.000
6	1375	1503.33	2031.10	1339.33	32/100	
7	1361	1462.79	2080.67	1270.79	14/100	

Table 9.

Model indices for models with different class numbers (males only)

No. of Classes	df	AIC	BIC	$G^2$	Frequency
2	703	1131.70	1273.00	1081.70	100/100
3	690	1020.08	1234.85	944.08	45/100
<b>4</b>	<b>677</b>	<b>945.04</b>	<b>1233.29</b>	<b>843.04</b>	<b>35/100</b>
5	664	882.47	1259.32	754.47	24/100

Table 10.

Four-class model of antisocial behavior development for males group

	Probability of responses			
	Class 1	Class 2	Class 3	Class 4
Prevalence	46.21%	27.57%	13.64%	12.58%
Wave 1 delinquency	<b>0.89 (0)</b> 0.11 (1) 0.00 (2)	0.38 (0) <b>0.42 (1)</b> 0.20 (2)	0.34 (0) <b>0.44 (1)</b> 0.22 (2)	0.17 (0) 0.24 (1) <b>0.59 (2)</b>
Wave 1 violence	<b>0.88 (0)</b> 0.10 (1) 0.02 (2)	<b>0.45 (0)</b> 0.28 (1) 0.27 (2)	<b>0.68 (0)</b> 0.26 (1) 0.06 (2)	0.08 (0) 0.16 (1) <b>0.76 (2)</b>
Wave 2 delinquency	<b>0.94 (0)</b> 0.06 (1) 0.00 (2)	<b>0.51 (0)</b> 0.34 (1) 0.14 (2)	<b>0.46 (0)</b> 0.35 (1) 0.19 (2)	0.28 (0) 0.24 (1) <b>0.48 (2)</b>
Wave 2 violence	<b>0.92 (0)</b> 0.07 (1) 0.01 (2)	<b>0.58 (0)</b> 0.23 (1) 0.19 (2)	<b>0.86 (0)</b> 0.12 (1) 0.02 (2)	0.19 (0) 0.26 (1) <b>0.55 (2)</b>
Wave 3 delinquency	<b>0.84 (0)</b> 0.12 (1) 0.04 (2)	<b>0.92 (0)</b> 0.08 (1) 0.00 (2)	0.05 (0) <b>0.48 (1)</b> <b>0.47 (2)</b>	0.40 (0) 0.24 (1) 0.37 (2)
Wave 3 violence	<b>0.90 (0)</b> 0.06 (1) 0.04 (2)	<b>0.79 (0)</b> 0.16 (1) 0.06 (2)	<b>0.52 (0)</b> 0.26 (1) 0.21 (2)	<b>0.46 (0)</b> 0.18 (1) 0.36 (2)

Table 11.

Mean (SD) of antisocial behavior by class among males

	Classes			
	Never	Desister	Chronic	Decliner
Wave 1 delinquency	0.080 (0.271)	0.903 (0.718)	0.936 (0.713)	1.488 (0.737)
Wave 1 violence	0.102 (0.309)	0.962 (0.840)	0.322 (0.503)	1.812 (0.470)
Wave 2 delinquency	0.047 (0.213)	0.654 (0.709)	0.782 (0.760)	1.277 (0.847)
Wave 2 violence	0.061 (0.244)	0.693 (0.807)	0.167 (0.414)	1.437 (0.754)
Wave 3 delinquency	0.197 (0.487)	0.036 (0.187)	1.456 (0.499)	1.062 (0.861)
Wave 3 violence	0.136 (0.438)	0.262 (0.537)	0.686 (0.802)	1.004 (0.915)

Table 12.

Model indices for models with different class numbers (females only)

No. of Classes	df	AIC	BIC	G <sup>2</sup>	Frequency
2	703	833.67	979.33	783.67	94/100
<b>3</b>	<b>690</b>	<b>728.48</b>	<b>949.88</b>	<b>652.48</b>	<b>80/100</b>
4	677	668.45	963.01	566.45	31/100

Table 13.

Three-class model of antisocial behavior development for female group

	Probability of responses		
	Class 1	Class 2	Class 3
Prevalence	64.68%	24.25%	11.07%
Wave 1 delinquency	<b>0.89 (0)</b> 0.11 (1) 0.01 (2)	<b>0.52 (0)</b> <b>0.40 (1)</b> 0.08 (2)	0.16 (0) 0.33 (1) <b>0.51 (2)</b>
Wave 1 violence	<b>0.93 (0)</b> 0.07 (1) 0.00 (2)	0.30 (0) <b>0.43 (1)</b> 0.28 (2)	<b>0.48 (0)</b> 0.22 (1) 0.30 (2)
Wave 2 delinquency	<b>0.92 (0)</b> 0.08 (1) 0.01 (2)	<b>0.72 (0)</b> 0.28 (1) 0.00 (2)	0.06 (0) 0.36 (1) <b>0.59 (2)</b>
Wave 2 violence	<b>0.95 (0)</b> 0.04 (1) 0.00 (2)	<b>0.58 (0)</b> 0.28 (1) 0.13 (2)	<b>0.53 (0)</b> 0.23 (1) 0.23 (2)
Wave 3 delinquency	<b>0.91 (0)</b> 0.07 (1) 0.02 (2)	<b>0.85 (0)</b> 0.12 (1) 0.04 (2)	<b>0.74 (0)</b> 0.14 (1) 0.12 (2)
Wave 3 violence	<b>0.97 (0)</b> 0.03 (1) 0.00 (2)	<b>0.90 (0)</b> 0.07 (1) 0.02 (2)	<b>0.88 (0)</b> 0.06 (1) 0.05 (2)

Table 14.

Mean (SD) of antisocial behavior by class from among females

	Classes		
	Never	Desister	Nonviolent desister
Wave 1 delinquency	0.143 (0.374)	0.582 (0.615)	1.574 (0.658)
Wave 1 violence	0.064 (0.245)	1.230 (0.657)	0.842 (0.862)
Wave 2 delinquency	0.102 (0.323)	0.316 (0.465)	1.679 (0.478)
Wave 2 violence	0.042 (0.200)	0.725 (0.753)	0.722 (0.832)
Wave 3 delinquency	0.105 (0.353)	0.211 (0.504)	0.404 (0.712)
Wave 3 violence	0.037 (0.201)	0.138 (0.418)	0.183 (0.519)

Table 15.

## Five-class model of antisocial behavior development

	Probability of responses				
	Class 1	Class 2	Class 3	Class 4	Class 5
Prevalence for male	36.44%	19.84%	19.87%	23.85%	0.00%
Prevalence for female	66.08%	0.00%	17.66%	0.00%	16.26%
Wave 1 delinquency	<b>0.90 (0)</b> 0.10 (1) 0.00 (2)	0.10(0) 0.31 (1) <b>0.59 (2)</b>	<b>0.61 (0)</b> 0.32 (1) 0.06 (2)	<b>0.48 (0)</b> <b>0.40 (1)</b> 0.12 (2)	0.10 (0) <b>0.47 (1)</b> <b>0.43 (2)</b>
Wave 1 violence	<b>0.91 (0)</b> 0.08 (1) 0.01 (2)	0.17 (0) 0.22 (1) <b>0.61 (2)</b>	0.32 (0) 0.36 (1) 0.32 (2)	<b>0.82 (0)</b> 0.18 (1) 0.00 (2)	<b>0.48 (0)</b> 0.27 (1) 0.25 (2)
Wave 2 delinquency	<b>0.92 (0)</b> 0.07 (1) 0.01 (2)	0.25 (0) 0.29 (1) <b>0.46 (2)</b>	<b>0.73 (0)</b> 0.23 (1) 0.04 (2)	<b>0.58 (0)</b> 0.30 (1) 0.11 (2)	0.26 (0) 0.39 (1) 0.35 (2)
Wave 2 violence	<b>0.95 (0)</b> 0.05 (1) 0.00 (2)	0.35 (0) 0.22 (1) <b>0.42 (2)</b>	<b>0.49 (0)</b> 0.33 (1) 0.19 (2)	<b>0.90 (0)</b> 0.08 (1) 0.02 (2)	<b>0.65 (0)</b> 0.21 (1) 0.14 (2)
Wave 3 delinquency	<b>0.90 (0)</b> 0.08 (1) 0.02 (2)	<b>0.50 (0)</b> 0.21 (1) 0.29 (2)	<b>0.84 (0)</b> 0.13 (1) 0.04 (2)	<b>0.43 (0)</b> 0.32 (1) 0.26 (2)	<b>0.79 (0)</b> 0.12 (1) 0.09 (2)
Wave 3 violence	<b>0.97 (0)</b> 0.03 (1) 0.00 (2)	<b>0.54 (0)</b> 0.19 (1) 0.27 (2)	<b>0.79 (0)</b> 0.15 (1) 0.06 (2)	<b>0.64 (0)</b> 0.20 (1) 0.16 (2)	<b>0.94 (0)</b> 0.03 (1) 0.02 (2)

Table 16.

Mean (SD) of antisocial behavior by class

	Classes				
	Never	Decliner	Desister	Chronic	Nonviolent desister
Wave 1 delinquency	0.115 (0.319)	1.528 (0.730)	0.982 (0.764)	0.719 (0.713)	1.208 (0.711)
Wave 1 violence	0.134 (0.381)	1.717 (0.614)	1.432 (0.681)	0.281 (0.472)	0.229 (0.421)
Wave 2 delinquency	0.055 (0.228)	1.317 (0.837)	0.774 (0.797)	0.583 (0.697)	1.206 (0.579)
Wave 2 violence	0.088 (0.315)	1.359 (0.801)	1.034 (0.794)	0.154 (0.421)	0.040 (0.179)
Wave 3 delinquency	0.094 (0.318)	1.275 (0.802)	0.211 (0.496)	0.889 (0.823)	0.364 (0.692)
Wave 3 violence	0.035 (0.195)	1.235 (0.856)	0.206 (0.490)	0.662 (0.798)	0.021 (0.144)

Table 17.

Beta parameters and odds ratio (OR) among males in the first model

	Reference						
	Never	Chronic		Decliner		Desister	
		Beta	OR	Beta	OR	Beta	OR
Neighborhood disadvantage	-2.600	0.074	-2.917	0.054	-0.738	0.478	
Family support	0.447	1.564	-0.234	0.791	-0.133	0.875	
Family protection	-0.984	0.374	-1.854	0.157	-0.851	0.427	
Parent talk	0.691	1.995	1.843	6.312	0.548	1.730	
School problem	0.782	2.185	2.669	14.426	1.540	4.663	
GPA	-0.465	0.628	-0.483	0.617	-0.781	0.458	

*all p < .0001.*

Table 18.

Beta parameters and odds ratio (OR) among females in the first model

	Reference	
	Never	Desister
	Beta	OR
Neighborhood disadvantage	-1.326	0.265
Family support	-0.407	0.666
Family protection	-0.851	0.427
Parent talk	0.586	1.796
School problem	1.990	7.312
GPA	-0.558	0.572

*all p < .0001.*

Table 19.

Beta parameters and odds ratio (OR) among males in the second model

	Reference						
	Never	Decliner		Desister		Chronic	
		Beta	OR	Beta	OR	Beta	OR
Neighborhood disadvantage	-2.220	0.109	-0.562	0.570	-2.373	0.093	
Family support	-0.240	0.787	0.610	1.840	0.293	1.340	
Family protection	-1.576	0.207	-0.900	0.407	-0.761	0.467	
Parent talk	1.504	4.500	0.715	2.043	0.505	1.657	
School problem	2.404	11.071	2.430	11.355	-0.590	0.554	
GPA	-0.702	0.496	-0.766	0.465	-0.289	0.749	

*all p < .0001.*

Table 20.

Beta parameters and odds ratio (OR) among females in the second model

	Reference				
	Never	Desister		Nonviolent desister	
		Beta	OR	Beta	OR
Neighborhood disadvantage		2.468	11.795	-7.108	0.001
Family support		-0.182	0.833	-0.537	0.584
Family protection		-0.517	0.596	-1.024	0.359
Parent talk		0.511	1.667	0.472	1.604
School problem		2.850	17.282	1.440	4.220
GPA		-0.622	0.537	-0.599	0.549

*all p < .0001.*

Table 21.

Young adulthood outcome proportions by class

	Classes					
	Overall	Never	Decliner	Desister	Chronic	Nonviolent desister
Current married	12.94%	11.76%	5.5%	17.08%	3.74%	13.14%
Have a high school diploma	80.04%	86.03%	64%	69.25%	83.67%	85.17%
In college	52.04%	59.73%	37.50%	35.87%	57.31%	61.02%
Have at least one child	20.74%	20.20%	12.65%	32.71%	7.47%	25.74%

## Appendix B

### Figures

Figure 1.

Developmental trajectories of aggregated antisocial behavior in four-class model

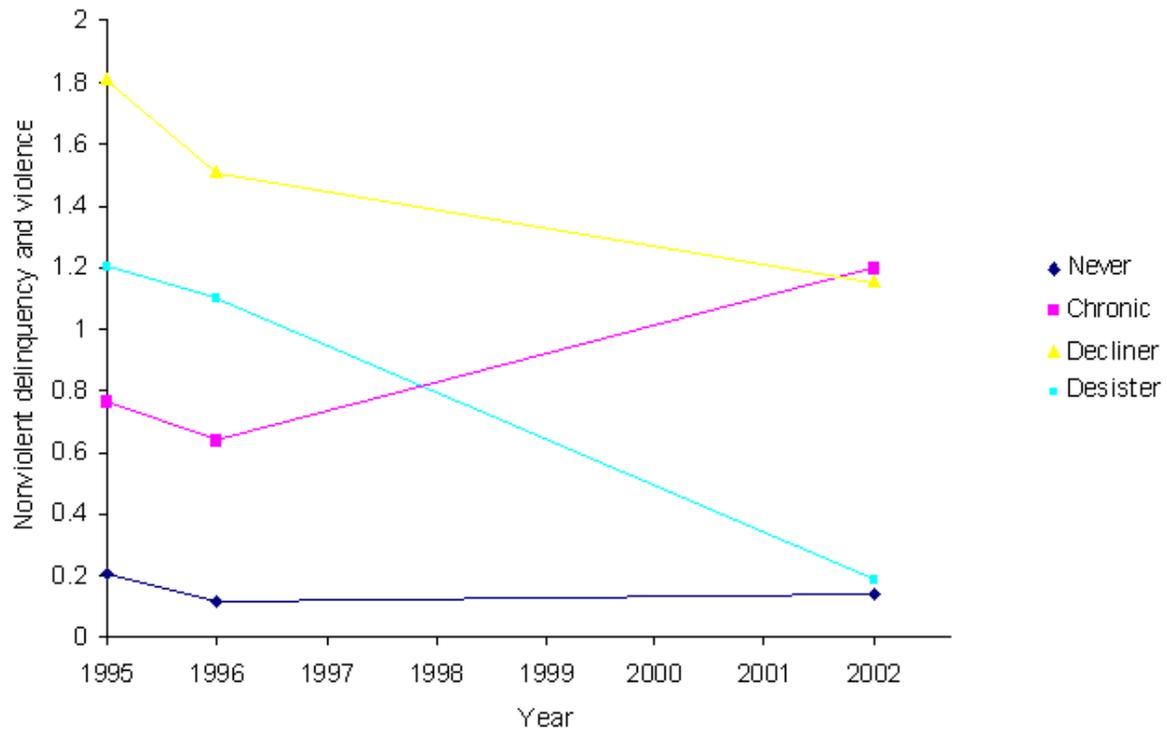


Figure 2.

Developmental trajectories of segregated antisocial behavior in four-class model among males

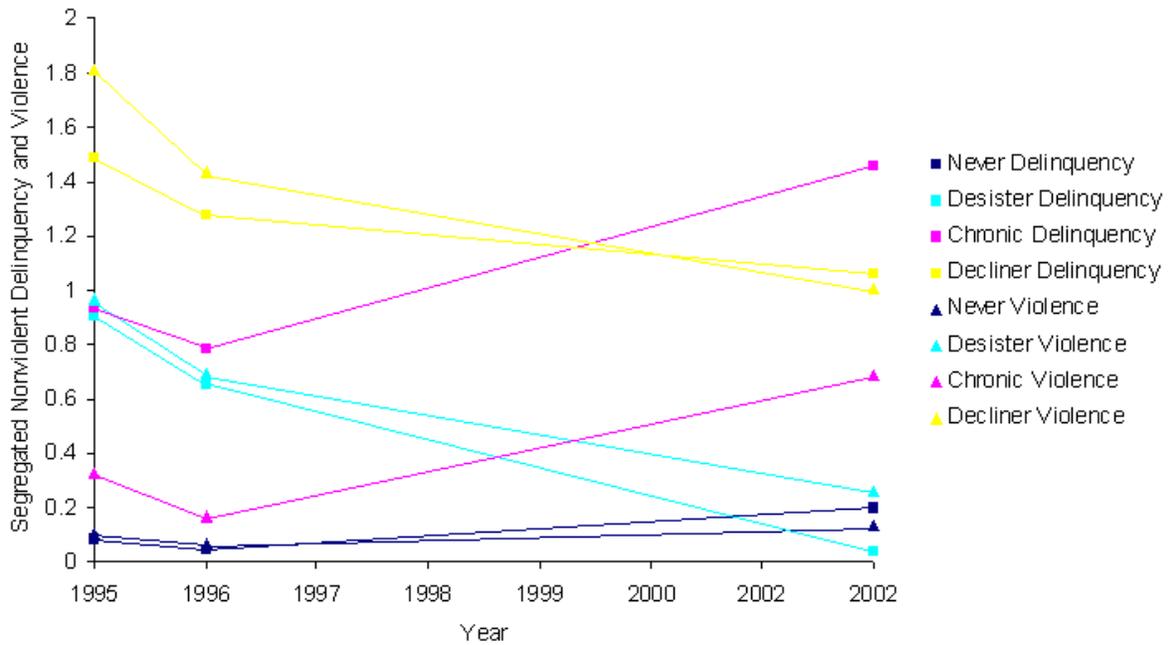


Figure 3.

Developmental trajectories of segregated antisocial behavior in three-class model among females

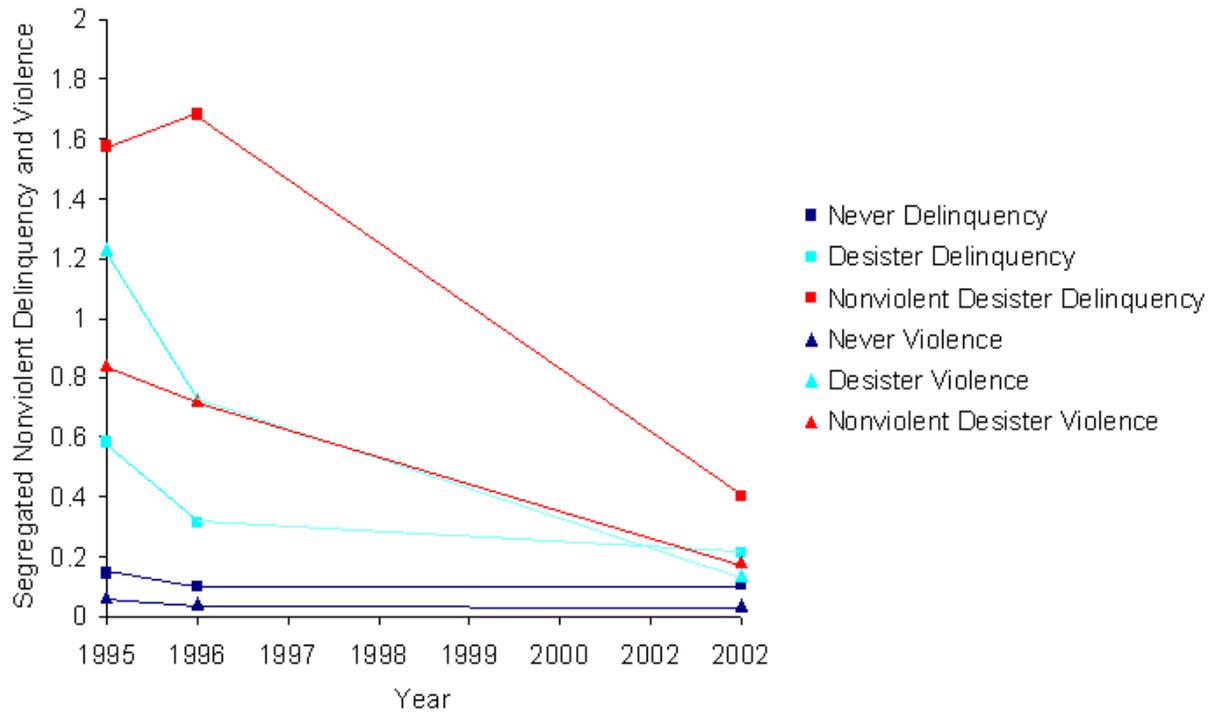


Figure 4.

Developmental trajectories of segregated antisocial behavior in five-class model

