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**LATE CHILDHOOD RISK FACTORS
ASSOCIATED WITH CONDUCT DISORDER
SUBTYPES IN EARLY ADOLESCENCE:**

A LATENT CLASS ANALYSIS
OF A CANADIAN SAMPLE

Research Report: 2012-2

NATIONAL CRIME PREVENTION CENTRE / CENTRE NATIONAL DE PRÉVENTION DU CRIME

ACTING TO PREVENT
CRIME
AGIR POUR PRÉVENIR

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La présente publication est aussi disponible en français. Elle s'intitule : Facteurs de risque de la petite enfance associés aux sous-types de troubles des conduites au début de l'adolescence : analyse de structure latente d'un échantillon canadien.

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EXECUTIVE SUMMARY

Background: Very few studies have investigated the association between risk factors in late childhood and subtypes of conduct disorder (CD) in early adolescence that comprise such heterogeneous symptoms as aggression, destruction of property, theft and serious violations of rules. Previous research has identified four distinct subtypes: *No CD* type (82.4%), *Non-Aggressive CD* (NACD) type (13.9%), *Physically Aggressive CD* (PACD) type (2.3%) and *Severe-Mixed CD* (SMCD) type (1.4%). These subtypes suggest that there can be multiple pathways to CD that can have similar or different risk factors depending on the qualitative or quantitative aspects of the CD profiles. The aim of the present study was to identify late childhood risk factors in multiple domains, such as neighbourhood characteristics, family adversity, parenting/peer relationships and externalized/internalized behaviours that are common and specific to the four CD subtypes. **Methods:** Data on CD symptoms and risk factors were collected using the National Longitudinal Survey of Children and Youth. Three cohorts of 12- and 13-year-olds were assessed during 1994–1995, 1996–1997 and 1998–1999 ($N = 4,125$). **Results:** Bivariate analyses revealed that out of 12 risk factors, 10 were associated with SMCD, 9 were associated with PACD and 10 were associated with NACD. In contrast to No CD subtype, multivariate analyses revealed that older age, non-intact family, family mobility and hyperactivity/inattention were predictors of SMCD. Males in the younger age category with family mobility and high physical aggression were associated with PACD. NACD was characterized by males in the older age category and with non-intact family, family mobility, coercive/ineffective parenting and deviant peers. **Conclusion:** Although there are many subtypes of CD, our findings suggest that there is more commonality than differences in risk factors. Components of family adversity, parenting practices and hyperactivity/inattention should be the focus of prevention and intervention efforts. **Keywords:** DSM-V, Conduct Disorder, latent class analysis, adolescence, predictive validity. **Abbreviations:** CD: Conduct Disorder; NACD: Non-Aggressive Conduct Disorder; PACD: Physically Aggressive Conduct Disorder; SMCD: Severe-Mixed Conduct Disorder; DSM: Diagnostic Statistical Manual; CBCL: Child Behaviour Checklist.

Late Childhood Risk Factors Associated with Conduct Disorder Subtypes in Early Adolescence: A Latent Class Analysis

During adolescence, antisocial and rule-breaking behaviour is wide-ranging, from school truancy to sexual assault and other extreme forms of property and violent offences. The configuration of problem behaviours and mostly the presence or absence of physical aggression has been central to better understanding the origins and consequences of behavioural problems (Tremblay 2010). Although many researchers have highlighted this limitation, *DSM-IV* focuses more on the age of onset of conduct disorder (CD) rather than on the qualitative nature of the symptoms (e.g., aggressive vs. non-aggressive, or the severity of behaviours). The *DSM* diagnosis has often been criticized as being too broad to be useful for clinicians or for researchers who try to define causes of specific phenotypes. The present study investigates three subtypes of CD that were previously identified through latent class analysis by looking at risk factors in late childhood (i.e., age 10–11) that could discriminate them. Although age of onset of CD is a very important piece of information, we think that other aspects of the symptomatology should also be taken into account.

There is longstanding theoretical consensus based on major longitudinal cohort studies that either the most chronic or the most severe criminal behaviours occurring in adulthood originate from persistent disruptive behaviours (e.g., physical aggression, hyperactivity, opposition) in childhood or conduct problems during adolescence (e.g., theft, vandalism and violence) (Loeber, Burke and Pardini 2009a; Tremblay 2010). One of the most important individual risks of a long-term adult criminal lifestyle is the presence of childhood or adolescent onset CD (Moffitt et al. 2008; Odgers et al. 2007). In the *DSM-IV*, CD is defined as a “repetitive and persistent pattern of behaviour in which the basic rights of others or major age appropriate societal norms or rules are violated” (American Psychiatric Association 1994). Although the *DSM-IV* defines CD as a unified general construct, a recent cohort study of 4,125 youth found that frequent rule-breaking and aggressive and non-aggressive antisocial behaviour symptoms tend to cluster in distinctive youth groups (Lacourse et al. 2010). In this study, latent class analysis identified four subtypes: *No CD* (82.4%); *Non-Aggressive CD* (NACD, 13.9%); *Physically Aggressive CD* (PACD, 2.3%); and *Severe-Mixed CD* (SMCD, 1.4%). Although risk factors for violent and non-violent delinquency have been identified in some studies, few have investigated the risk factors associated with subtypes of CD that present distinctive behaviour patterns. This is particularly important because a major criticism of the CD construct is that it is conceptually and operationally too broad to be used to distinguish serious and violent young offenders from less serious young offenders, either for clinical diagnosis and treatment planning or to identify risk for future offending (Moffitt et al. 2008).

Developmental pathways of CD, delinquency and violence

Our subtyping analysis has provided empirical support for the multiple pathway model developed by Loeber and others (1993). This model describes three developmental pathways toward serious forms of delinquency: 1) an overt pathway, which starts with minor aggression, has physical fighting as a second stage and more severe violence as a third stage; 2) a covert pathway before age 14, which starts with minor covert acts (stealing at home), has property damage as a second stage and moderate to serious delinquency as a third stage; and 3) an authority conflict pathway prior to age 12, which is initiated with stubborn behaviours, followed by defiant behaviours in the second stage and authority avoidance behaviour (e.g., truancy) in the third stage. However, we were not able to identify empirically this third pathway or subtype because most of the relevant authority conflict behaviours were associated with the non-aggressive CD subtype. This could be related to the short observation period, at age 12 and 13 (Lacourse et al. 2010).

It is also important to point out that for a small proportion of children, progression on multiple pathways is more likely and reflects an increasing variety of problem behaviours over time (Loeber and Hay 1997). Nagin and Tremblay (1999) also found that early aggressive boys were at risk of committing covert acts, whereas boys engaging in covert acts and oppositional/defiant behaviours were less likely to develop aggression problems. As well, results from our previous study (Lacourse et al. 2010) suggest that youth who are classified in aggressive and non-aggressive CD subtypes during early adolescence are more likely to engage in violent and non-violent delinquency later during adolescence, whereas the severe/mixed subtype is, by far, the most at risk for serious delinquency in late adolescence.

Risk factors associated with CD

As noted by Loeber, Burke and Pardini 2009b, many studies have found bivariate relationships between risk factors from multiple domains that are associated with violent and non-violent delinquency, including neighbourhood, school, peer, family, behavioural, cognitive and biological characteristics. Many of these risk factors are evident in early childhood while others appear later, during adolescence (for a review, see Lipsey and Derzon 1998; Loeber, Burke and Pardini 2009b; Loeber and Hay 1997).

However, when subject to multivariate analyses, the risk factors exhibited far less consistency that remained significant (Lacourse, Dupéré and Loeber 2008; Loeber, Burke and Pardini 2009a). Clearly, as an initial step in understanding CD subtypes, it is critical to identify potential distinctive sets of risk factors through a multivariate analysis. A multidisciplinary approach utilizing risk factors from developmental psychopathology, psychiatry, criminology and sociology is theoretically essential. The subsequent step is to address the following two questions:

- 1) What are the risk factors associated with CD and what are their independent contributions and strengths?
- 2) How are these risk factors specific to subtypes of CD?

According to Loeber and others (2009a), risk factors are defined as events or conditions that are associated with an increased probability of a negative event such as a CD diagnosis. In addition, these researchers distinguish risk factors from promotive and protective factors, which are associated with a lower probability of a negative event. In the present study, we focus mainly on the additive effects of risk factors that increase the probability of presenting different subtypes of CD. Risk factors can arguably be considered as the inverse of a protective factor; thus, including both would create redundancy.

The present study focuses on social processes that are relevant to the aetiology of CD. It includes neighbourhood, family, peer and individual propensities, such as hyperactivity/inattention and physical aggression, and internalized symptoms, such as anxiety and depression.

Age

Age is one of the best predictors of the prevalence and frequency of delinquency and CD. In general, studies have found that the prevalence of non-aggressive delinquency increases with age during adolescence. In contrast, the prevalence and frequency of physically aggressive behaviours tends to decrease for most during the same period (Maughan et al. 2004; Nagin and Tremblay 1999). However, the frequency and severity of delinquency and violence generally increases with age in some youths until age 20 and decreases afterward (Barker et al. 2007; Lacourse et al. 2002; Lacourse, Dupéré and Loeber 2008; Loeber et al. 1993).

Gender

During childhood, there is a consensus that the development of disruptive behaviours is slightly more prevalent among boys than girls and boys generally show more risk factors early in their development (e.g., hyperactivity, learning and developmental disorders) (Tremblay 2010). Differences between the genders become more striking during adolescence and emerging adulthood when males far outnumber girls in terms of the prevalence, frequency and seriousness of violence and delinquency. Specifically, more chronic and serious violence by adolescent boys increases in relation to deviant peer and gang membership, especially in neighbourhoods that suffer from structural problems such as a high concentration of poverty, low collective efficacy (e.g., social cohesion, trust and informal social control of youth' behaviour) and high mobility rates (Sampson, Raudenbush and Earls 1997; Wikström and Sampson 2003).

Neighbourhood characteristics

The most prominent contemporary researchers who studied the centrality of neighbourhood risk factors are Sampson and Laub (1993; 1994). Following the lead of their theoretical predecessors from the Chicago School who examined neighbourhood social disorganization, they confirmed that the most prevalent serious violent and non-violent delinquency is often concentrated in urban areas and mostly in disadvantaged neighbourhoods. Impoverished and racially segregated neighbourhoods are more at risk of serious delinquency, apparently, because of a reduced capacity for "collective efficacy" (Sampson, Morenoff and Gannon-Rowley 2002; Sampson, Raudenbush and Earls 1997). Consistent with Sampson's pioneering work, we considered two neighbourhood structural characteristics likely to influence the social control and socialization of teenagers: concentrated economic disadvantage and residential instability. Concentrated economic disadvantage reduces residents' collective efficacy, potentially because it reduces local resources for supervising youth and generates feelings of exclusion and powerlessness. High rates of residential instability (i.e. high rates of both residential turnover and renter-occupied dwellings) is also associated with reduced collective efficacy because in residentially unstable neighbourhoods there is less time for neighbours to get to know one another and develop trust.

Family SES

Socioeconomic status (SES) has been central to most classical sociological explanations of delinquency, with low SES theoretically related to a higher frequency of delinquency primarily because it exposes youth to most of the risk factors discussed above. Yet, most of the empirical research has found no link or very weak negative correlations between SES and involvement in delinquency. In effect, despite the concentration of serious delinquency in visibly impoverished neighbourhoods and single-parent families, the impact of SES appears to be indirect (Tittle, Villemez and Smith 1978). Although not explored in the present study, specific components of SES, such as the level of education of the mother, can be another potential explanation (Nagin and Tremblay 2001). More empirical research is needed to explore the link between SES and CD subtypes.

Family structure

The profile of Canadian families has changed fundamentally, with more than half of adolescents living with only one biological parent. This is critical since there is a longstanding consensus in the sociological, psychological and criminological literature that “broken homes” are an important risk factor for physical aggression during childhood (Tremblay et al. 2004) and adolescence (Nagin and Tremblay 1999). Family structure is thought to have mainly an indirect effect on conduct problems, through poor child monitoring, harsh and inconsistent discipline, and stressful life events such as economic hardship (Loeber and Hay 1997). While debate continues about the relationship between specific parenting practices and conduct problems, there is overwhelming evidence that inconsistent and excessively harsh parenting styles are important in the development of conduct problems (Trentacosta et al. in press). Again, the link between family structure and CD subtypes still needs to be explored.

Family mobility

Family mobility is a risk factor identified in aggregate-level studies that link geographic data on residential mobility with neighbourhood or city-level violence (Sampson, Raudenbush and Earls 1997). However, much fewer studies examine the relationship between residential mobility at the individual level, especially with regard to the development of CD subtypes in early adolescence. Some recent models attempt to explain how family mobility disrupts critical child and adolescent social ties with peers as well as significant adults. In effect, residential relocation can negatively affect not only parent-child relationships but also other significant relationships at school and in the community (Adam, Gunnar and Tanaka 2004). Also, residential relocation can reduce social capital and informal social control (Haynie and South 2005). One result is the increased likelihood of engaging in deviant peer social networks. Mobile youth more frequently report having fewer close friends, less personal intimacy with them and feeling less central in the peer network. Friends’ involvement in deviance also appears to be the more likely mediator of subsequent involvement in delinquency among mobile youth (Dupéré et al. 2007; Haynie and South 2005).

Coercive/ineffective parenting

The persistence of problem behaviours results, in part, from parents who react to agitated and irritable children with coercive, hostile and inconsistent discipline. The children then learn this negative style of social interaction and generalize it to other interpersonal relationships (e.g., peers and teachers) that evoke similar negative responses. Granic and Patterson (2006) ascribe the causes of problem behaviours more to the coercive child-parent interactions and parental acquiescence, or “giving up”, rather than to the early neurocognitive deficits of the child (Patterson, DeGarmo and Knutson 2000; Reid, Patterson and Snyder 2002). During the past 40 years, researchers have elaborated on the specific patterns of positive and negative reinforcement that lead to an escalation in disruptive behaviours within the family and later, with peers. When parents eventually withdraw from conflicts with their children, their inconsistent parental discipline reinforces the coercive and disruptive behaviours because children learn that their coercive behaviours ultimately can succeed in intimidating peers and adults into accepting their demands (Reid, Patterson and Snyder 2002). Subsequently, this coercive social interaction style can lead to peers’ rejection (Barker et al. 2008) and to affiliation with disruptive or deviant peers as early as elementary school (Snyder et al. 2005).

Peers

The peak ages in the onset of offending occur after puberty and the prevalence of offending increases during adolescence since more than half of youth commit some type of offence, typically minor property crimes, during adolescence (Piquero et al. 1999). Similar trends are evident for deviant peer affiliations (Lacourse et al. 2003; Warr 1993; 2002). However, these youth criminal careers usually involve intermittent offending, which usually ends abruptly in early adulthood. In other words, breaking the law at least once during adolescence appears to be the norm. Several risk factors for offending emerge in adolescence that can explain why some youth with no childhood behavioural problems suddenly engage in antisocial and delinquent behaviours. According to Moffitt (1993) and to Patterson, DeBaryshe and Ramsey (1989), association with deviant peers constitutes the key risk factor. Adolescent peers, often older, who have an early onset delinquent trajectory, become role models for adolescents who seek autonomy from parents and other authority figures. Generally, they seek adult-like privileges such as sexual partners and financial independence. It is this adult “social mimicry” that motivates late onset adolescents to fill a “maturity gap” (e.g., incongruence between biological age and desired adult social status) by associating with antisocial peers and adopting their lifestyles. Granic and Patterson (2006) again assert that ineffective (e.g., too rigid, authoritarian) parent-adolescent interactions involving conflicts related to autonomy and inadequate supervision are central in explaining late onset trajectories. Conversely, more flexible parent-child/adolescent relationships, though with clear boundaries, favour a better regulation of adolescent emotional and problem-solving skills, and the avoidance or mitigation of late onset delinquency.

Externalized and internalized behaviour disorders

In a recent review of youth disruptive behaviours, Tremblay (2010) noted that, in nearly all longitudinal studies throughout many countries, violent youth often have disruptive behaviours in childhood, mostly physical aggression and impulse control problems related to attention-deficit hyperactivity disorder (ADHD). However, many studies aggregate disruptive behaviours such as physical aggression and hyperactivity/inattention with verbal aggression, indirect aggression, proactive/reactive aggression and oppositional behaviours more generally. Tremblay (2010), instead, emphasizes the importance of specifically assessing physical aggression as the primary predictive behavioural risk factor. Equally important, he and others assert the most effective strategy for prevention is to target chronically physically aggressive children rather than directing scarce program resources to the broader category of troublesome children (Nagin and Tremblay 1999; Tremblay 2010).

Although Nagin and Tremblay’s 1999 study found a strong relationship between chronic physical aggression and later violence, and a relationship between chronic oppositional behaviour and theft, other empirical longitudinal studies identified a strong relationship between hyperactivity/inattention and both later delinquency and conduct problems (Thapar, Harrington and McGuffin 2001). The latter relationship is central to one of the most dominant theories in criminology, Gottfredson and Hirschi’s *General Theory of Crime* (1990), which asserted the predominance of self-control. They argued that several empirical associations are critical to the self-control theory of crime: 1) the age-crime curve is invariant across social groups, societies and historical periods and, therefore, cannot be culturally explained; 2) criminals do not specialize in offences but are versatile in a range of deviant behaviours; and 3) crime is overwhelmingly stable across the life course. The key to persistent criminality is impulsiveness, the inability to delay gratification and the abnormal seeking of excitement through high-risk behaviours. Central to the final trait is criminal offending versatility (i.e., a wide range of types of criminal offending are thrill-seeking and fulfilling). The variation of crime by age is simply explained by the opportunities and abilities to commit crimes increasing with age during adolescence, and rapidly declining in early adulthood with stable employment and family responsibilities. Over and above self-control issues, Tremblay and others’ model (2004) anxiety or internalized disorders in childhood as a strong protective factor from involvement in deviance and delinquency (Lacourse et al. 2006; Tremblay et al. 2004). We will again test this proposition with the multiple CD subtypes as outcomes.

Methods

Sample

Participants were selected among the 6,168 12- and 13-year-olds who participated in cycle 2 ($n = 2,258$), cycle 3 ($n = 2,055$) and cycle 4 ($n = 1,855$) of the National Longitudinal Survey of Children and Youth (NLSCY). The NLSCY was launched in 1994–1995, with follow-up surveys conducted every two years thereafter. The sample design employed is a clustered probability sample of private households within the 10 Canadian provinces, excluding children living in remote areas, institutional settings and on First Nations reserves. The sample was approximately evenly distributed across both genders. In the present study, we selected participants who were aged 12–13 years at the first three data collection cycles, and who had complete data on the age 10–11 risk factors and on self-reported CD symptoms. The response rate was 67% ($n = 4,125$) at age 12–13 years based on these selection criteria. To take into account attrition, non-response and the stratified sampling design of the NLSCY, all analyses were conducted using normalized longitudinal survey weights provided by Statistics Canada. Techniques to correct for missing data, such as multiple imputations, were used to compare parameter estimates of models based on imputed and listwise datasets. Since the results were similar when using various techniques, we selected listwise deletion coupled with the use of longitudinal survey weights as the most optimal analytic procedure.

Measures

Age 10–11 risk factors. Every two years since the beginning of the NLSCY, data on children have been collected by interview or by questionnaire using responses from multiple informants, specifically the person who is the most knowledgeable about the child (PMK) (usually the mother), the teacher, and the child himself or herself. The NLSCY includes a large number of questions to measure many facets of childhood behaviours (e.g., hyperactivity, physical aggression) and quality of relationships (e.g., coercive/ineffective parenting, deviant peer affiliation). Most of the items were adapted from the Montreal Longitudinal and Experimental Study and the Child Behaviour Checklist (CBCL), thus providing scales that have strong psychometric properties and have been validated on multiple occasions. We categorized continuous scales to assess linear or non-linear dose-response relationship, as this procedure has been used effectively in some previous studies (Lacourse, Dupéré and Loeber 2008; Nagin and Tremblay 1999).

Family SES was measured through a Statistics Canada index based on parental education, parental professional attainment and household income. The index ranged from -3.51 to 2.80 ($M = 0.00$; $SD = 0.69$). The *nonintact family* variable distinguished those who were not living with either biological or adoptive parents from those living in intact families. Neighbourhood characteristics were measured using the 2001 Census of Canada. Two neighbourhood disadvantage scales were derived, with one representing concentrated economic disadvantage and the other representing residential instability. For more details see Dupéré and others (2007).

Hyperactivity/inattention symptoms were adapted from the CBCL and measured based on a PMK-reported scale with eight items (e.g., can't sit still or is restless, is hyperactive, is impulsive or acts without thinking). This scale has been validated in two previous studies. Scores ranged from 0 to 16 ($M = 4.14$, $SD = 3.55$), and 15% of youth were classified as high level, 35% as medium level and 50% as low level of hyperactivity/inattention. The Cronbach alpha reliability coefficient was .85.

Physical aggression/bullying symptoms were measured with a PMK-reported six-item scale (i.e., gets into many fights, reacts with anger and fighting, threatens people, is cruel, bullies or is mean to others). A similar scale has been used in a number of previous studies (Nagin and Tremblay 2001; Nagin and Tremblay 1999). Scores ranged from 0 to 12 ($M = 1.21$, $SD = 1.74$), and 15% of youth were classified as high level, 35% as medium level and 50% as low level of physical aggression. The Cronbach alpha reliability coefficient was .84.

Coercive/ineffective parenting is based on Strayhorn and Weidman's Parenting Practices Scale and consists of seven PMK-reported items. Sample items include "How often do you get angry when you punish (name)?" and "How often do you get annoyed with (name) for saying or doing something he/she is not supposed to do?" High scores reflect a coercive parenting style: hostile, angry and reactive. Scores ranged from 0 to 25 ($M = 8.79$, $SD = 3.84$), and 15% of youth were classified as being exposed to high level, 55% as medium level and 30% as low level of coercive parenting. The Cronbach alpha reliability coefficient was .78.

Deviant peer affiliation was measured by one PMK-reported item: "In the past 12 months, was your child part of a group that did bad things?" The answer format for this item was binary (yes/no) and the prevalence was found to be 9.6%. Similar single items have been extensively used in youth gang research and represent a reasonable estimation of deviant peer affiliation membership.

Analysis

Predictors of CD subtypes were examined in two steps. First, we investigated the bivariate association between the predictors and the three CD subtypes in contrast to the No CD subtype. In a second step, we included all the predictors in the same analysis to assess their independent contribution to the probability of belonging to a subtype. Multinomial logistic regressions were used since the dependent variable is nominal (e.g., CD subtypes cannot be ordered in a meaningful way, and they consist of four distinct and mutually exclusive categories of adolescents). Parameter estimates take the form of odds ratios that represent the odds of being in the dependent variable category vs. the comparison category associated with a one-unit change on the independent variable (Maddala 1983). Based on these odds ratios, we were able to compute the predicted probabilities of being classified in each of the three distinct CD subtypes for individuals presenting 0, 1, 2, 3, 4, 5 or 6 risk factors. This way, we could better assess the strength of the prediction for different levels of risk.

Results

Bivariate analyses

Age and Gender

As presented in Table 1, age and gender are significant variables associated with CD subtypes. In contrast with the No CD class, being 13 instead of 12 ($OR = 2.2$; $95\% CI = 1.3-3.9$) and being male ($OR = 1.7$; $95\% CI = 1.0-3.0$) increased the risk of SMCD. Being 12 instead of 13 ($OR = .6$; $95\% CI = .4-.9$) and being male ($OR = 2.6$; $95\% CI = 1.7-4.0$) increased the risk of PACD. Being 13 instead of 12 ($OR = 1.4$; $95\% CI = 1.2-1.7$) and being male ($OR = 1.9$; $95\% CI = 1.6-2.3$) also increased the risk of NACD.

Neighbourhood characteristics

High neighbourhood instability ($OR = 2.7$; $95\% CI = 1.2-6.4$) increased the risk of SMCD. On the other hand, only moderate high neighbourhood economic disadvantage ($OR = 2.0$; $95\% CI = 1.1-3.9$) increased the risk of PACD. NACD was also characterized by moderate high ($OR = 1.6$; $95\% CI = 1.2-2.0$) and high neighbourhood economic disadvantage ($OR = 1.4$; $95\% CI = 1.1-1.9$), and high neighbourhood instability ($OR = 1.6$; $95\% CI = 1.2-2.1$).

TABLE 1: RISK FACTORS ASSOCIATED WITH CONDUCT DISORDER (CD) SUBTYPES

	Non-Aggressive CD vs. No CD		Physically Aggressive CD vs. No CD		Severe/Mixed CD vs. No CD	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Age						
12	—	—	—	—	—	—
13	1.39*	1.16–1.66	0.60*	0.39–0.90	2.23*	1.27–3.91
Gender						
Female	—	—	—	—	—	—
Male	1.89*	1.58–2.27	2.59*	1.67–4.03	1.74*	1.02–2.97
Family status						
Intact	—	—	—	—	—	—
Non-intact	1.68*	1.39–2.03	1.64*	1.07–2.51	3.28*	1.94–5.54
Family SES						
Low	—	—	—	—	—	—
Low moderate	1.02	0.79–1.30	0.83	0.49–1.38	1.29	0.65–2.54
Moderate high	0.77*	0.59–0.99	0.53*	0.30–0.93	0.72	0.34–1.53
High	0.80	0.60–1.05	0.46*	0.24–0.89	0.40	0.15–1.09
Neighbourhood instability						
Low	—	—	—	—	—	—
Low moderate	0.99	0.76–1.31	0.67	0.35–1.28	1.93	0.83–4.46
Moderate high	1.31	1.00–1.70	1.35	0.77–2.39	0.89	0.34–2.32
High	1.60*	1.21–2.11	1.37	0.73–2.55	2.71*	1.15–6.40

	Non-Aggressive CD vs. No CD		Physically Aggressive CD vs. No CD		Severe/Mixed CD vs. No CD	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Neighbourhood economic disadvantage						
Low	—	—	—	—	—	—
Low moderate	1.23	0.94–1.62	1.54	0.79–3.02	1.47	0.65–3.33
Moderate high	1.55*	1.19–2.03	2.04*	1.06–3.91	1.28	0.55–2.97
High	1.43*	1.07–1.92	1.70	0.83–3.48	1.90	0.81–4.43
Family mobility						
Low	—	—	—	—	—	—
Moderate	1.24	0.98–1.57	0.61	0.31–1.22	3.24*	1.84–5.72
High	1.95*	1.52–2.52	2.56*	1.56–4.22	2.03	0.90–4.58
Hyperactivity/inattention						
Low	—	—	—	—	—	—
Moderate	1.36*	1.11–1.67	2.24*	1.37–3.67	2.31*	1.18–4.52
High	1.88*	1.49–2.36	3.63*	2.17–6.05	5.00*	2.60–9.61
Physical aggression						
Low	—	—	—	—	—	—
Moderate	1.10	0.90–1.35	1.81*	1.11–2.97	0.71	0.36–1.39
High	1.53*	1.20–1.94	3.49*	2.08–5.86	2.46*	1.35–4.49
Internalized symptoms						
Low	—	—	—	—	—	—
Moderate	1.09	0.89–1.34	1.76*	1.11–2.80	2.43*	1.36–4.34
High	1.43*	1.13–1.81	2.30*	1.32–3.78	1.84	0.87–3.91
Deviant peers						
Few	—	—	—	—	—	—
Many	1.89*	1.45–2.45	1.40	0.74–2.65	3.52*	1.91–6.51
Coercive/ineffective parenting						
Low	—	—	—	—	—	—
Moderate	1.46*	1.18–1.81	1.48	0.86–2.52	1.11	0.57–2.16
High	1.52*	1.15–2.01	2.94*	1.63–5.30	2.59*	1.27–5.29

Note: Odds ratios (ORs) and 95% confidence intervals (CI) were estimated in bivariate multinomial logistic regressions weighted by longitudinal sample weights and posterior probabilities of assignment to the latent classes.

* Significant at the .05 level.

Family adversity

Three components of family adversity were considered: 1) non-intact family; 2) family SES; and 3) family mobility. Non-intact family ($OR = 3.3$; 95% $CI = 1.9-5.5$) and moderate family mobility ($OR = 3.2$; 95% $CI = 1.8-5.7$) were associated with SMCD. PACD was characterized by non-intact family ($OR = 1.6$; 95% $CI = 1.1-2.5$), by lower SES ($OR = 0.5$; 95% $CI = 0.2-0.9$) and by high mobility ($OR = 2.6$; 95% $CI = 1.6-4.2$). Non-intact family ($OR = 1.7$; 95% $CI = 1.4-2.0$) and high mobility ($OR = 2.0$; 95% $CI = 1.5-2.5$) increased the risk of NACD.

Externalized and internalized behaviour symptoms

Three behavioural risk factors were assessed: 1) hyperactivity/inattention; 2) physical aggression; and 3) internalized symptoms. Moderate ($OR = 2.3$; 95% $CI = 1.2-4.5$) and high hyperactivity/inattention ($OR = 5.0$; 95% $CI = 2.6-9.6$), high physical aggression ($OR = 2.5$; 95% $CI = 1.4-4.5$) and moderate internalized symptoms ($OR = 2.4$; 95% $CI = 1.4-4.3$) increased the risk of SMCD. In a similar fashion, moderate ($OR = 2.2$; 95% $CI = 1.4-3.7$) and high hyperactivity/inattention ($OR = 3.6$; 95% $CI = 2.2-6.1$), moderate ($OR = 1.8$; 95% $CI = 1.1-3.0$) and high physical aggression ($OR = 3.5$; 95% $CI = 2.1-5.9$), and moderate ($OR = 1.8$; 95% $CI = 1.1-2.8$) and high internalized symptoms ($OR = 2.3$; 95% $CI = 1.3-3.8$) increased the risk of PACD. Odds ratios were generally smaller for the NACD subtype. Moderate ($OR = 1.4$; 95% $CI = 1.1-1.7$) and high hyperactivity/inattention ($OR = 1.9$; 95% $CI = 1.5-2.4$), high physical aggression ($OR = 1.5$; 95% $CI = 1.2-1.9$) and high internalized symptoms ($OR = 1.4$; 95% $CI = 1.1-1.8$) were found to be risks for NACD.

Deviant peers

Deviant peers increased the risk of SMCD ($OR = 3.5$; 95% $CI = 1.9-6.5$) and NACD ($OR = 1.9$; 95% $CI = 1.5-2.5$) but not PACD.

Coercive/ineffective parenting

High coercive/ineffective parenting was associated with SMCD ($OR = 2.6$; 95% $CI = 1.3-5.3$), PACD ($OR = 2.9$; 95% $CI = 1.6-5.3$) and NACD ($OR = 1.5$; 95% $CI = 1.2-2.0$) subtypes. Moderate coercive/ineffective parenting was a risk factor only for NACD ($OR = 1.5$; 95% $CI = 1.2-1.8$).

Multivariate analyses

As shown in Table 2, multivariate analyses provide a slightly different picture than bivariate analyses since they control for the other variables included in the model, and emphasize the specific and additive effects of each variable in the prediction of the different subtypes.

TABLE 2: MULTIVARIATE RISK FACTORS ASSOCIATED WITH CONDUCT DISORDER (CD) SUBTYPES

	Non-Aggressive CD vs. No CD		Physically Aggressive CD vs. No CD		Severe/Mixed CD vs. No CD	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Age						
12	—	—	—	—	—	—
13	1.46*	1.22–1.76	0.63*	0.41–0.96	2.33*	1.31–4.15
Gender						
Female	—	—	—	—	—	—
Male	1.90*	1.57–2.30	2.42*	1.53–3.83	1.68	0.95–2.97
Family status						
Intact	—	—	—	—	—	—
Non-intact	1.43*	1.15–1.78	1.17	0.71–1.93	2.53*	1.37–4.68
Family SES						
Low	—	—	—	—	—	—
Low moderate	1.20	0.92–1.55	0.99	0.57–1.71	1.90	0.91–3.95
Moderate high	0.98	0.74–1.29	0.62	0.33–1.15	1.20	0.52–2.79
High	1.14	0.83–1.56	0.64	0.30–1.35	0.82	0.27–2.79
Neighbourhood instability						
Low	—	—	—	—	—	—
Low moderate	0.94	0.71–1.25	0.64	0.33–1.24	1.76	0.74–4.20
Moderate high	1.13	0.85–1.49	1.15	0.63–2.10	0.74	0.27–2.02
High	1.28	0.94–1.76	1.00	0.50–2.01	1.85	0.70–4.92
Neighbourhood economic disadvantage						
Low	—	—	—	—	—	—
Low moderate	1.14	0.85–1.51	1.33	0.67–2.67	1.21	0.51–2.84
Moderate high	1.25	0.93–1.68	1.38	0.67–2.83	0.87	0.35–2.18
High	1.12	0.80–1.57	1.07	0.48–2.40	0.94	0.35–2.57
Family mobility						
Low	—	—	—	—	—	—
Moderate	1.11	0.87–1.42	0.53	0.26–1.07	2.15*	1.17–3.96
High	1.52*	1.15–2.02	1.91*	1.08–3.37	0.99	0.40–2.42
Hyperactivity/inattention						
Low	—	—	—	—	—	—
Moderate	1.15	0.92–1.43	1.50	0.88–2.55	1.95	0.95–3.99
High	1.22	0.92–1.61	1.64	0.88–3.04	2.77*	1.24–6.15

	Non-Aggressive CD vs. No CD		Physically Aggressive CD vs. No CD		Severe/Mixed CD vs. No CD	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Physical aggression						
Low	—	—	—	—	—	—
Moderate	0.98	0.80–1.22	1.32	0.78–2.22	0.62	0.30–1.26
High	1.10	0.83–1.46	1.85*	1.00–3.45	1.26	0.61–2.57
Internalized symptoms						
Low	—	—	—	—	—	—
Moderate	0.96	0.77–1.20	1.41	0.86–2.32	1.83	0.98–3.43
High	1.10	0.83–1.45	1.23	0.67–2.27	0.88	0.37–2.09
Deviant peers						
Few	—	—	—	—	—	—
Many	1.41*	1.07–1.87	0.71	0.36–1.40	1.71	0.86–3.42
Coercive/ineffective parenting						
Low	—	—	—	—	—	—
Moderate	1.30*	1.03–1.63	0.98	0.55–1.73	0.77	0.37–1.59
High	1.15	0.83–1.59	1.46	0.73–2.94	1.17	0.50–2.76

Note: Odds ratios (ORs) and 95% confidence intervals (CI) were estimated in multivariate multinomial logistic regressions weighted by longitudinal sample weights and posterior probabilities of assignment to the latent classes.

* Significant at the .05 level.

No CD vs. SMCD

Age ($OR = 2.3$; $95\% CI = 1.3–4.2$) was a significant variable but gender was not. Non-intact family remained a strong predictor ($OR = 2.5$; $95\% CI = 1.4–4.7$) as well as moderate family mobility ($OR = 2.2$; $95\% CI = 1.2–4.0$). Only high hyperactivity/inattention ($OR = 2.8$; $95\% CI = 1.2–6.1$) was significant. Figure 1 presents the predicted probabilities of the SMCD class conditional on the number of risk factors an individual presents. We combined risk factors in a way that maximized the predicted probabilities.

No CD vs. PACD

Age ($OR = .6$; $95\% CI = 0.4–1.0$) and gender ($OR = 2.4$; $95\% CI = 1.5–3.8$) were significant variables associated with PACD. No neighbourhood characteristics were significant and only one family adversity characteristic, high family mobility ($OR = 1.9$; $95\% CI = 1.1–3.4$), was significant. High physical aggression ($OR = 1.9$; $95\% CI = 1.0–3.5$) was also a predictor of this subtype. Figure 2 presents the predicted probabilities of the PACD class conditional on the number of risk factors.

No CD vs. NACD

Age ($OR = 1.5$; $95\% CI = 1.2–1.8$) and gender ($OR = 1.9$; $95\% CI = 1.6–2.3$) were significant variables associated with NACD. Non-intact family ($OR = 1.4$; $95\% CI = 1.2–1.8$) and high family mobility ($OR = 1.5$; $95\% CI = 1.2–2.0$) were significantly associated, as were deviant peers ($OR = 1.4$; $95\% CI = 1.1–1.9$) and moderate coercive/ineffective parenting ($OR = 1.3$; $95\% CI = 1.0–1.6$). Figure 3 presents the predicted probabilities of the NACD class conditional on the number of risk factors.

Discussion

Using data from a longitudinal and nationally representative sample of Canadian youth, the present study examined the risk factors that distinguish four previously identified CD subtypes during early adolescence: *No CD* type; *Non-Aggressive CD* (NACD) type; *Physically Aggressive CD* (PACD) type; and *Severe-Mixed CD* (SMCD) type. As revealed in several previous studies (Lacourse, Dupéré and Loeber 2008), it is much easier to identify risk factors bivariately than multivariately because risk factors tend to cluster together or co-occur in the same children and families. Not surprisingly, most of the 12 risk factors were individually associated with one or more CD subtypes and, therefore, these risk factors somewhat failed to clearly discriminate the different subtypes. Most importantly, though, three theoretically key risk factors – 1) hyperactivity/inattention; 2) non-intact family; and 3) family mobility – were more predictive of the SMCD type and PACD type than of the NACD type. These three risk factors had odds ratios over three for the SMCD type and all three remained significant in the multivariate analyses. In effect, the least numerous but most versatile and severe CD type was predicted by these three risk factors.

The SMCD type is most prevalent among older adolescents, which confirms that the seriousness of CD increases with age in some children. The strong relationship between hyperactivity/inattention and chronic or severe CD trajectories was also confirmed (Nagin and Tremblay 1999; Shaw, Lacourse and Nagin 2005). CD and ADHD syndromes have several parallels; they are typically stable from the kindergarten period onward. Although only a small percentage of children present clinically elevated levels of hyperactivity/inattention symptoms, they often co-occur with serious CD symptoms (Barkley 2006; Beauchaine and Neuhaus 2008). Also, persistence and severity of CD is often related to the combination of child behaviour factors and family dysfunction and conflicts (Hinshaw and Lee 2003). Again, our bivariate and multivariate results are consistent with these typical patterns. However, coercive/ineffective parenting, and deviant peers, did not significantly predict SMCD. Yet, these predictors have been recently viewed as outcomes of disruptive, oppositional and aggressive childhood behaviours rather than as their causes (Lacourse, Dupéré and Loeber 2008; Lacourse et al. 2006; Loeber, Burke and Pardini 2009b). Clearly, these mixed empirical results leave the causal direction unresolved.

The PACD type includes mainly younger males and only family mobility was a significant predictor. This type is possibly akin to the DSM-III description of the “unsocialized” CD type, which includes pervasive abnormality, distinguished by social isolation in interpersonal relationships with other children, such as rejection and unpopularity. Bullying and excessive fighting at school are predominant symptoms and it is likely that social mobility can disrupt the ability of the child or adolescent to develop the normative social skills to integrate into peer groups – even deviant peer groups.

The NACD type is the most prevalent type. Its prevalence increases with age and, similar to the SMCD type, non-intact family and family mobility were significant risk factors along with coercive/ineffective parenting and affiliation with deviant peers. This CD subtype is similar to the covert type (Loeber et al. 1993), as well as the late onset or adolescent-limited type (Moffitt 1993; Patterson and Yoerger 1997). Although individual characteristics are less central to this CD type, a combination or the cumulative effect of interpersonal risk factors appears important. Identification of CD subtypes and risk factor analyses are best seen as tentative yet important theoretically, clinically and for youth/adult justice policy issues.

Limitations

Although we only investigated additive effects of risk factors, there could be interaction effects between specific risk factors. There are examples in the literature showing interaction effects between neighbourhood and individual characteristics such as neighbourhood instability and hyperactivity (Dupéré et al. 2007; for a review, see Schonberg and Shaw 2007). Even with a large NLSCY sample, our analyses and inferences are based on relatively small numbers of individuals. Indeed, because the NLSCY is a normative sample, few adolescents reported symptoms of SMCD or PACD. Replications of the results in studies oversampling at-risk adolescents but also including families from a range of neighbourhood contexts are necessary to assess the generalizability of our results. Finally, unobservable variable biases remain a potential problem, as for all other non-experimental studies, even if many neighbourhood, family and individual characteristics are included in the analyses.

Implications for Prevention Policies

While the results are necessarily tentative, several possible intervention policy implications can be drawn from this study. The heterogeneity of the CD youth and the relevant risk predictors for each type suggest that accurately diagnosing subtypes will likely assist in the determination of a more targeted intervention. This is particularly important because, as mentioned above, CD is a broad construct that covers a wide range of behaviours that cluster in distinctive patterns. Arguably, intervention programs need to vary according to the extensiveness and severity of subtypes. For example, the SMCD subtype rather obviously requires a more extensive treatment plan than the NACD subtype. The former subtype might benefit from a multisystemic intervention program that incorporates individual, family and neighbourhood risk factors (Center for the Study and Prevention of Violence 2006). Individuals with the PACD subtype would likely benefit more by having their higher likelihood of social isolation addressed, for example, with a Big Brother or Big Sister style of program and their residential stability needs through social housing programs. Clearly, research is needed to validate social and psychological prevention program effectiveness by conduct disorder subtype.

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Appendix

FIGURE 1 – PREDICTED PROBABILITIES OF BEING CLASSIFIED IN THE SEVERE-MIXED CATEGORY CONDITIONAL ON THE NUMBER OF RISK FACTORS

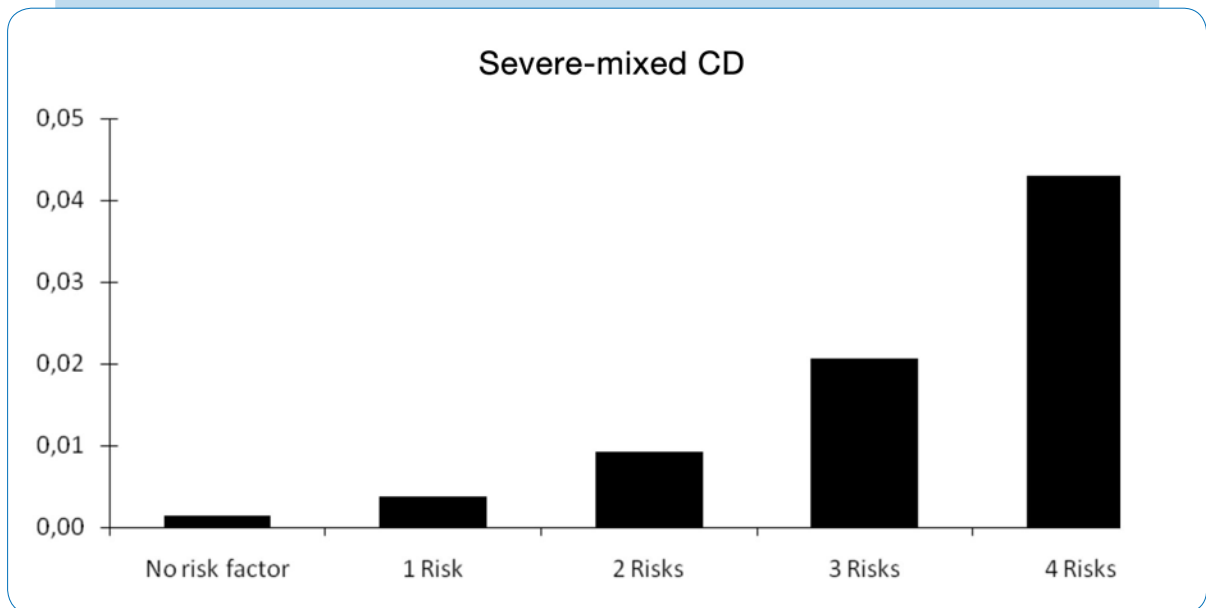


FIGURE 2 – PREDICTED PROBABILITIES OF BEING CLASSIFIED IN THE PHYSICALLY AGGRESSIVE CATEGORY CONDITIONAL ON THE NUMBER OF RISK FACTORS

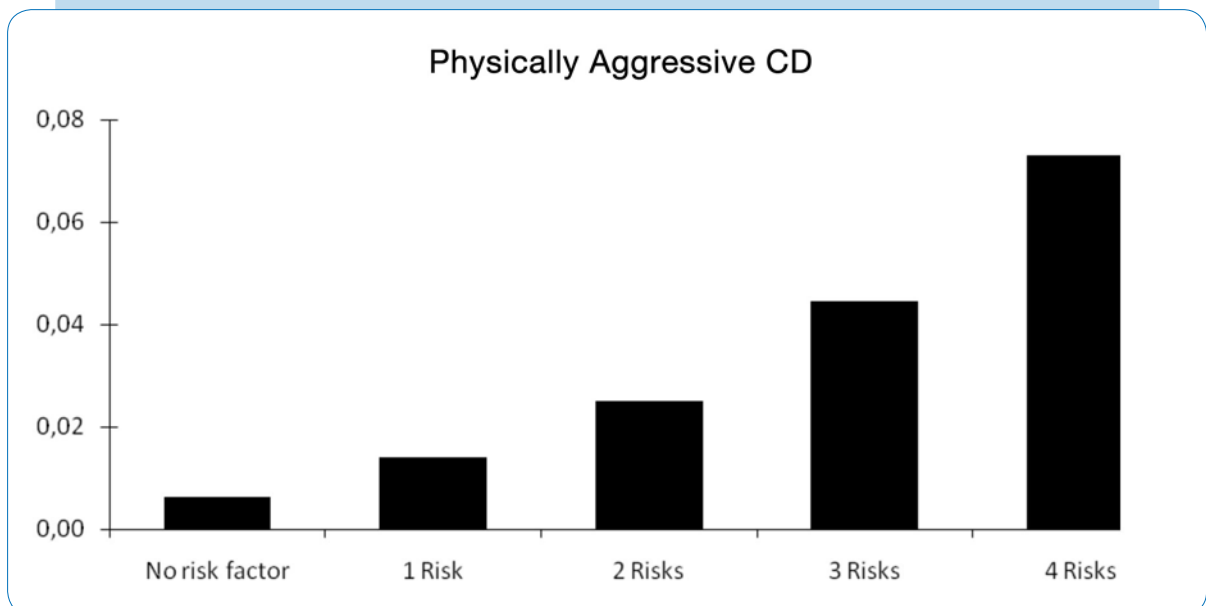


FIGURE 3 – PREDICTED PROBABILITIES OF BEING CLASSIFIED IN THE NON-AGGRESSIVE CATEGORY CONDITIONAL ON THE NUMBER OF RISK FACTORS

