

## GOVERNMENT COSTS ASSOCIATED WITH DELINQUENT TRAJECTORIES

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**Abstract:** The objectives of this project were to: (a) identify early trajectories of delinquency for both boys and girls at ages 8 (Grade 3), 11 (Grade 6), and 14 (Grade 9) in a longitudinal sample of 842 at-risk youth from a multi-informant perspective (i.e., parents, teachers, self-reported youth ratings), and (b) estimate the costs associated with each delinquency trajectory on utilization of resources in the criminal justice system, remedial education, health care and social services, and social assistance. The results indicated six distinct trajectories of delinquency: two low groups, two desisting groups, an escalator group, and a high delinquency group. There were significantly more females than males in the two *low delinquency* trajectory groups,  $p < .05$  for both analyses. Furthermore, both the youth from the two *desisters* trajectory groups (13% of the sample) and from the two most at-risk trajectories (*escalators* and *high delinquency*, 5% of the sample) each accounted for approximately 40% of the estimated costs to government. It is interesting to note that 80% of the estimated *Criminal Justice* costs were due to the *high delinquency* and *escalators* trajectory groups. Antisocial or delinquent girls cost society more money than antisocial or delinquent boys in all domains, with the exception of the *Social Assistance* domain. Implications for crime prevention are discussed.

**Key Words:** delinquency, trajectories, costs, risk, and protective factors

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Delinquency is one of the most prevalent problem behaviours engaged in by Canadian youth. Statistics Canada (Savoie, 2006) indicates that over one-third of youth have been involved in some form of delinquency by the age of 14 and that childhood delinquency tends to predict violent behaviours throughout the course of a lifetime. Although delinquency covers a wide range of behaviours, many of which do not go reported to the police, about 5% of Canadian youth have been charged with federal offences (Savoie, 2006). Engaging in delinquent behaviour has been linked to negative psychological, emotional, health, social, academic, employment, and criminal outcomes (Boyd et al., 2005; Lacourse, Nagin, Tremblay, Vitaro, & Claes, 2003; Marti, Stice, & Springer, 2010). There are significant individual, criminal, health, social, and societal costs associated with delinquency. The high intra-personal, interpersonal, and societal costs highlight the need to increase our understanding of delinquency behaviour before it emerges. In this paper, we examine the developmental trajectories of delinquency and provide an economic analysis of the costs tied to early pathways associated with delinquent behaviours, in order to inform prevention and intervention.

The objectives of this project were to: (a) identify early trajectories of delinquency for both boys and girls at age 8 (Grade 3), age 11 (Grade 6), and age 14 (Grade 9) in a longitudinal sample of 842 at-risk youth from a multi-informant perspective (i.e., parents, teachers, self-reported youth ratings); and (b) estimate the costs associated with each delinquency trajectory on utilization of resources in the criminal justice system (i.e., arrests and court appearances), remedial education (i.e., grade repetition and use of special education services from Grades 1 to 8), health care and social services (i.e., visits to a family physician, hospital emergency room use, serious injuries, overnight stays in a hospital, and family's involvement with the Children's Aid Society), and social assistance (i.e., families' receipt of welfare and disability payments).

### ***Development of Delinquent Behaviours***

A theory of delinquency needs to explain how differences in the frequency and severity of antisocial and criminal behaviours are associated with gender and age (e.g., Moffitt, 2001). Males are much more likely to commit crimes than females. Nonetheless, most of the literature agrees that the shape of the age-related changes is roughly the same for males and females (Maldonado-Molina, Piquero, Jennings, Bird, & Canino, 2009; Jennings, Maldonado-Molina, & Komro, 2010). Recently, Postlethwait, Barth, and Guo (2010) presented evidence that changes in delinquent behaviour may vary by level of depression and discipline for females and by level of substance use for males.

The frequency of offending increases with age through to late adolescence, peaks around the age of 16, and then begins to decline, continuing throughout adulthood (Carrington, Matarazzo, & de Souza, 2005; Moffitt, 2001). Furthermore, not all children participate in delinquent behaviours, but those involved at a young age are most at risk for further delinquent behaviour throughout their lives (Carrington et al., 2005; Loeber & Farrington, 1998). Research also shows that most people who are arrested for criminal offences begin their criminal behaviour in their teenage years and desist in their 20s (Loeber & Farrington, 1998; Moffitt, 2001). A small group of mostly male offenders exhibit pre-pubertal antisocial behaviour and commit a disproportionate number of serious and often violent offences as adults; among adult offenders, this latter group is the most persistent (e.g., Carrington et al., 2005; Moffitt, 2001).

Although the typical age-crime curve is depicted by a single line joining the rates of crime across the age range from early adolescence through adulthood, it reveals little about the development of criminal behaviour and about the variability in youths' level of involvement in delinquent behaviour. The goal of this paper is to identify the early trajectories of delinquency to increase our understanding of the developmental pathways of those who are most at risk for persisting in their offending patterns.

Recent methodological advances have allowed for a new statistical approach (PROC TRAJ<sup>1</sup>) to understanding the individual developmental patterns of delinquency. Previous studies categorizing children as delinquent have employed predetermined cut-off points in defining delinquency group membership. While these classifications may be theoretically reasonable, they do not necessarily exist naturally, and may be based on potentially misleading categorizations. Advancements in methodology for examining individuals' developmental trajectories provide researchers with the ability to transcend the use of these categorization procedures for identifying individual patterns of delinquency. Another advantage of this technique is that in contrast to hierarchical and latent growth curve modelling, it makes no assumptions regarding a continuous distribution of trajectories and therefore allows for the identification of distinct mixtures of trajectories within the population (Nagin, 1999). As well, instead of assuming heterogeneity among different trajectories, this method identifies the existing differences among groups. In addition, it is well suited for censored normal distributions in which a small, yet significant proportion of the population is affected (e.g., if 10% of children are engaged in serious, persistent delinquent activity). Finally, it treats missing data as random, thereby making full use of the data and reducing the need to over-sample for attrition.

Several studies have used trajectory analysis to distinguish individual patterns of delinquent behaviour from childhood to adolescence (e.g., Hoeve et al., 2008; Jennings et al., 2010; Schonberg & Shaw, 2007; Wiesner & Windle, 2006). A review of these studies highlights several important themes. First, on average, between three and six groups tend to be identified by the trajectory methodology, slightly more with self-reports than official records. Although there was a range in the number of trajectories found in each of these studies, there are three consistent trajectories identified (although differentially labelled). These trajectories include a low delinquency group (representing the majority of individuals who rarely engage in delinquent behaviour), a high delinquency group (representing a small minority of individuals who start high on delinquent behaviour and increase over time), and a desisting delinquency group (representing a minority of individuals who start with a fairly high level of delinquency but this behaviour decreases with time). In studies where more than three trajectories have been found, the three consistent groups are usually subdivided into other groups. For example, Lacourse et al. (2002) found six trajectories that included the three above as well as the low rising, low decline, and medium decline. Schonberg and Shaw (2007) identified four trajectories that included a moderate level that stays relatively consistent but engages in more delinquent activities than the abstaining group. Jennings et al. (2010) looked at seven different trajectory categories, and categorized them generally as increasing, stable, or desisting. The second important consistency across studies is that by the end of adolescence, most trajectory groups are on

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<sup>1</sup> PROC TRAJ is a statistical program that is designed to analyze data using a semi-parametric group-based trajectory approach (Jones, Nagin, & Roeder, 2001; Nagin, 1999, 2005)

the decline with respect to delinquent behaviour<sup>2</sup>. Third, across studies, there are more groups than proposed originally by Moffitt (2001).

There are, however, key methodological differences in these studies that may account for some of the differences in results. First, while all the studies included self-report measures, some also included court records (Hoeve et al., 2008) and teachers' and parents' ratings (Lacourse et al., 2002). Second, the studies varied with the geographical region. For example, some studies have participants from urban United States (Hoeve et al., 2008; Jennings et al., 2010) or urban French-speaking Canadians (Lacourse et al., 2002). Third, the studies varied with respect to the age of participants and have primarily focused on older students. Fourth, with the exception of Jennings et al. (2010) and Wiesner and Windle (2006), all of the studies only included boys. Although fewer girls than boys engage in high levels of problem behaviours, those girls who do start early and persist in antisocial behaviours experience mental health problems at levels equal to their antisocial male counterparts (Jennings et al., 2010; Odgers et al., 2008). Thus, there are limited data available on the trajectories of delinquency in girls. Fifth, some of the studies conceptualized delinquency broadly and examined externalizing behaviours (i.e., conduct problems, physical aggression, oppositional behaviour, hyperactivity) as opposed to delinquency (defined by violations of the Criminal Code). Sixth, studies varied with respect to the number of assessments and the timing of assessments used to derive the trajectories. Thus, the operationalizing of delinquency and the study design may in part influence the differences in the shape and the number of the trajectories. Despite these methodological differences across studies, the consistent finding of at least three similar trajectories on different populations and cultures provides strong test re-test reliability to these three trajectories. The current paper furthers the research by using multiple informants in identifying the economic cost associated with each different type of delinquent trajectory, starting from an early age.

### ***Estimated Costs Associated with Delinquency***

Despite the well-documented individual, psychological, physical and mental health, social, and criminal outcomes of engaging in delinquent behaviours, there are limited data available in Canada on the costs associated with it. There is also a paucity of research on the costs of delinquency beyond costs savings of early prevention programs on future delinquency, and the costs to the criminal justice system. Antisocial youth tend to be multiple offenders and Cohen (1998) found that the average delinquent commits 68 to 80 crimes over their delinquency time period and costs society between \$1.3 million and \$1.5 million. Cowell et al.'s (2010) study of teenaged arrestees found evidence that intervention programs targeting youth after their first arrest are slow to reduce juvenile justice costs for these individuals. Early intervention programs, on the other hand, do have the potential to reduce the long-term costs of delinquency. Cohen and Piquero (2009) estimated that a beneficial prevention program of diverting a 14-year-old high-risk juvenile from a life of crime could save from \$2.6 million to \$5.3 million (U.S. dollars).

Few studies of early childhood prevention programs for children in the U.S. and only one in Canada have included an economic analysis (e.g., Karoly, Kilburn, & Cannon, 2005; Mrazek & Brown, 2002; Peters et al., 2010; Waddell, Hua, Garland, Peters, & McEwan, 2007). Four notable

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<sup>2</sup> With the exception of Jennings et al. (2010), who found that virtually all of the males who were assigned to any of the delinquent trajectories were either maintaining their rates of offending or increasing their offending by the end of the 7th and 8th grade school year. This result may be explained by the fact that the participants were not followed to the end of adolescence as was the case in the other studies.

exceptions in the U.S. are the Elmira Prenatal/Early Infancy Project (PEIP; Karoly et al., 1998); the Carolina Abecedarian Project (Barnett & Masse, 2007; Masse & Barnett, 2002); the Chicago Child-Parent Centers program (CPC; Reynolds, Temple, Robertson, & Mann, 2002); and the High/Scope Perry Preschool Project (PPP; Barnett, 1996; Nores, Belfield, Barnett, & Schweinhart, 2005). The Canadian study is on Better Beginnings, Better Futures (BBBF; Peters et al., 2010). All these early childhood intervention studies have reported economic analyses based on follow-up data for children, and in some cases their parents, to the child's age of 15 (BBBF and PEIP), 21 (Abecedarian and CPC), and 40 (PPP). Economic analyses results from these studies provide the rationale to policy-makers for investing in early childhood interventions.

For most economic analyses of early childhood education programs, economic benefits are typically divided into three categories: benefits to program participants (e.g., increased income from improved education); benefits to non-program participants (e.g., reduced costs to crime victims); and benefits to government/taxpayers (e.g., decreased remedial education costs, decreased costs to the justice system). The costing perspective of the Canadian BBBF economic analysis was the government/taxpayers; Karoly et al. (1998) refer to this analysis as *cost-savings analysis* to differentiate it from the more traditional cost-benefit analysis. In this paper, we will examine the social, health, educational, and juvenile justice costs for each of our trajectories based on data from the BBBF study. This is the first study in Canada to include girls in this type of analysis.

Of particular note, Cohen, Piquero, and Jennings (2010) have recently looked at the costs of adult criminal offending of unique trajectories disaggregated across gender and ethnicity. They found that chronic offenders who did not desist in their late adolescence, went on to commit more serious crimes and ultimately cost far more than low-frequency chronic offenders. The present study aims to extend this methodology to a Canadian sample using parent, teacher, and youth informants, and, for a more comprehensive cost estimate, to include more cost measures than solely the cost directly accrued from an offence.

In summary, most studies of juvenile delinquency over the past two decades have focused on older, serious, and violent juvenile offenders. Younger delinquents have been ignored partly because their number is relatively small and their threat is not as immediate. However, whereas the number of very young offenders is small compared with older juveniles, child delinquents present unique challenges that need to be addressed. Intervening before minor offences become more serious and before the occasional offender becomes a chronic offender is important, and more effective. Furthermore, past studies have focused on the cost-benefit analysis of individual prevention programs, but not the comprehensive (including social, health, and educational) cost-savings analysis of particular delinquent trajectories, using multi-informant data. Understanding the trajectories and costs of delinquency at a young age is paramount to developing efficient strategies that target individuals at young ages to improve the outcomes of those in high-risk groups.

## Method

### *Participants*

In the BBBF sample, the longitudinal research cohort was comprised of a *focal* cohort and a *following* cohort. Children in the focal cohort ( $n = 721$ ) were born in 1989 and were recruited to the

longitudinal study between Junior Kindergarten (JK) and Grade 3, mostly through the school system. Children in the following cohort ( $n = 238$ ) were born in 1990, and were recruited to the longitudinal study when they were in Grade 3. For this study, there were 842 participants (396 girls and 446 boys), representing 88% of the original sample. These participants represent the longitudinal follow-up of the BBBF study and had data at ages 8 (Grade 3), 11 (Grade 6), and 14 (Grade 9).

Attrition was mainly due to two factors: families relocated and the researchers were unable to contact them or families declined to be interviewed. As a test for attrition bias, we employed logistic regression to examine socio-demographic differences in children and families who dropped out of the research cohort between Grades 3 and 6 and between Grades 6 and 9, and families who completed all years of data collection. These analyses indicated no significant differences in socio-demographic variables between the retained and lost cases.

Approximately 30% of the households were headed by single parents, 34% of parents did not complete high school, 59% of families were living below the Statistics Canada Low Income Cut-off line, and 19% were living in public housing. There were no significant gender differences on any of the demographic variables.

### **Measures**

**Delinquency.** Child delinquency measures were created using items from the National Longitudinal Survey of Children and Youth (NLSCY; Statistics Canada, 1995). Three different measures were created, one for parents, one for teachers, and one for the youth themselves. Ratings in Grade 3 were provided by teachers only, while ratings in Grade 6 were provided by parents, teachers, and youth, and ratings in Grade 9 by parents and youth. Items for the parent and teacher versions and the Grade 6 youth version were rated on a three-point scale: 0 = *never or not true*, 1 = *sometimes or somewhat true*, and 2 = *often or very true* (e.g., “vandalizes”, “steals”, “destroys things”, and “tells lies or cheats”). At Grade 9, the youth indicated whether or not in the past 12 months, they were part of a gang (0 = *no*, 1 = *yes*) and the remaining nine items were rated 0 = *never*, 1 = *once or twice*, 2 = *three or four times*, or 3 = *five or more times* (e.g., “stayed out all night without permission”, “stolen something”, “sold drugs”, and “intentionally destroyed/damaged things”). Using principal component factor analyses, delinquency items from teachers, parents, and youth were combined separately at each of the three grades to create Grades 3, 6, and 9 delinquency scales: The Grade 3 delinquency scale was created by combining three teacher-rated items; the Grade 6 measure had 13 items (6 parents, 5 teachers, and 2 youth); and the Grade 9 measure of delinquency included 16 items (6 parents and 10 youth). All three scales had high inter rater and test re-test reliabilities.

**Estimated Costs of Government Resources Associated with Delinquency.** We identified 12 measures in our data set that could be monetized to reflect children’s and parents’ utilization of government resources in health care and social services, remedial education, the criminal justice system, and social assistance (see Table 1 for summary). These measures were collected from children and their parents beginning when the children were in Junior Kindergarten (JK) up to and including Grade 9 (more specific details on how each of the 12 outcomes was monetized can be requested from the authors).

Table 1. Estimated Costs of Government Resources

<b>GOVERNMENT RESOURCE</b>	<b>ESTIMATED COSTS IN CANADIAN DOLLARS<sup>A</sup></b>
<b>Health Care and Social Services</b>	
Visits to a family physician	\$29.44 per visit in Ontario based on 2001 dollar figures (Browne, Gafni, & Roberts, 2002)
Hospital emergency room use	\$195.76 per visit in Ontario based on 2001 dollar figures (Browne et al., 2002)
Number of serious injuries	The average cost of an unintentional injury in Canada was \$4,000 in 1996. (Angus et al., 1998)
Number of overnight stays in hospital	\$816.35 per overnight stay in a hospital in Ontario based on 2001 dollar figures. (Browne et al., 2002)
Visits with a nurse practitioner	\$19 per visit in Ontario based on 2001 dollar figures (Browne et al., 2002)
Family involvement with Children's Aid Society	\$60 per visit in Ontario based on 2001 dollar figures (Browne et al., 2002)
<b>Remedial Education</b>	
Grade repetition	\$6,151 per year in Ontario based on 2002/03 school year dollar figures.
Use of special education services	\$6,794 average cost per child receiving special education services in Ontario based on 2001/02 school year dollar figures.
<b>Criminal Justice System</b>	
Arrests	\$500 Canadian national average cost per police investigation in 1998 (Hepworth, 2000)
Court appearances	\$1,250 Canadian national average court costs (Hepworth, 2000)
<b>Social Assistance Programs</b>	

Social Welfare Assistance	\$842 per month in Ontario based on 2003 estimated minimum value of basic social assistance for a single parent with one dependent child (National Council on Welfare, 2004)
Ontario Disability Support Program	\$829 (single parent with one child) and \$940 (two parents with one child) per month in Ontario based on 2003 estimated minimum payments (Ontario Ministry of Community and Social Services, 2003)

<sup>a</sup> A 3% discount rate was applied for all estimated cost data.



### Data Analysis

To identify the trajectories of delinquency, we used the semi-parametric group-based trajectory approach (Jones et al., 2001; Nagin, 1999, 2005). In this modelling, the dependent variable was the total standardized delinquency scale score at Grades 3, 6, and 9. The censored normal distribution was used to model the trajectories to account for the censoring at the lower and upper bounds of the delinquency scale. A polynomial relationship was used to link age to delinquency behaviour. We compared models with different numbers of groups using a Bayesian information criterion (BIC) (Kass & Raftery, 1995). A large BIC value corresponds to a good model with a large log-likelihood value and not too many parameters. We tested competing models of 2, 3, 4, 5, and 6 groups of delinquency to determine the “best” model based on BIC criterion; we found that the BIC values for two-, three-, four-, five-, and six-group models were, respectively, -886.8, -881.2, -894.4, -851.8, and -838.2. Application of the maximum BIC for model selection indicated that the six-group solution was the “best” model for the combined sample of girls and boys.

To estimate costs associated with each trajectory of delinquency, we estimated an average cost/child/trajectory for each of the 12 monetizable government resources described in Table 1. For each child, we estimated the costs of utilizing the government resource by multiplying the unit cost available from a secondary source (e.g., \$29.44 for an appointment with a family physician) by the occurrence of the event. All dollar figures that we report were discounted at a rate of 3%. This discount rate falls within the range of rates commonly used and recommended in public policy analysis (e.g., Karoly et al., 1998; Karoly et al., 2005; Reynolds et al., 2002). All missing values, including the values of the missing grades (such as Grades 4, 5, 7, and 8 when no data collection took place), were interpolated, given that there were at least 60% data points present. Each grade-specific cost figure was then combined and reclassified into three major groups – JK to Grade 3 (ages 4 to 8), Grade 4 to Grade 6 (ages 9 to 11), and Grade 7 to Grade 9 (ages 12 to 14) – and presented by delinquency group trajectories and child’s gender. We used the following equation to estimate the average cost for each of the 12 measures of utilization of government resources for each grade. The cost values are based on the value ( $v$ ) of each outcome as outlined in Table 1 (e.g., \$29.44 for a visit to a family physician), multiplied by frequency of occurrence ( $o$ ) of that outcome for each child for that year.

$$VO = \left( \sum_{i=1}^n v_i o_i / n \right) \quad (1)$$

where, VO = Average cost for an outcome measure in a grade;

$i$  = number of children (1, ...,  $n$ );

$n$  = sample size;

$v$  = value of outcomes (\$);

$o$  = occurrences of the outcome.

## Results

### Trajectories of Delinquency

According to the statistical tests, the six-group solution was the “best” model for the combined sample of girls and boys. Figure 1 depicts the distinct developmental trajectories of the six-class model for delinquency. Children in two of the trajectories had very low ratings of delinquency across time; we labelled these groups the *lowest delinquency* group and the *second lowest delinquency* group. Two other trajectories showed a similar pattern of delinquency ratings that was decreasing over time. In the *moderate desisters* group, children had moderate levels of delinquency at Grade 3, followed by low levels of delinquency at Grades 6 and 9. In the *highest desisters* group, children had the highest level of reported delinquency behaviours at Grade 3, followed by a marked decrease in reported delinquency at Grades 6 and 9. The fifth trajectory group, labelled *escalators*, had very low levels of reported delinquency at Grade 3 and increased markedly in their reported delinquency over time. By Grade 9, children in this trajectory had the second highest delinquency scores. The final group, labelled *high delinquency*, started with moderate levels of reported delinquency at Grade 3, marked by the highest reported levels of delinquency at Grades 6 and 9 of any of the trajectory groups. See Figure 1.

Figure 1. Delinquency Trajectories of At-Risk Youth

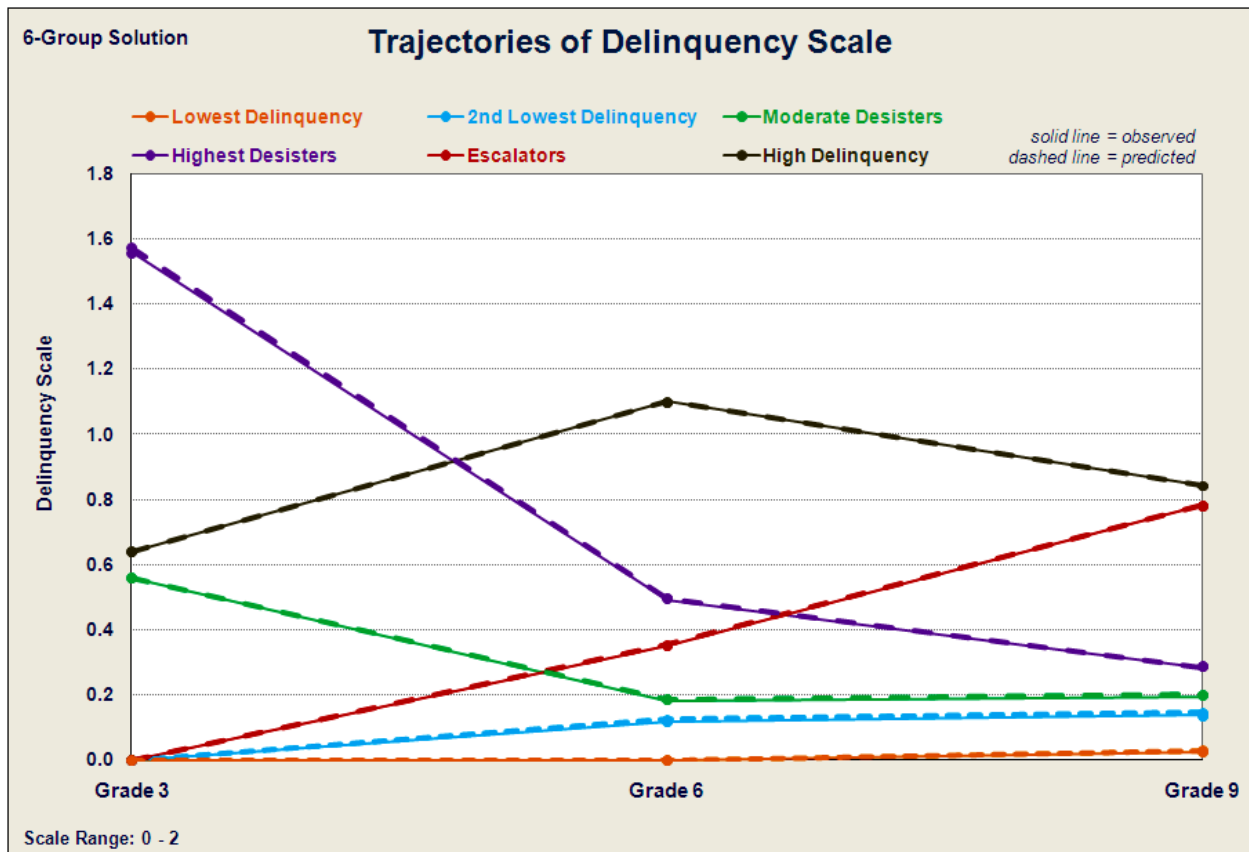


Table 2 depicts the percentages of children in each of the groups. Chi-squares tested for gender differences in the group membership of each trajectory group; a significant group by gender effect was found, that is, that there was a significant difference in the proportion of males compared to the proportion of females ( $p < .003$ ). We then compared whether the proportion of males versus females differed for each of the six trajectory groups separately. There were significantly more females than males in the two *low delinquency* trajectory groups,  $p < .05$  for both analyses. There were more males than females in the four remaining trajectory groups, but only the differences for the trajectory groups showing marked decreases in delinquency over time were significant (the *moderate and highest desisters*),  $p < .05$  for both analyses.

Table 2. Percentage of Boys vs. Girls in Each Trajectory

Trajectory Group	Males % (n)	Females % (n)
Lowest Delinquency*	6.7% (30)	10.6% (42)
Second Lowest Delinquency*	70.4% (314)	76.5% (303)
Moderate Desisters*	13.5% (60)	8.1% (32)
Highest Desisters*	3.4% (15)	1.0% (4)
Escalators	4.0% (18)	2.8% (11)
High Delinquency	2.0% (9)	1.0% (4)

\*  $p < .05$ , therefore significant sex differences.

**Estimated Costs Associated with Delinquency Trajectories**

Table 3 provides a summary of the government expenditures by general domain by trajectory group. To briefly summarize the results, government expenditures were highest in the *Remedial Education* domain (64% of costs), followed by *Health Care and Social Services* (29%), *Social Assistance* (6%), and *Criminal Justice System* (1%). The two lowest delinquency trajectories (82% of the sample) accounted for only 19.4% of the estimated government costs. In other words, approximately 80% of the estimated costs to government were from 18% of the sample. Specifically, we found that youth from the two *desisters* trajectory groups (13% of the sample) accounted for 40% of the estimated costs to government; and youth from the two most at-risk trajectories (*escalators* and *high delinquency*, 5% of the sample) accounted for 40.6% of the estimated costs to government. It is interesting to note that 80% of the estimated *Criminal Justice* costs were due to the *high delinquency* and *escalators* trajectory groups.

We also found that antisocial or delinquent girls cost society more money than antisocial or delinquent boys in all domains, with the exception of the Social Assistance domain. Specifically, summing across all six trajectory groups from ages 4 to 14, we estimated that girls cost \$244,056 while boys cost \$229,236. In addition, we estimated that girls’ criminal justice costs were almost twice those of boys (\$4,835 vs. \$2,408).

Table 3: Results of Estimated Utilization of Government Resources by Trajectory Group

		JK – Grade 3 (\$)			Grade 4 – Grade 6 (\$)			Grade 7 – Grade 9 (\$)			All Grades (\$)		
		Male	Female	All	Male	Female	All	Male	Female	All	Male	Female	All
<b>Health Care and Social Services</b>													
VISITS TO A FAMILY PHYSICIAN	2nd lowest delinquency	110	103	107	58	54	56	52	48	50	220	205	212
	escalators	125	150	134	67	59	64	54	44	50	246	253	249
	high delinquency	108	156	128	51	57	53	51	45	49	209	259	230
	moderate desisters	116	107	113	56	54	56	55	52	54	227	213	222
	lowest delinquency	110	107	109	51	47	49	32	39	36	192	193	193

		JK – Grade 3 (\$)			Grade 4 – Grade 6 (\$)			Grade 7 – Grade 9 (\$)			All Grades (\$)		
		Male	Female	All	Male	Female	All	Male	Female	All	Male	Female	All
	highest desisters	93	45	82	61	60	61	64	46	60	218	151	203
	<b>Group total</b>	662	668	673	344	331	338	307	274	299	1,313	1,273	1,310
HOSPITAL EMERGENCY ROOM USE	2nd lowest delinquency	261	237	250	107	99	103	97	92	95	465	428	447
	escalators	370	448	384	164	196	175	139	138	138	673	782	698
	high delinquency	474	78	355	215	8	167	172	3	125	861	89	647
	moderate desisters	203	123	184	62	65	63	66	74	69	331	261	317
	lowest delinquency	176	210	194	71	61	65	60	28	41	307	300	301
	highest desisters	440	78	380	166	128	158	119	62	108	725	268	646
	<b>Group total</b>	1,923	1,174	1,748	785	557	732	653	397	576	3,362	2,128	3,056

		JK – Grade 3 (\$)			Grade 4 – Grade 6 (\$)			Grade 7 – Grade 9 (\$)			All Grades (\$)		
		Male	Female	All	Male	Female	All	Male	Female	All	Male	Female	All
NUMBER OF SERIOUS INJURIES	2nd lowest delinquency	2,328	1,659	2,009	2,087	1,405	1,759	4,890	4,363	4,637	9,305	7,427	8,405
	escalators	2,476	987	1,904	3,595	1,756	2,903	8,932	11,055	9,714	15,004	13,799	14,521
	high delinquency	30	1,499	427	1,628	4,783	2,299	6,188	17,343	8,410	7,846	23,625	11,136
	moderate desisters	1,130	1,382	1,195	882	890	885	5,092	3,609	4,556	7,104	5,882	6,636
	lowest delinquency	718	1,125	889	774	1,299	1,073	3,478	1,468	2,326	4,971	3,893	4,288
	highest desisters	1,542	1,086	1,507	1,906	969	1,740	3,976	6,327	4,271	7,424	8,382	7,518
	<b>Group total</b>	<b>8,223</b>	<b>7,738</b>	<b>7,930</b>	<b>10,873</b>	<b>11,103</b>	<b>10,659</b>	<b>32,558</b>	<b>44,167</b>	<b>33,915</b>	<b>51,654</b>	<b>63,008</b>	<b>52,504</b>
NUMBER OF OVERNIGHT STAYS IN HOSPITAL	2nd lowest delinquency	348	482	414	92	172	131	144	226	184	584	881	728
	escalators	160	234	190	245	26	163	1,062	448	834	1,467	709	1,187
	high delinquency	0	5	1	0	51	10	0	1,480	296	0	1,536	307
	moderate desisters	1,098	255	874	206	134	188	134	66	110	1,437	455	1,172
	lowest delinquency	893	210	547	378	64	206	475	8	208	1,746	283	962
	highest desisters	4,586	761	3,928	848	1,046	892	143	305	177	5,577	2,112	4,998
	<b>Group total</b>	<b>7,085</b>	<b>1,947</b>	<b>5,955</b>	<b>1,769</b>	<b>1,494</b>	<b>1,590</b>	<b>1,957</b>	<b>2,534</b>	<b>1,810</b>	<b>10,811</b>	<b>5,975</b>	<b>9,355</b>
VISITS WITH A NURSE PRACTITIONER	2nd lowest delinquency	12	15	13	4	5	5	3	6	4	19	25	22
	escalators	14	11	13	6	9	7	9	7	8	29	27	28
	high delinquency	13	1	8	1	19	4	0	27	8	14	47	20
	moderate desisters	10	4	8	3	5	3	2	5	3	14	14	15
	lowest delinquency	9	8	9	4	5	4	3	5	4	16	18	17
	highest desisters	3	18	7	4	1	3	5	12	6	11	31	16

	JK – Grade 3 (\$)			Grade 4 – Grade 6 (\$)			Grade 7 – Grade 9 (\$)			All Grades (\$)		
	Male	Female	All	Male	Female	All	Male	Female	All	Male	Female	All
<b>Group total</b>	61	56	57	21	43	27	21	63	34	103	162	118

		JK – Grade 3 (\$)			Grade 4 – Grade 6 (\$)			Grade 7 – Grade 9 (\$)			All Grades (\$)		
		Male	Female	All	Male	Female	All	Male	Female	All	Male	Female	All
VISITED BY A CHILDREN'S AID WORKER	2nd lowest delinquency	10	10	10	7	7	7	7	8	8	25	26	25
	escalators	7	93	36	20	39	27	39	76	53	66	208	117
	high delinquency	23	108	61	41	13	37	64	59	64	128	179	163
	moderate desisters	18	16	18	13	14	13	11	15	12	42	45	43
	lowest delinquency	13	7	10	1	0	1	0	0	0	14	8	11
	highest desisters	10	57	22	50	41	48	34	20	31	94	119	102
	<b>Group total</b>	81	291	158	133	115	134	156	179	169	370	585	461
<b>Remedial Education</b>													
GRADE REPETITION (Historical repetition data from JK to Grade 9)	2nd lowest delinquency										932	869	900
	escalators										2,024	1,864	1,971
	high delinquency										1,660	3,429	2,250
	moderate desisters										1,559	1,385	1,501
	lowest delinquency										578	185	351
	highest desisters										1,259	2,597	1,546
	<b>Group total</b>											8,012	10,328
USE OF SPECTAL EDUCATION SERVICES (from Grade 1 to Grade 9)	2nd lowest delinquency	5,813	5,777	5,807	5,606	5,067	5,363	4,496	4,027	4,278	15,915	14,871	15,447
	escalators	8,557	5,297	7,285	8,373	6,294	7,651	7,571	9,184	8,101	24,501	20,775	23,037
	high delinquency	9,405	6,642	8,927	8,606	7,994	8,476	8,180	15,830	10,348	26,191	30,466	27,751
	moderate desisters	8,037	8,643	8,223	7,227	9,381	8,032	6,225	7,006	6,522	21,490	25,031	22,776



	JK – Grade 3 (\$)			Grade 4 – Grade 6 (\$)			Grade 7 – Grade 9 (\$)			All Grades (\$)		
	Male	Female	All	Male	Female	All	Male	Female	All	Male	Female	All
lowest delinquency	5,586	3,647	4,595	3,920	2,092	2,898	3,248	1,090	2,104	12,754	6,830	9,596
highest desisters	10,701	14,482	11,700	13,956	13,673	13,908	12,654	17,341	13,430	37,311	45,496	39,038
<b>Group total</b>	48,099	44,489	46,537	47,688	44,502	46,327	42,375	54,477	44,782	138,162	143,468	137,646

		JK – Grade 3 (\$)			Grade 4 – Grade 6 (\$)			Grade 7 – Grade 9 (\$)			All Grades (\$)		
		Male	Female	All	Male	Female	All	Male	Female	All	Male	Female	All
<b>Criminal Justice System</b>													
NUMBER OF ARRESTS (Grade 9 only)	2nd lowest delinquency										43	63	53
	escalators										335	949	555
	high delinquency										755	1,869	1,059
	moderate desisters										189	72	147
	lowest delinquency										72	0	30
	highest desisters										180	0	154
	<b>Group total</b>											1,573	2,953
COURT APPEARANCES (Grade 9 only)	2nd lowest delinquency										12	26	19
	escalators										135	719	345
	high delinquency										404	1,078	588
	moderate desisters										67	60	65
	lowest delinquency										0	0	0
	highest desisters										216	0	180
	<b>Group total</b>											834	1,883
<b>Family Social Assistance</b>													
SOCIAL WELFARE (Grade 9 only)	2nd lowest delinquency										1,093	1,054	1,074
	escalators										2,320	4,210	3,037
	high delinquency										3,093	0	2,142
	moderate desisters										1,326	2,738	1,811
	lowest delinquency										600	0	250

		JK – Grade 3 (\$)			Grade 4 – Grade 6 (\$)			Grade 7 – Grade 9 (\$)			All Grades (\$)		
		Male	Female	All	Male	Female	All	Male	Female	All	Male	Female	All
		highest desisters									2,320	0	1,856
		<b>Group total</b>									10,752	8,001	10,169
ONTARIO DISABILITY (Grade 9 only)	2nd lowest delinquency										709	660	685
	escalators										0	2,753	1,044
	high delinquency										0	0	0
	moderate desisters										904	577	792
	lowest delinquency										675	302	458
	highest desisters										0	0	0
	<b>Group total</b>										2,288	4,292	2,978

### Domain Total and Grand Total

		JK – Grade 3 (\$)			Grade 4 – Grade 6 (\$)			Grade 7 – Grade 9 (\$)			All Grades (\$)		
		Male	Female	All	Male	Female	All	Male	Female	All	Male	Female	All
HEALTH CARE AND SOCIAL SERVICES	2nd lowest delinquency	3,070	2,505	2,802	2,354	1,743	2,061	5,194	4,743	4,978	10,618	8,990	9,841
	escalators	3,152	1,923	2,661	4,098	2,085	3,340	10,235	11,769	10,798	17,484	15,778	16,800
	high delinquency	647	1,846	980	1,936	4,931	2,570	6,476	18,957	8,953	9,058	25,734	12,503
	moderate desisters	2,575	1,887	2,392	1,222	1,161	1,209	5,359	3,822	4,804	9,156	6,870	8,405
	lowest delinquency	1,919	1,669	1,758	1,280	1,477	1,398	4,048	1,548	2,616	7,246	4,694	5,772
	highest desisters	6,674	2,044	5,927	3,035	2,246	2,902	4,340	6,774	4,654	14,050	11,064	13,483
	<b>Group total</b>	18,036	11,875	16,521	13,925	13,643	13,480	35,652	47,613	36,802	67,613	73,130	66,803
REMEDIAL EDUCATION	2nd lowest delinquency	5,813	5,777	5,807	5,606	5,067	5,363	4,496	4,027	4,278	16,847	15,739	16,348
	escalators	8,557	5,297	7,285	8,373	6,294	7,651	7,571	9,184	8,101	26,525	22,639	25,008
	high delinquency	9,405	6,642	8,927	8,606	7,994	8,476	8,180	15,830	10,348	27,851	33,895	30,001
	moderate desisters	8,037	8,643	8,223	7,227	9,381	8,032	6,225	7,006	6,522	23,049	26,416	24,277
	lowest delinquency	5,586	3,647	4,595	3,920	2,092	2,898	3,248	1,090	2,104	13,332	7,014	9,947
	highest desisters	10,701	14,482	11,700	13,956	13,673	13,908	12,654	17,341	13,430	38,571	48,094	40,584
	<b>Group total</b>	48,099	44,489	46,537	47,688	44,502	46,327	42,375	54,477	44,782	146,175	153,797	146,165

		JK – Grade 3 (\$)			Grade 4 – Grade 6 (\$)			Grade 7 – Grade 9 (\$)			All Grades (\$)		
		Male	Female	All	Male	Female	All	Male	Female	All	Male	Female	All
CRIMINAL JUSTICE SYSTEM	2nd lowest delinquency										55	89	71
	escalators										470	1,668	900
	high delinquency										1,159	2,947	1,647
	moderate desisters										256	132	211
	lowest delinquency										72	0	30
	highest desisters										395	0	334
	<b>Group total</b>										2,408	4,835	3,193

		JK – Grade 3 (\$)			Grade 4 – Grade 6 (\$)			Grade 7 – Grade 9 (\$)			All Grades (\$)		
		Male	Female	All	Male	Female	All	Male	Female	All	Male	Female	All
FAMILY SOCIAL ASSISTANCE	2nd lowest delinquency										1,802	1,714	1,758
	escalators										2,320	6,963	4,081
	high delinquency										3,093	0	2,142
	moderate desisters										2,230	3,315	2,603
	lowest delinquency										1,275	302	708
	highest desisters										2,320	0	1,856
	<b>Group total</b>											13,041	12,293
ALL DOMAINS (12 MEASURES)	2nd lowest delinquency	8,882	8,282	8,609	7,960	6,809	7,424	9,690	8,769	9,255	29,323	26,532	28,018
	escalators	11,709	7,220	9,946	12,471	8,380	10,991	17,806	20,953	18,899	46,800	47,047	46,788
	high delinquency	10,053	8,488	9,907	10,542	12,925	11,046	14,655	34,786	19,301	41,162	62,576	46,292
	moderate desisters	10,612	10,530	10,615	8,449	10,543	9,240	11,585	10,828	11,326	34,691	36,733	35,496
	lowest delinquency	7,504	5,316	6,352	5,200	3,569	4,296	7,296	2,639	4,720	21,925	12,010	16,457
	highest desisters	17,375	16,527	17,628	16,991	15,919	16,810	16,995	24,115	18,084	55,336	59,158	56,257
	<b>Group total</b>	66,135	56,364	63,058	61,613	58,145	59,807	78,027	102,091	81,585	229,236	244,056	229,308

## Discussion

Delinquency is a serious problem in our society. Over one-third of youth have been involved in some form of delinquency by the age of 14 (Farrington, 1989). Furthermore, childhood delinquency tends to predict violent behaviours throughout the course of a lifetime (Farrington, 1989). Consequently, understanding the developmental pathways that lead to delinquency is a critical issue. The current study was designed to identify the delinquency trajectories of boys and girls living in disadvantaged communities in Ontario from ages 8 to 14, and examine the estimated costs associated with each trajectory. Key messages from findings are that:

1. Children who are at risk for involvement in delinquency start early and can be potentially identified early in their development;
2. Early identification and investment may make a difference and reduce the number of children who may go on to be delinquent;
3. The costs of children at risk for delinquency begin early and are high; and
4. Early investment in education and families is important to prevent long-term criminal justice costs.

### *Developmental Trajectories of Delinquency*

Our first objective was to examine the trajectories of delinquency in boys and girls from ages 8 (Grade 3) to 14 (Grade 9). Our results confirm the heterogeneity of the development of delinquency and are generally consistent with previous research. We found six groups of delinquency. As expected, two groups, *lowest delinquency* and *second lowest delinquency*, representing the majority of the youth ( $\approx 82\%$  of the sample) reported consistently low levels of delinquency over time. Two other trajectories (*highest desisters* and *moderate desisters*) showed a similar pattern of delinquency ratings decreasing over time, representing the *desisters* ( $\approx 13\%$  of the sample). Another group, the *escalators* ( $\approx 3.5\%$  of the sample), had very low levels of reported delinquency at Grade 3 and increased over time. Finally, the *high delinquency* group started with moderate levels of reported delinquency at Grade 3 and had the highest reported levels of delinquency at Grades 6 and 9 of any of the trajectory groups. The *high delinquency* group represented approximately 1.5% of the sample. It may be that the low percentage of youth in the *high delinquency* group reflects the fact that we only have data up until the youth are in Grade 9, or approximately 14 years old. Thus, many youth may just be at the beginning of engaging in delinquent acts. We hypothesize that with more longitudinal data points, the proportion of youth in the *high delinquency* group would increase and likely more closely resemble other research findings.

This study supported the trajectories of delinquency reported in other studies, but also identified some key differences. Similarities included that: (a) The majority of youth were involved

in no or limited delinquent activities; (b) females were less likely than males to be involved in delinquency (i.e., there were more females in the *low delinquency* and *second lowest delinquency* trajectory groups); (c) there was a group of individuals who desisted from involvement in delinquency; and (d) there was a trajectory of consistently high engagement in delinquent behaviour. The key differences from previous literature were the number of groups that had low levels of delinquency (i.e., there were two groups – low and second lowest – that engaged in minimal delinquent behaviours). Second, the *escalators* and *high delinquency* groups had equal proportional representation of males and females. Typically, research reports that males are more likely to engage in delinquent behaviour than females and, thus, we expected to have more males than females in the *high delinquency* group. Third, the shape of the *high delinquency* trajectory group was surprising, as there was a peak in delinquency in Grade 6. We expected that the peak would not be present, and if we had extended longitudinal data, we would have expected to see it at around age 18. There are several possible interpretations to this early peak. First, no other study on delinquent trajectories has been conducted starting at such a young age. Second, the current study included girls, which no other study of delinquent trajectories has done. Third, this study was based on community sampling conducted in high-risk, low socio-economic status neighbourhoods. Lastly, it is possible that there are unique sample characteristics in the participants and the results may reflect this sampling. Nonetheless, more longitudinal research is required that begins as early as this research to validate our findings.

With our longitudinal analyses, we also examined differences in the distributions of boys and girls within the diverse trajectory groups. We found no gender differences in the distribution of boys and girls in the *high delinquency* group (2% of males and 1% of females), or in the *escalators* group (4% of males and 3% of females). This pattern is inconsistent with the general developmental trend reported by Silverthorn and Frick (1999) who found that girls tend to experience a later onset of delinquency than boys, and the general finding that boys are more likely to be involved in high delinquent behaviour than girls. The discrepancy may arise because we have used a multi-informant approach, and have taken a person-oriented approach (as opposed to a group-oriented approach), allowing us to examine heterogeneity within the development of delinquency. The small minority of at-risk girls in our sample demonstrated these problems as early as boys. Consistent with other research, we found that girls were overrepresented in the two low delinquency groups. However, we found there were significantly more males in the two *desisters* groups.

Trajectories increase our understanding of delinquency development and identify behavioural patterns that emerge in individuals on a specific trajectory. Once these trajectories are identified, specific factors pertaining to the individual, peers, family, and community in general can be explored to determine which factors heighten the risk of delinquency (i.e., the chronic or increasing trajectories) or act as a protective factor against the involvement in delinquency (i.e., low, non-involved, or declining trajectories).

### ***Estimated Economic Costs Associated with Delinquency Trajectories***

The second objective of this study was to estimate the costs to government associated with each delinquency trajectory on utilization of government resources in the criminal justice system, remedial education, health care and social services, and social assistance. The majority of the



estimated costs associated with each of the trajectories were in the educational system – 64% of the costs were for remedial education. In contrast, the percentage of the estimated costs associated with the other domains was 29% for health care and social services, 6% for social assistance, and 1% for the criminal justice system.

It was the *desisters* groups (*highest desisters* and *moderate desisters*) who received the most special educational services, and this likely was a positive and preventive investment. Approximately 80% of the estimated costs to government were due to the two *desisters* trajectory groups (*highest desisters* and *moderate desisters*) and the youth from the two most at-risk trajectories (*escalators* and *high delinquency*) who represented 18% of the sample. Specifically, we found, first, that youth from the two *desisters* trajectory groups (13% of the sample) accounted for 40% of the estimated costs to government (primarily driven by education costs, a preventive response); and, second, youth from the two most at-risk trajectories (*escalators* and *high delinquency*, 5% of the sample) accounted for 40.6% of the estimated costs to government. A review of the specific estimated health care costs indicates that the *escalators* in particular had the highest costs associated with visiting their doctor, going to the emergency room, having serious injuries, and visiting with a nurse practitioner. These are reactionary costs (as opposed to preventive costs) in the sense that a significant event has happened. Furthermore, for girls in the *high delinquency* group, some costs were estimated as being much higher than for boys (e.g., the number of serious injuries, and overnight stays in hospital). At-risk girls may be particularly vulnerable to medical problems associated with delinquency involvement compared to at-risk boys.

High-risk girls were also more costly with respect to the criminal justice system. Compared to boys, the total estimated costs at age 14 (Grade 9) for girls were almost twice that for boys (\$4,835 vs. \$2,408). The data revealed that girls in the two high-risk groups (*high delinquency* and *escalators*) were much more likely to have higher costs associated with both being arrested and appearing in court. It appears that girls, once arrested, were also much more likely to enter the criminal justice system. Admittedly, our sample of girls was small and may not be representative, but it does reflect the developmental course and costs associated with a small sample of very high-risk delinquent girls. The high-risk boy groups also had the highest estimated costs, but not as high as those of the high-risk girls. In summary, our findings suggest that girls cost the government more money than boys in all domains (except social assistance). Specifically, summing across the six trajectory groups, we estimated that, between the ages of 4 and 14, girls cost \$244,056 while boys cost \$229,236.

Additionally, 80% of the estimated criminal justice costs were due to the *high delinquency* and *escalators* groups. Even though the estimated criminal justice system costs to government were relatively low as of Grade 9 (only 1% of the overall costs), these two groups may just be getting started and the costs associated with these groups can only increase. Interestingly, the *high delinquency* and *escalators* groups accounted for 46% of the reactive costs (such as criminal justice system, health care, and social services) compared to 32% for the two *desisters* groups and 22% for the two *low delinquency* groups; for the preventive costs (e.g., remedial education), the *high delinquency* and *escalator* groups accounted for 38% of the costs compared to 44% for the two *desisters* groups and 18% for the two *low delinquency* groups. The implication is that investing early in prevention costs such as remedial education may provide at-risk children and their families the opportunity to have more positive developmental outcomes and desist from delinquency involvement. As a consequence, investing in prevention can save the government money in the long

run. The most at-risk groups did not receive sufficient early support and consequently the costs associated with them were reactive and costly.

### Limitations

There are many strengths to the current research: The BBBF research sample comprised disadvantaged and at-risk communities; the communities were diverse (francophone, Aboriginal, recent immigrants, and multicultural); the sample had both boys and girls; and the data allowed for economic analyses to be conducted. This is the first on a Canadian sample. However, some of the trajectories had a small sample size and hence the results may not be generalizable. For example, in the *high delinquency* group, the costs of delinquent behaviour in girls were high relative to boys. It may be that this is an atypical group that had many arrests, or in fact, it may be representative of an extreme group of girls that to date have been neglected by research.

There are early indicators to the developmental pathways for delinquency. This research suggests that delinquency involvement does not just emerge, but develops over time, and without intervention, the costs associated with these problems accumulate and are serious and significant as early as Grade 9. Investment in prevention, such as educational support, can reduce delinquency involvement. The most at-risk groups for delinquency involvement (e.g., *escalators* and *high delinquency*) accounted for the majority of reactive costs (e.g., criminal justice) and not the preventive costs (e.g., remedial education). Furthermore, although more research is needed to understand the developmental delinquency trajectories of girls, they appear to require more support than do boys. Although our sample of high-risk girls was limited, there are some preliminary indications from this research that they were costly and may be experiencing emotional problems, criminal activity, and court system involvement. The costs associated with their problems may be higher than for boys because they appear not only in the criminal justice system, but also in the health care system. Traditionally, we have estimated only the criminal justice costs. It may be that this venue does not reflect the full range of costs associated with female delinquency.

This research indicates that pathways to delinquency begin early. It is well known that for the early onset of offending, youth tend to persist and desist at a later stage, and as such impose a greater social and criminal justice costs on society (Tremblay, Van Aken, & Koops, 2009). To address crime and antisocial behaviour, Welsh (2007) has suggested that the “most hopeful” methods (derived from research in the United States and Canada) are those designed to counter “specific risk factors”, such as home visiting by health professionals, pre-school programs to stimulate thinking and reasoning skills in young children, parenting education programs, cognitive and social skills training to teach children to consider the consequences of their behaviour, and teacher training and anti-bullying initiatives in schools. Thus, crime prevention needs to occur early in development and be ongoing.

Although we have made a great deal of progress in understanding individual differences in antisocial behaviour and linking these to interventions, much work remains to be done. Research that continues to monitor the development of these trajectories could be informative as youth transition into early adulthood. The mental and physical health and other needs of children at risk for delinquency involvement should not be ignored. Their behaviours greatly affect families and communities and are costly. An examination of the youth who desist from delinquency provides strong support for the value of investing early in children to prevent negative long-term outcomes. Even modestly successful prevention and intervention investments, such as in education, yielded significant benefits, including decreasing future costs associated with delinquency, improving the well-being and safety of families, children, and youth in a community, and reducing crime and delinquency.

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