Report Title: The Economic Impact of Children in Care with FASD and Parental Alcohol Issues Phase II: Costs and Service Utilization of Health Care, Special Education, and Child Care

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We wish to acknowledge and express our thanks to many collaborators and contributors:

Manitoba Health and Healthy Living

Manitoba Education, Citizenship and Youth

Manitoba Family Services and Housing

Contributors from the Clinic for Alcohol and Drug Exposed Children (CADEC):

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We would like to acknowledge the funding of the Public Health Agency of Canada, through the Centres of Excellence in Child Welfare Initiatives.

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EXECUTIVE SUMMARY

Fetal Alcohol Spectrum Disorder (FASD) is a serious social and health issue for the child welfare, health care and education sectors in North America with significant social and economic costs. Meeting the needs of children with disabilities creates substantial challenges for child welfare agencies. In Manitoba, Fuchs, Burnside, Marchenski and Mudry (2005) determined that one-third of children in care fall within a broad definition of disability and 17% of children in care were affected by diagnosed or suspected Fetal Alcohol Spectrum Disorder (FASD). Fetal Alcohol Spectrum Disorder is a preventable condition, since it is caused by maternal alcohol consumption during pregnancy.

Though FASD is an important area of emphasis for economic costing exercises, it is only one specific consequence of substance abuse, which contributes uniquely to the fiscal costs. Prior to this study, much investigation was lacking on the far-reaching economic impacts of problematic parental drinking on children not known to have FASD. A particular strength of this study is that it investigates children not known to have FASD but whose parents have been identified as having alcohol issues, as well as FASD-affected children.

This research is exploratory and descriptive in design. The Child and Family Services administrative database and the population-based data repository at the Manitoba Centre for Health Policy allowed for identification of five population groups of children, both in the care of a child welfare agency and not in care, as well as children diagnosed with FASD and children not known to have FASD.

The findings reveal that both the children diagnosed with FASD and those affected by parental alcohol misuse account for significantly higher utilization and costs in the health and education sectors, compared to the general population sample. A higher percentage of both the children in the FASD group and those affected by parental alcohol misuse, accessed subsidized child care.

From a policy perspective, there is wide social and political interest in the cost of illness and health care in general. Until now, the current body of research makes no meaningful link to the notion that costly health and educational resources may be consumed each year by children affected by their parents' misuse of alcohol. This economic impact study is a starting point only, but this research provides a more accurate picture of the utilization of resources in the Manitoba health care and education sectors. It is important for addressing future programming in the area of services to FASD-affected children, as well as confronting challenges faced by

children affected by problematic parental drinking. Moreover, a higher emphasis on primary prevention would effectively expand the public policy approach to FASD in Canada, as well as creating efficiencies in the allocation of scarce resources.

1. INTRODUCTION

Fetal Alcohol Spectrum Disorder (FASD) is a serious social and health issue for the child welfare, health care and education sectors in North America with significant social and economic costs. Meeting the needs of children with disabilities creates substantial challenges for child welfare agencies. In Manitoba, Fuchs, Burnside, Marchenski and Mudry (2005) determined that one-third of children in care fall within a broad definition of disability and 17% of children in care were affected by diagnosed or suspected Fetal Alcohol Spectrum Disorder (FASD). Fetal alcohol spectrum disorder is a preventable condition, since it is caused by maternal alcohol consumption during pregnancy.

Children with a diagnosis of FASD present child welfare agencies, as well as the health and education sectors, with an array of complex and variable needs, as a consequence of a range of detrimental health outcomes. The syndrome includes physical characteristics, inhibited growth, and neurodevelopment problems, as well as behavioral and cognitive difficulties that are inconsistent with developmental level. Given the significant proportion of FASD-affected children in care, as well as the nature of their needs, it is imperative to understand the service demands of this population to agencies, governments, and communities.

The recognition that FASD is a contributing factor to large social and economic costs is helping to advance research on this important issue. The field of cost analysis in FASD research, though imperfect due to wide variations of methodological approaches has expanded over the past two decades. However, in comparative terms, there is limited Canadian research which investigates the economic impact of FASD in the child welfare, health care and education sectors. Moreover, the current body of research makes no meaningful link to the notion that substantial health and educational resources may be consumed each year by children with no FASD diagnosis, but who are affected by parents who misuse alcohol. The research in the current study is the second phase of an empirical study which has already examined of the cost of FASD to the child welfare system for children in care. This research builds on a larger body of empirical research on children in care with disabilities (Fuchs et al. 2005; 2007; Fuchs, Burnside, Marchenski , Mudry, DeRiviere, 2008). The current study is also part of a broader national strategy to develop a Canadian model for calculating the economic impact of FASD.

In the Economic Impact of Children in Care with FASD study (Fuchs, Burnside, Marchenski, Mudry, DeRiviere, 2008), the fiscal costs to the Manitoba child welfare system in 2006 for 400 permanent ward children who were FASD-affected was estimated. These children were in care

for 146,000 days in 2006 at a total cost of $9.5 million or $23,760 per annum for each child on average ($65 per day for each child). Basic maintenance is the funding provided for all children in care with or without disabilities. In addition, a special rate may be provided as part of the per diem of care, to cover expenditures such as respite, therapy, home visits, as well as some medical and special needs expenses that are not intended to be covered by basic maintenance. Special rate may also include a service fee provided to the caregiver to compensate for the high care demands presented by some children. In examining the total children in care population in 2006, on average children in care required a special rate of $35 per day. However, permanent ward children who were FASD-affected had special rate expenditures averaging $43 per day.

The intent in Phase II of the Economic Impact Study was to broaden our understanding of the costs associated with FASD-affected children to include the costs of health care, special education and subsidized child care services. For the purposes of comparison, a sample group of children in care with no FASD diagnosis, but who were involved with the child welfare system due to parental alcohol abuse, was created. In addition, a random sample of children from the general population was created using a random matching methodology. The children in this group were not in care and not involved with an agency due to parental alcohol misuse. The monetary value of health, education, and child care service utilization were estimated for the various comparison groups.

Objectives

As part of the development of an empirically-based FASD economic impact model, the objectives of this project include the following:

1. To determine the utilization and cost of health, education and subsidized child care services provided to children with diagnosed FASD in care of child welfare agencies in Manitoba

2. To compare the cost of services provided to children in care with FASD and the cost of services provided to children in care with no diagnosed FASD but associated with parental alcohol abuse

3. To compare the cost of services provided to children with diagnosed FASD in care and the cost of services provided to children with diagnosed FASD who are not in care and

4. To compare the costs of services provided to children who are FASD-affected or for whom parental alcohol misuse is an identified issue at a child welfare agency to a

sample of children in the general population who are not in care and not identified as being alcohol-affected.

An important strength of this study is that the analysis is approached from an incremental costing perspective. That is, the data is gathered on the extent of health care utilization, special education resources, and subsidized day care for FASD-affected children and children for whom problematic parental drinking is an identified issue at a child welfare agency. The costs for these groups are compared to a sample from the general population. In others words, the marginal resource use is identified and valued.

Data sources

Phase II of the Economic Impact Study was based on collaboration with the Manitoba Centre for Health Policy (MCHP), a research centre of excellence, which develops and maintains the comprehensive population-based data repository for the Province of Manitoba. The data housed in the repository is derived from administrative records kept by different government sectors that deliver health and social services. With the assistance of the Manitoba Centre for Health Policy, Phase II of this project has broadened the scope of the cost analysis to include the costs of health care, subsidized child care and educational services, for groups of children with FASD and with no FASD, in care and not in care.

Research universities, government department, and funders

The present project is the culmination of several years of a research partnership related to children in care with disabilities between the Faculty of Social Work at the University of Manitoba and Manitoba Family Services and Housing.

The current study was undertaken by a research team representing Manitoba Family Services and Housing, the Faculty of Social Work at the University of Manitoba, and faculty from the University of Winnipeg. The research was funded by a grant from the Public Health Agency of Canada as a deliverable in the ongoing development of an economic impact model for FASD.

2. THE LITERATURE

Over the past two decades, FASD has been increasingly recognized as having far-reaching and costly societal outcomes, including a significant impact on quality of life for affected people. Typically, economic cost analysis in FASD research has taken three distinct but related perspectives based on point of view, including:

- The fiscal *or* government point of view, which includes the costs to the health care or education sectors
- An individual *or* private point of view, often estimated using a human capital approach[1] in order to calculate productivity effects for affected individuals
- A societal point of view – costs are estimated for various stakeholders in society, such as insurance companies, employers, parents and relatives of affected children

During the 1980s and 1990s, some of the earlier economic costing exercises calculated the lifetime cost for each child affected by FAS typically, which was found to be in the range of $596,000 in 1980 (Harwood & Napolitano 1985) to $1.4-$1.5 million less than a decade later (Lupton, Burd, & Hardwood, 2004; Klug & Burd 2003; Manitoba Child and Youth Secretariat 1997; Thanh & Jonsson 2009). Frequently, studies calculate the annual aggregated costs to a province, state, or a nation incurred on behalf of FASD-affected individuals.

More recently, these figures have been revised to $2.0 million in 2002 U.S. dollars and $2.8 million in 2008 Canadian dollars. Fiscal costs comprise approximately 80% of total costs and the balance of 20% is allocated to productivity losses (Lupton et al. 2004; Thanh & Jonsson 2009). The Harwood and Napolitano (1985) figure of $596,000 in 1980 has recently been adjusted to $2,774,400 in 2008 Canadian dollars (Thanh & Jonsson 2009). It should be noted that some of the costs cited in this section are undiscounted and, thus, overstated because they do not account for the time value of money. Nevertheless, the literature reveals that the fiscal and societal impact of FASD is strikingly large.

In Canada, a limited body of research investigates the economic impact of FASD primarily from a fiscal perspective. However, the most comprehensive Canadian-based study to date, which

[1] Human capital approach defined: This is a measurement strategy, which involves calculating the indirect costs to the individual in terms of lost productivity. Estimations include the value of lost time in the labour market, as well as unpaid non-market activities if it is possible to value them, such as caring for children or household production. If for any reason the individual is disconnected from the labour force, the period of time is multiplied by potential earnings at that particular stage of the life cycle. In the Canadian Stade et al. (2006) study, productivity losses were limited to parents of alcohol-affected children.

was conducted by Stade, Ungar, Stevens, Beyenne and Koren (2006), measures both societal and individual costs in 2003 dollars. The cross-country sample includes both FAS/FAE-diagnosed individuals, thus not limiting the analysis to FAS only, as in other U.S. research. This study examined direct health care costs, prescription medications, special education and social services (respite and foster care), as well as direct costs incurred by the parents of the FAS/FAE-affected children. The impact of externalizing behaviors was also measured[2]. Moreover, the study's costing exercise captured some indirect costs, such as missed workdays for parents, using a human capital approach.

Stade et al. (2006) study findings showed that medical and education costs comprise approximately 63% of total costs. Productivity losses make up 8.1% of the costs, though if the children had been over 21 years of age, these costs would be much higher. The severity of the disability[3] and the age of the child were both significant and direct predictors of costs. In fact, the costs double for children who have a severe disability compared to those children who are mildly affected. The costs for children aged 6-15 years were highest ($18,988 per annum) compared to the costs incurred by all other groups. Costs were also higher in Central and Western Canada compared to Eastern Canada. It remains unclear to what extent those variables were influenced by the availability of services. Based on a prevalence rate of 3 in 1,000 people, the estimated cost of FASD-affected children up to age 21 is $344,208,000 in 2003 Canadian dollars. The annual average cost for all children combined totaled $14,342.

In other research, Fuchs, Burnside, Marchenski, Mudry & DeRiviere (2008) estimated fiscal costs in the Manitoba child welfare system for 400 FASD-affected permanent ward children in 2006. These children were in care for 146,000 days in 2006 at a total cost of $9.5 million or $23,760 per annum for each child ($65 per day for each child). Basic maintenance is the first level of funding for all children in care with or without disabilities. Children in care may also be eligible for special rate as part of the per diem of care, to cover expenditures such as respite, therapy, home visits, as well as some medical and special needs expenses that are not intended to be covered by basic maintenance. Special rate can also include a service fee provided to the caregiver that compensates for the high care demands some children have.

[2] This study included the costs incurred as a result of externalizing behaviours, which the authors defined as "aggression such as damage to people/property or stealing…" (Stade et al. 2006: 4).

[3] In Stade et al. (2006) severity is defined by "cognitive functioning, severity of behaviour problems and organ anomalies" (p.11)

In examining the total children in care population in 2006, on average, children in care required a special rate of $35 per day. However, the analysts found that permanent wards that are FASD-affected had incremental special rate expenditures averaging $43 per day (an average cost of $15,600 per annum for each child). Average expenditures of special needs also increase as the children age. More specifically, special needs costs averaged $10,038 for children aged 0-5 years. However, these costs increased by 80.6% to $18,130 for children aged 16 and older (Fuchs et al 2008).

In an earlier study, Fuchs et al. (2007) found that children who received a diagnosis of FASD had come into care for the first time at an earlier age (2.5 years) compared to children with no disability (3.6 years) and children with other disabilities (4.3 years). Their legal and placement histories confirmed that permanent wards with FASD spend approximately three quarters of their lives in the care of an agency or about 15% more than any other permanent wards. Consequently, not only are the daily special rate costs higher for this group of children but also those costs are extended over a lengthier period of time. Once children in this group come into care, they have a higher probability of becoming permanent wards and in a shorter time period compared to other children due to their younger age at point of admission to care.

Fuchs et al.'s (2008) estimations of the costs of supporting FASD children in the child welfare system is the first of its kind in Canada. As identified earlier by Hutson (2006) in her review of the cost of substance abuse in Canada, medical and education costs are better understood, particularly in the U.S. However, the author noted a lack of research in two areas that are critical to aggregating accurate costs incurred by the FASD population: the child welfare system and the justice system. Recently, the National Center on Addiction and Substance Abuse at Columbia University (2009) found that the second largest share of federal public spending for children in the U.S. includes the child welfare system for foster care, independent living and other related programs. These expenditures fall within a larger budget category, referred to as Child and Family Assistance. In fact, child welfare accounts for 3.1% of the total federal budget and 6.2% of state budgets spent on substance abuse and addiction.

Hutson (2006) has asserted that an estimated "50% of children in care in Alberta have FAS" and she concluded that FASD-affected children may very well be overrepresented within the child welfare system (Hutson 2006). In Manitoba, Fuchs et al. (2005) found evidence of diagnosed or suspected FASD in 17% of the children in care in this province. Consequently, gathering accurate costs incurred on behalf of alcohol-affected children in the child welfare system is a critical phase in economic costing research around FASD.

More recently, health analysts in Alberta have estimated two types of aggregated costs in 2008 dollars. The first calculation is the aggregated lifetime costs for FASD-affected children multiplied by the number of affected children born each year. Based on their methodology, the annual long-term costs of FASD range from $130 to $400 million per year in Alberta. In a second calculation, the analysts used an FASD cost calculator developed by colleagues in North Dakota in order to estimate the annual short-term economic cost, which ranged from $48 to $143 million per year in 2008 Canadian dollars. This calculation estimates the annual costs incurred by people who are currently affected by FASD. Though these are rough estimates at best, the study effectively affirms the urgent need for primary prevention strategies[4] in this country (Thanh & Jonson 2009).

It should be noted that there are currently no accurate national statistics on the rates of *FASD* in Canada. However, the incidence has been estimated at 1 to 6 in 1,000 live births (Stade et al 2006), and women give birth to approximately 3,000-4,000 FASD-affected babies each year in Canada (Hutson 2006; Thanh & Jonsson 2009). Moreover, the incidence of *FAS* is estimated at 1 case in 100 live births, which is thought to be higher than the U.S. (Stade et al. 2006; Lupton et al. 2004). Two Manitoba studies are noted. Square (1997) estimated the prevalence in a Manitoba First Nations community to be 55-101 per 1,000 and Williams, Obaido & McGee (1999) reported an incidence of 7.2 per 1,000 live births in northeastern Manitoba. In considering these estimates, it is important to remember that the complexity of diagnosis contributes to the delay or even omission of diagnosis (Chudley, Conroy, Cook, Loock, Rosales, & LeBlanc, 2005), and prevalence is often determined by diagnostic thresholds (Klug & Burd 2003).

In terms of the U.S. literature, economic cost analysis tends to focus on children with FAS incidence, as opposed to the wider continuum of conditions that result from prenatal exposure to alcohol, which falls under the FASD umbrella term. A small group of investigators are generally regarded for their work in estimating the annual and lifetime costs of FASD[5]. Cost categories typically included health care, residential, and educational support services. In a few studies, productivity effects are estimated (Harwood et al. 1998; Harwood and Napolitano 1985). However, the cost of crime is often one area lacking serious estimation of fiscal costs

[4] Primary prevention costs are more preventive-focused. One example includes public awareness campaigns preventing prenatal alcohol use in high-risk populations, since FASD is known to be preventable.

[5] For a comprehensive review of the U.S. literature over the past two decades, the reader is referred to Thanh and Jonsson (2009).

(Stade et al. 2006), which is a curiosum, since an estimated 60% of FASD-affected youth are thought to have conflicts with the law (Thanh & Jonsson 2009).

Recent North Dakota research is probably the most relevant to the current study. Klug & Burd (2003) accessed health care data based on the International Classification of Diseases (ICD-9) in order to calculate the health care utilization and costs for FAS-affected children from birth to age 21. The benefit of their study is the use of a costing method to calculate "extra" cost savings of $2,342 per year in the health care system. For example, they subtracted the health care costs for children without FAS from the costs incurred for children who are known to be FAS-affected. After 20 years, the cumulative cost savings (undiscounted) from preventing one case of FAS is $491,820, which far exceeds the costs of attention deficit/hyperactivity disorder, other learning and developmental disabilities, as well as oppositional defiant disorder.

The study received some criticism from Ahn (2004) who emphasized the methodological difficulties of gathering information on young children who are usually undiagnosed, as well as sampling from a database that did not include uninsured individuals. Their study most likely excluded many children from low-income families, as well as those with a Native-American heritage (approximately 3% of residents in the state of North Dakota). These study design issues probably resulted in underestimated costs, though this is the norm in economic costing exercises. Although there is no readily available solution for early identification of affected children, in Manitoba, universal health care makes the health database a more reliable sample.

In other research over the past three decades, Abel and Sokol (1987) measured costs from the perspective of the health and residential care systems, and based their cost estimate of $321 million (1984 dollars) on an incidence of 1.9 FAS cases per 1000 live births. Abel and Sokol (1991a) repeated their estimate using a more conservative approach. Again, they estimated health and residential care, but based the aggregated costs of $74.6 million in 1984 U.S. dollars on a lower incidence rate of .33 per 1000. However, this incidence rate excluded populations known to face risks of FAS. Residential services accounted for approximately three-quarters of the costs, and health care accounted for the balance of 23%[6]. More recently, Thanh and Jonsson (2009) have revised the $74.6 million figure to $250 million in 2008 Canadian dollars.

Neither the 1987 or 1991 studies included costs past age 21, for example, residential services, lost productivity, and costs to relatives of affected individuals (Abel & Sokol 1987, 1991a,

[6] A third study conducted by Abel and Sokol (1991b) took more of a marginal costing approach, and they came up with $249.7 million in 1987 dollars.

1991b). Nevertheless, a North Dakota study determined that the costs for adults with FAS are 5-8 times the cost of care for a child affected by FAS. It is also known that the costs associated with late diagnosis are substantial (Oliver, 1998).

Based on a prevalence rate of 1.67 cases per 1,000 live births, Harwood and Napolitano (1985) used a societal and lifetime cost perspective to come up with $3.2 billion in 1980 U.S. dollars. The revised Canadian equivalent in 2008 dollars is $16.1 billion (Thanh & Jonsson 2009). The analysts estimated the value of lost productivity resulting from cognitive disabilities and the cost of education, treatment and residential care for patients of all ages. They used incidence rates of 1.0, 1.67, and 5.0 per 1000 (Harwood & Napolitano 1985).

Following the approach used in the 1985 study, Harwood, et al. (1998) estimated aggregate costs of $2.9 billion in 1992 U.S. dollars using a prevalence rate of 2.0 per 1000 live births. These costs were subsequently estimated at $4.0 billion in 1998 U.S. dollars (Harwood 2000) and $6.27 billion in 2008 Canadian dollars (Thanh & Jonsson 2009). Included in the analysis were treatment services to age 21, home and residential care services to age 65, lost productivity, and special education.

More recently, the 2002 inflation-adjusted costs for these studies were estimated at $2 million U.S. ($2.8 million in 2008 Canadian dollars) for each person affected by FAS, of which 80% is attributed to health care services, special education, and residential care, plus 20% is lost productivity. Costs also increase over the life cycle (Thanh & Jonsson 2009).

Rice, Kelman and Miller (1990) estimated aggregated costs from a health care and residential services perspective at approximately $1.6 billion in 1985 dollars[7] using a prevalence rate of 1.9 per 1,000 births. This estimate was recently revised to $4.72 billion in 2008 Canadian dollars (Thanh & Jonsson 2009). The study included an annual cost for treating FAS-related birth defects and cognitive disability, as well as the cost for residential care for those over 21 years. The cost of residential care accounted for 80% of their total cost estimate. Here again, the societal viewpoint of lost productivity and costs to family members are excluded. In a subsequent analysis, Rice (1993) estimated the costs had risen to $2.1 billion from 1985 to 1990.

[7] The estimate of $1.6 billion was based on the approach used in the Abel and Sokol (1987) study in which costs totaled $321 million.

These cost studies produce a wide variation in estimates. Economic estimates of FASD are highly dependent on a number of study-specific factors (Lupton et al. 2004; Thanh & Jonsson 2009), including:

- the selected point of view: fiscal, individual, and societal
- time horizon of the analysis (birth to age 18 or older)
- assumed prevalence rates in a region, as well as population growth
- a country's health and social welfare system
- the method by which the cost of service utilization is calculated; for example, in the Canadian health care system, average costs per weighted case are frequently used (Finlayson , Reimer, Dahl, Stargardter, & McGowan, 2009)
- adjusting factors, such as regional inflation rates, net present value calculations, and discount rates which are used to take into consideration the time value of money when conducting economic costing analysis over a period of time
- some analysts have considered the discounted lifetime cost per birth cohort (Lupton, Burd, and Harwood 2004)

Consequently, on the basis of a limited literature, the Canadian costs range from $344.2 million annually for FASD-affected children ages 1-21 (Stade et al. 2006) or $3-$4 billion per annum if the costs are considered to age 65 (Hutson 2006), as well as $600 billion over a lifetime for all children currently affected by FASD in Canada. It is sometimes argued that the latter estimate exceeds the national debt (Hutson 2006; McLean 2000)[8].

Though there are significant variations in the estimates, to a large extent, these costing exercises have informed the knowledge gap around this significant health and social issue. Many costs are thought to be the tip of the iceberg in terms of the true costs. Several studies emphasize a cost avoidance perspective by identifying monetary savings to government for every case of FASD prevented. As result of the substantial estimations of the cost of care, a common theme in the literature is the need for primary prevention. Primary prevention costs are thought to be lower than the discounted lifetime cost for an alcohol-affected child (Lupton et al. 2004; Klug and Burd 2003; Stade et al. 2006; Fuchs et al. 2008; 2007). An emphasis on

[8] Lupton et al. (2004) also calculated the adjusted 2002 estimates in U.S. dollars for some of the cited American studies in this paper, which ranges from $0.2 billion to $9.3 billion in U.S. dollars, also accounting for population growth and inflation. In addition, when adjusted for prevalence rates and residential care over age 21, the gap in aggregate costs narrows from $2.3 to $6.0 billion in 2002 U.S. dollars. The median is $3.6 billion.

primary prevention would effectively expand the public policy approach to FASD in Canada, as well as creating efficiencies in the allocation of scarce fiscal resources.

There are significant costs associated with special education services for learning disabilities, speech and language delays. In their study of the costs of substance abuse to the different levels of government, National Center on Addiction and Substance Abuse (2009) found that the largest share of fiscal expenditures for children affected by alcohol was in the education sector, including special education. Many alcohol-affected children have problems with reasoning or judgment, and they face issues with meeting society's expectations (Lupton et al. 2004). However, Stade et al. (2006) noted that parents living in the East consistently reported a lack of educational and health services for their children with FASD.

In Manitoba, the annual cost of special education can run as high as $19,530 for Level 3 funded children and $8,780 for Level 2 funding, compared to the basic rate of $1,866 annually for children with no disabilities (Manitoba Education, Citizenship and Youth 2007). For example, Level 2 support is provided for children who are diagnosed with severe multiple disabilities, those who are severely emotionally and/or behaviourally-disordered, and severely psychotic children. Level 3 support is provided for children who are more profoundly affected by these respective conditions (Manitoba Education, Citizenship and Youth, accessed June 5 2009 online at: http://www.edu.gov.mb.ca/k12/specedu/funding/level2-3.html).

Parental Alcohol Misuse

To date, an important area of emphasis for economic costing exercises is FASD, but it is one specific consequence of substance abuse, which contributes uniquely to these costs. In particular, there are a number of studies that have investigated the economic impact of substance abuse on different sectors, such as the health care system (Rice 1993; Rice et al. 1990; Harwood et al. 1998; National Center on Addiction and Substance Abuse (2009).et al. 2009). The costs of tobacco use were estimated by Choi and Pak (1996) at $3.6 billion in 1988 Canadian dollars. Interestingly, this value far exceeded consumer expenditures on tobacco products.

In another Canadian study, Rehm et al. (2006) examined the societal costs of tobacco, alcohol, and illegal drugs in 2002 Canadian dollars. The analysts estimated the annual cost of substance abuse in Canada to be approximately $39.8 billion, which is a cost of $1,267 for each citizen in this country. The misuse of alcohol accounted for 36.6% of these costs ($14.6 billion). These were updated estimates of Single et al.'s (1998, 1996) study a decade earlier, in which

economic costs of $18.45 billion were calculated for 1992, which represents a cost of $649 to every Canadian. The costs of alcohol misuse totaled 40.7% or $7.5 billion in the earlier study in 1992.

The major shortcoming of these studies is the lack of emphasis on the intergenerational costs of parental alcohol misuse. Although in a recent U.S. study, National Center on Addiction and Substance Abuse (2009)have calculated aggregate estimates of the fiscal consequences of substance abuse and addiction being imposed on children. Nevertheless, there is a significant research gap on the adverse health and education outcomes for children who are affected by parental alcohol misuse in Canada. McNichol & Tash (2001) assert that children of parents with substance abuse problems are likely to experience lifelong consequences as a result of inconsistent parenting practices, attachment disruption, and grief and loss issues as a result of coming into care, with a smaller subset of children being even more seriously impacted due to prenatal exposure to substances. Although we do know that parental problem drinking is a factor which often leads to the involvement of mandated child welfare agencies (Vanderploeg , Connell, Caron, Saunders, Katz, & Tebes, 2007), much investigation is lacking on the far-reaching economic impacts when children are adversely affected by problematic parental drinking.

In a related economic costing literature, there is heightened attention directed at the societal and fiscal costs relating to child maltreatment, which is known to be highly correlated with parent alcohol misuse (Velleman, Templeton, Reuber, Klein, & Moesgen, 2008; Trocme Tourigny, MacLaurin, & Fallon, 2003; Dube, Felitti, Croft, Edwards, & Wright, 2001). Bowlus, Day, McKenna and Wright (2002) have estimated that the economic costs of child maltreatment in Canada totaled $15.7 billion in 1998. These expenditures included fiscal costs to the government for the provision of justice, medical and social services, as well as private costs to the victims, in terms of direct out-of-pocket expenses and lifetime earnings losses. Califano et al. (2009) found that 73.1% of child welfare costs were linked to substance abuse.

Another Ontario report has stated that, “Victims of child abuse are ten times more likely than other children to commit offences as adolescents” (cited in Mallea 1999). In a publication entitled *Jack’s Troubled Career: the Costs to Society of a Young Person in Trouble*, Hepworth (2001) has attempted to capture the costs of the intergenerational effects of child abuse on the criminal justice system and other social services, including the child welfare system, which may run as high as $511,500 per child. More recently, the intergenerational cost of poverty in Ontario was estimated at $4.6 to $5.9 billion annually (Laurie 2008). Nevertheless, the

literature is silent on the economic costs of children living in a situation of parental problem drinking or coming into the care of child welfare due to parental alcohol misuse.

We found no economic impact studies, which looked at whether or not children who are affected by parental alcohol misuse are at higher risk of suffering from adverse health outcomes. However it has been demonstrated in other literature that children, in homes where alcohol or other drug problems exist, suffer from a variety of physical, mental and emotional health problems at a greater rate than children in the general population and children of alcoholics sustain more injuries and poisonings than children in the general population (Connecticut Clearinghouse, 1999). It is also believed that environmental stressors from parental misuse of alcohol contribute to child-related depression (Anda, Whitfield, Felitti, Chapman, Edwards, Dube, & Williamson, 2002), behavioral problems, anxiety disorders, as well as other manifestations of physical and mental health (Barnow, Ulrich, Grabe, Freyberger, & Spitzer, 2007; Balsa 2006). These factors may result in higher utilization of the health care system over their lifetime. Conversely, negligence which is often attributed to problematic parental drinking may result in less contact with some health service providers, such as dentists, or routine physical examinations and other preventive health care services (Balsa 2006).

What also remains unclear is the impact on education costs resulting from children having reduced learning capacity in school that is related to parental alcohol misuse. Likewise, the impacts on human capital formation and productive capabilities in the labour market of these children as adults are not widely researched. One recent study focused labour market outcomes. The analyst asserted that children of problem drinkers have a higher probability of experiencing detrimental outcomes in the labour market, for example unemployment and low wages, though regression analysis yielded indeterminate causality (Balsa 2008). The author also reaffirmed the lack of conclusive economic data linking problematic parental drinking and adverse child outcomes. Though Bowlus et al. (2002) examined the economic costs for adult survivors of child abuse, not all forms of maltreatment are alcohol-related. Parental alcohol abuse is identified as one of many specific types of substance abuse in many studies.

To conclude, closing the gap in knowledge around the economic costs of FASD-affected individuals can help to make better public policy, which in part focuses on preventing children from being born with significant disabilities in future. Moreover, from a health policy perspective, there is wide social and political interest in the cost of illness and health care in general. However, the current body of research makes no meaningful link to the notion that

substantial health and educational resources may be consumed each year by children living with parents who misuse alcohol. The current study is a starting point only, but it will provide a more accurate picture of the utilization of resources in the Manitoba health care and education system. It is important for addressing future programming in the area of children living in homes where problem drinking is a challenge.

3. STUDY METHODOLOGY

Manitoba Centre for Health Policy (MCHP) Methodology

This study sought to examine the financial costs of children in care with parental alcohol issues (including FASD) in Manitoba. To gather information on the costs of services delivered outside of the child welfare system, it was necessary to determine what additional services were being provided to children who were either in care or who were involved with a child welfare agency, and at what cost those other services were being delivered. In order to do this, the services of the Manitoba Centre for Health Policy (MCHP) were utilized.

The MCHP is a research centre of excellence that develops and maintains a comprehensive population-based data repository for the Province of Manitoba. The data found in the repository is derived from administrative records kept by different government departments to deliver health and social services. To meet the objectives of this study, several sample groups were identified using the child welfare database. The cost of services received by the children in the identified groups was calculated with the assistance of the data held by the MCHP and compared with the cost of services received by a comparative sample of the general population.

The following MCHP database files provided information for this report:

- Medical claims - records of visits to physicians
- Physician Resource Database – identifies the type of provider
- Hospital files - records of hospital admissions
- Population registry data - records of the time a person is registered as a resident of Manitoba, as well as their age, sex and area of residence
- Vital statistics – records of deaths and causes of death
- Pharmaceutical claims – records of pharmaceutical prescriptions dispensed
- Child and Family Services Information System – information on children in care and families receiving protection and support services from the child welfare system, funded through Manitoba Family Services and Housing
- Enrolment and assessment data from the Manitoba Department of Education, Citizenship and Youth
- A child care database, which provided data on the number of children accessing subsidized child care services
- Clinical data from the Clinic for Alcohol and Drug Exposed Children (CADEC)

Any identifying information (names, personal health information number, etc) was removed prior to the transfer to MCHP.

In order to access the MCHP repository, this research team submitted a proposal to MCHP for consideration. Approvals were then secured from the University of Manitoba Health Research Ethics Board, MCHP, the Health Information Privacy Committee, and each Department from which the research project would be accessing data. All data linkages and analyses took place at the MCHP.

Child records across databases were linked using a unique consistent identifier. The completeness of the data set was evaluated by identifying specific information that is present on both files. A match is an indicator of completeness of data and the degree of agreement between items on both records provides a measure of reliability. Re-abstraction determines how reliably information is moved from paper records to computerized form (MCHP website).

Group Creation

The initial task of this phase of the research project was to identify children in care of a Manitoba child welfare agency with parental alcohol issues including FASD from the Child and Family Services (CFS) administrative database. Child and Family Services Application (CFSA) is the data system used by child welfare agencies within Manitoba. It has two main components: Child and Family Services Information System (CFSIS) and the Intake Module. For the purpose of this study, CFSIS was used in conjunction with the MCHP data repository to create five distinct populations of children.

Using CFSIS, a special query created a list of children who were identified with FASD (diagnosed, partial, Alcohol Related Neurodevelopmental Disorder (ARND) and suspected). The children included on the list may have other disabilities in addition to FASD. As demonstrated in previous research, this population was commonly diagnosed with other disabling conditions. For example, a co-occurrence of mental health disorders was identified in 46% of the children with FASD (Fuchs, et al., 2005). These children also had to have an open child in care (CIC) or child in care supervision (CIC-Sup) file for at least one day during the period of January 1, 2006 to December 31, 2006. Children were included regardless of their legal status.

From this sample, a group of children with diagnosed FASD (recorded in CFSIS as diagnosed, partial or ARND) and who had a legal status of Permanent Ward (PW) were identified. In addition, children who were identified through MCHP as being diagnosed with FASD by the

Clinic for Alcohol and Drug Exposed Children (CADEC) in Winnipeg and were in care as a PW but did not have a FASD diagnosis on CFSIS were also included. This group of children was termed FASD-PW. This is a slightly different FASD population than was used in previous studies by this research team.

A second special query created from CFSIS resulted in a list of children who were identified with one or more of the following identified issues listed in their CIC file on CFSIS: "Parent intoxicated and unable to provide appropriate care", "Concern of ongoing substance abuse affecting parental capacity" and "Previous history of alcohol, drug or gambling abuse". The parental alcohol issue could have been added to the CIC file any time between 2005 and 2008. In addition, children had to have a CIC or CIC-Sup case that was open for at least one day in 2006. Children were included in this query regardless of legal status. Any children who were identified as having FASD (diagnosed, partial, and/or Alcohol Related Neurodevelopmental Disorder) recorded in CFSIS were removed from this group. This ensured the parental alcohol groups were distinct from the FASD-PW population examined.

Based on this second query, two groups of children were created: children who were permanent wards (PW) as of December 1, 2005 (termed the parental alcohol permanent ward or the PA-PW group) and children who were not PW as of December 1, 2005 but had an open CIC or CIC-Sup file for at least one day during the period of January 1, 2006 to December 31, 2006 (termed the parental alcohol or the PA group). The two parental alcohol groups were mutually exclusive.

The MCHP data repository was used to create a list of children who were diagnosed with FASD by CADEC but did not have a current CIC or CIC-Sup file recorded on CFSIS for 2006. This group was termed FASD-CADEC. It should be noted that inclusion in the FASD-CADEC group does not guarantee these children had no prior child welfare involvement. In fact, only 50 of these children were not found to have record on CFSIS.

The final group of children was a sample from the MCHP data repository of the Manitoba population of children who received health care services in 2006. To create the general population group a sample based on a 4 to 1 matched cohort for the population was used. More specifically, four children were selected for every one child from the three children in care groups: FASD-PW, PA, and PA-PW, all matched on age and gender. A random matching method was used. The CADEC group was excluded from the matching exercise and added to the analysis after the matching exercise was conducted. Each person in the CFSIS groups was

identified along with their age and gender. Then from the eligible Manitoba population (i.e., all Manitobans as of December 31, 2006 who were not in one of the CIC or FASD-CADEC groups) four individuals that matched on age and gender for each one individual from the three CIC groups were randomly selected. This group was termed the General Population group.

Analysis

The special queries that generated the population of children from CFSIS were produced in an Excel spreadsheet format. The preliminary CFSIS queries were validated by randomly checking information for 20 children in care against their actual CFSIS files. It was determined that the special queries had created an accurate total population. The unique identifiers for these children were scrambled and then transferred to the MCHP. All other data related to these children were removed. All further data collection and analysis was done at the MCHP.

Method used to estimate hospital costs: provincial average direct and indirect costs

The average cost per weighted case is a standardized indicator of the cost of providing hospital care to a *typical* patient. This specific approach is often used in population-based hospitalization costing studies. Calculating the average cost per weighted case involves a two-step process. First, all input costs related to inpatient/outpatient care are gathered, such as nursing, medical supplies, drugs, and diagnostics. Physician remuneration associated with inpatient/outpatient hospital stays and procedures are excluded. In a second step, the cost value of inputs is divided by an aggregate resource intensity weight (RIW for inpatients) or day procedure group weight (DPGWT for outpatients), which is assigned on the basis of the type of health case in terms of resource utilization, for example, heart disease or hip replacement. These are standardized weights used in hospitals across Canada, and there are 472 types of hospitalization cases. Total weighted cases are the sum of all RIWs assigned to discharge cases in Manitoba hospitals. Every person who is discharged from a hospital is assigned a resource intensity weight based on their demographic characteristics (e.g. age and sex), length of hospital stay, and intensity of resource use in the procedures, including surgical services (Finlayson, Reimer, Dahl, Stargardter, & McGowan, 2009). The formula for calculating the average cost per weighted case is:

$$\text{Provincial average direct cost per weighted case} = \frac{\text{Direct Inpatient Costs}}{\text{Total Weighted Cases}}$$

Consequently, the direct costs of hospitalizations are not gathered for specific cases, but instead for a *typical* case. A formal definition of the average cost per weighted case, as specified in the Finlayson et al. (2009) report is: "average cost calculated by summing the weights assigned to all cases treated by a hospital and dividing this number into the hospital's total inpatient expenditure" (p. 2, 55). The average cost per weighted case value based on 2005-6 hospitalizations is $2,953.45. Therefore, the average cost per weighted case value is multiplied by the RIW or DPGWT to obtain the direct cost of hospitalization for each of the five user groups in this study (FASD-PW; PA; PA-PW; FASD-CADEC; General Population).

Hospital costs are separated into *direct* and *indirect* costs. As discussed above, the direct costs are for direct service activities and care of inpatients/outpatients, excluding physician services. They are estimated using the provincial average direct cost per weighted case for a standard hospital patient multiplied by the RIW or DPGWT for a specific case. Indirect costs are primarily fixed in nature, though some costs of support services do vary with patient care. These costs are usually related to administration, information technology, buildings and other capital costs. These costs are estimated to be 19.9% of the direct costs (Finlayson et al. 2009).

Limitations of the study

This study was designed as a financial review of data on the MCHP data repository. The amount and accuracy of the information collected was dependent on the content and accuracy of the data repository. The data submitted by the governments that deliver health services, social services, and education may have varied compliance rates. It is also known that not all of the data collected by the child welfare system is shared with MCHP. Information that is only recorded on paper files and data collected on newer CFSIS screens are not on the data repository at this time.

Therefore, the estimates of this study are largely dependent on data availability and assumptions about which costs and service utilization will be included. Cost estimations are most likely underestimated, as this analysis only touches the surface of true societal expenditures incurred for children affected by FASD or parental alcohol misuse. For example, the costs of many social services are excluded. Neither do the current study's cost estimates tell us anything about the stream of lifetime costs. These gaps are not unusual in economic costing studies, as each study has its methodological and data limitations.

However, the analysis is approached from an incremental costing perspective, meaning that data is gathered on the extent of health care utilization, special education resources, and subsidized day care for FASD-affected individuals and children for whom parental alcohol is a presenting issue and compared to the general population. In others words, the additional or marginal resources are identified and valued, which is an important strength of this study.

While children in the both the PA-PW and PA groups did not have a diagnosis of FASD recorded, it does not mean they did not have FASD. A child could be on the waiting list for diagnosis, in the process of diagnosis, or have the condition undetected. Additionally, children in all of the five identified groups could have had disabilities aside from FASD.

MCHP policy requires the suppression of counts between 1 and 5 observations. Due to the possibility of outliers in the small counts, some of the estimates for the PA-PW and FASD-CADEC groups may not be entirely reliable in the analysis of this study. Consequently, when the estimates are adjusted by age and gender in the tables and figures which follow, the statistical significance of the differences in the estimates between the FASD-PW, PA and General Populations groups is reported, but it is not necessarily reported for the PA-PW or FASD-CADEC groups.

Although every attempt was made to create groups that were mutually exclusive, this was particularly problematic with the CADEC group. While it is possible to be certain that children who are recorded in CFSIS as being in care, are or have been in care, it not possible to determine with equal certainty that children not recorded in CFSIS are not in care. Some agencies in the province are not fully utilizing the information system. While the rate of utilization is increasing, the samples in this study were drawn from the year 2006. Further, children who are not in care may be living in families who are receiving voluntary or protection services from an agency. Those potential costs are beyond the scope of this study.

Tests of statistical significance: What does "statistical significance" mean?

Throughout this study, comparisons are made of the differences in the estimates that have been calculated for the five different populations of children. Statistical significance simply means there is reasonable certainty that the difference in the estimates is reliable or real; for example, it did not occur by chance. Put differently, the difference in the estimates is probably a true one. However, statistically significant does not necessarily mean important. A finding that the difference in the estimates is statistically significant does not necessarily imply an

important finding, and neither is the difference necessarily assumed to be large. However, it is a finding that could be evaluated further for practical relevance or decision-making utility. If the difference between two estimates is not statistically significant, this just means that the difference has a higher chance of not being a true difference.

To test the differences between group estimates of utilization of health services, MCHP estimated a Poisson regression with group, age, gender and their various interactions being the only explanatory variables. For the costing measures a negative binomial distribution was used with group, age, and gender being the only explanatory variables, including interaction variables. Due to the large number of children in each population who did not have a hospitalization, the model that estimates the average cost per child in the population group was not valid to estimate. Because there were too many children with zero hospital costs, the models of users of health services were estimated only. A statistically significant result implies a p-value of less than .05 in our estimated models.

Sample Description

A summary of the population groups and their sample sizes is listed as follows. The FASD-PW, PA, and PA-PW children will be referred to as the children in care or CIC children in the discussion throughout this study.

FASD-PW: n=603 Children who have been diagnosed with FASD and are permanent wards of child welfare in 2006
PA: n=587 Children whose parents presented with alcohol as a primary issue, who were in care under a temporary order of guardianship or a voluntary placement arrangement for some period of time in 2006
PA-PW: n=51 Children whose parents presented with alcohol as a primary issue at a child welfare agency, who are permanent wards in 2006
FASD-CADEC: n=119 Children who have been diagnosed by CADEC as having FASD, and who were not noted on CFSIS as children in care in 2006.
General Population group: n=4,964 Children who were selected on the basis of a random matching methodology

Table 1 describes the sample frequency breakdown by age and gender, and Figure 1 shows the mean age for each grouping, as well as by gender. The gender and age breakdown for the PA-PW group is: male 49.0% female 51.0%; Age categories: 0-5: 11.8%; 6-10: 23.5%; 11-15: 45.1%;

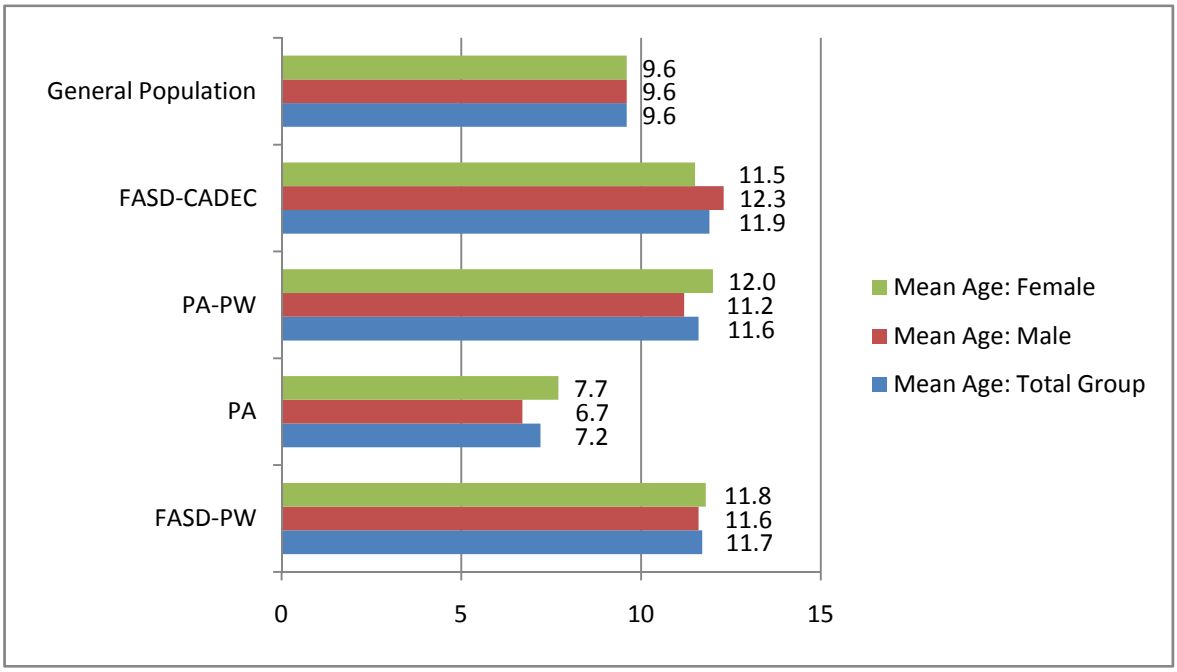
16+: 19.6%. A further three-way cross-tabulation by group, gender and age was not possible for the PA-PW group due to a small sample size of 51 children. The gender split for the FASD-PW group is 61% male and 39% female, which emulates the sample in Fuchs et al.'s (2008) Phase 1 study on the costs of children in the care of a child welfare agency, 62% and 38%, respectively.

Table 1: Frequency by Age Category and Gender

Group	Sample size	% Total sample	Age 0-5 %		Age 6-10 %		Age 11-15 %		Age 16+ %	
	n		Male	Female	Male	Female	Male	Female	Male	Female
FASD-PW	603	9.5	3.8	2.8	19.7	10.5	27.5	18.3	10.1	7.3
PA	587	9.3	22.5	20.1	16.0	16.9	8.2	11.0	1.7	3.6
PA-PW	51	0.8	(s)	(s)	(s)	(s)	(s)	(s)	(s)	(s)
FASD-CADEC	119	1.9	(s)	(s)	23.5	9.2	23.5	16.0	16.0	5.0
General Population	4964	78.5	12.7	11.1	17.7	13.5	18.2	15.1	6.0	5.7
	6,324	**100%**								

(s) Estimates are suppressed due to a small count between 1 and 5 observations

Figure 1: Mean Age by Gender and Group (2006)



In Figure 1, the parental alcohol (PA) group is considerably younger, which is potentially explained by the fact that, when they get older, they may become permanent wards and, thus, would be included in the PA-PW group or FASD-PW, if subsequently diagnosed. Many of the PA children are likely at the start of their path of involvement in the child welfare system.

4. STUDY FINDINGS: AN OVERVIEW OF THE AGGREGATED COSTS IN 2006

An Overview of Hospitalizations (Inpatient and Day Procedures), Physician Visits, and Prescription Drugs

For 1,360 children who are FASD-affected or for whom parental alcohol is an issue (the children in care (CIC) groups and FASD-CADEC), the costs of hospital and physician visits, plus prescription drugs, total $1,388,642 in 2006, compared to a representative sample of 4,964 children in the general population with total costs of $1,993,849. Considering the entire sample of children for whom costs are tallied in this study (n=6,324), the FASD-affected and parental alcohol children comprise 21.5% of total children; however, their hospital (inpatient and outpatient), physician, and drug costs make up 41.1% of the total costs.

Figure 2 illustrates that the FASD-PW and PA groups comprise the majority of the average total costs for hospital visits (inpatient and outpatient), physician services, and prescription drugs. Both cost estimates, as well as FASD-CADEC, are statistically different with respect to the General Population group. Average total costs for the FASD-PW group are 3.5 times higher than the General Population. Put differently, there is an additional $1,001 in health care costs incurred each year for every child who is FASD-affected and a permanent ward, compared to the General Population group.

This finding was anticipated, since Klug and Burd (2003) also found that health costs in North Dakota for FAS-affected children were 5.7 times the cost of medical care for children who did not have FAS (an annual average of $2,842 versus $500, respectively). It is known that children with a diagnosis of FAS have more severe health problems (Stade et al. 2006), which could explain an average cost which is 5.7 times the health costs of the general population in the Klug and Burd study compared to 3.5 times for FASD-PW children in the current study. The PA group's average costs are 1.8 times higher than the General Population group.

The *average total costs* (total costs divided by the number of children in the population group) for each group of children by gender and age category are listed in Table 2. Within each of the five groups, there is no discernible pattern of increasing or decreasing costs as the children age. However, for the children in care (CIC) and FASD-CADEC children in the older age categories (11-15 and 16+), females have substantially higher costs compared to males although one

exception is FASD-PW, Age 11-15. Conversely, females in the General Population group have lower average total costs compared to males in all age categories, except for those aged 16+.

Figure 2: Average Costs per Child – Hospitalizations (Inpatient and Day Procedures), Physician Visits, and Prescription Drugs - by Group (2006)

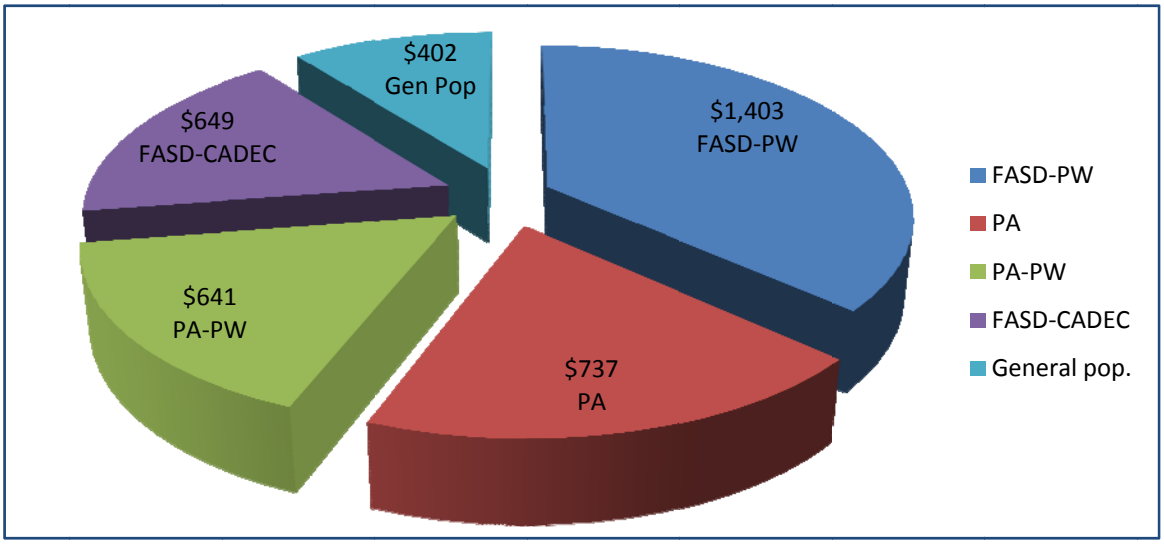


Table 2: Average Total Costs per Child – Hospital, Physician Visits, and Prescription Drugs by Gender, Age Category, and Group (2006)

Group	Avg costs per child in the group	Age 0-5 $		Age 6-10 $		Age 11-15 $		Age 16+ $	
	$	Male	Female	Male	Female	Male	Female	Male	Female
FASD-PW	1,403*	692	819*	1,049*	2,968*	1,629*	800*	1,249*	1,594
PA	737*(1)	819*	548*	247 (1)	1,103*(1)	535 (1)	837*	311 (1)	2,097
PA-PW	641 (1)	276	770	812	92 (1)	255 (1)	1,268 *	109 (1)	823
FASD-CADEC	649*(1)	2,751 (2)	207	352 (1)	376 (1)	639 (1)	887*	473 (1)	1,748 (2)
General pop.	402	493	330	285	238	400	315	325	1,399

*Statistically significant difference with respect to the General Population group
(1) Statistically significant difference with respect to the FASD-PW group
(2) the count is low; therefore, the high estimate could be attributed to one or more outliers
Note: PA-PW group estimates by age category may not be reliable due to a small sample size (n=51)

In the second column, "Avg costs per child in the group", all between group differences are statistically significant except for PA-PW compared to FASD-CADEC, General Population, and PA; FASD-CADEC compared to PA, all most likely due to small samples sizes in the PA-PW (n=51) and FASD-CADEC (n=119) groups (not denoted in Table 2). The estimates are statistically different between the FASD-PW group and PA, PA-PW, as well as FASD-CADEC groups, which is denoted by the symbol (1). Though the difference in the FASD-PW and PA estimates is statistically significant, the analysis which follows in the next three sections will illustrate that this is primarily attributed to prescription costs. Physician and hospital visits are shown to be relatively similar for these two groups of children in 2006.

When health expenditures are examined from the perspective of *cost per child user of services*, a similar picture emerges. In Table 3, user costs do not necessarily increase (or decrease) in the older age categories. Generally, females incur higher costs in the older age categories (11-15 and 16+) compared to males, with the exception of the FASD-PW and General Population groups, aged 11-15. Similar to the results in Table 2, females in the General Population group have lower average total costs compared to males, except for the 16+ age category. This finding is not necessarily reflected in the children in care and FASD-CADEC groups. Average user costs for the FASD-PW group are 3.1 times higher than the General Population group. Likewise, the PA group's average user costs are 1.7 times higher than the General Population. The differences in these estimates are statistically significant.

Table 3: Average Total Costs for *Users* of Services – Hospitalizations, Physician Visits, and Prescription Drugs – by Gender, Age Category and Group (2006)

Group	Avg costs per child user of services	Age 0-5 $		Age 6-10 $		Age 11-15 $		Age 16+ $	
	$	Male	Female	Male	Female	Male	Female	Male	Female
FASD-PW	1,514*	795	928*	1,145*	3,116*	1,744*	822*	1,411*	1,798
PA	828*(1)	908*	593*	283 (1)	1,270*(1)	642 (1)	938*	346 (1)	2,318
PA-PW	760 (1)	276	770	947	154 (1)	311 (1)	1,384*	145 (1)	987
FASD-CADEC	765*(1)	2,751*(2)	207(1)	379 (1)	413 (1)	716 (1)	1,204*	691	1,748
General pop.	484	547	370	354	286	506	388	421	1,628

*Statistically significant difference with respect to the General Population group
(1) Statistically significant difference with respect to the FASD-PW group
(2) the count is small, and the estimate could be attributed to one or more outliers
Note: PA-PW group estimates may not be reliable due to small sample size (n=51)

In the second column, "Avg costs per child user of services", all between group differences are statistically significant except for PA-PW compared to FASD-CADEC, General Population, as well as PA and CADEC, most likely due to small samples sizes in PA-PW (n=51) and FASD-CADEC (n=119) (not denoted in Table 3). Similar to the findings in Table 2, there is a statistically significant difference between the estimates of the FASD-PW group and PA, PA-PW, as well as FASD-CADEC groups, which is denoted by the symbol (1).

An Overview of Education Costs

As shown in Table 4, the average cost of education funding for FASD-PW children is 3.4 times the cost incurred for children in the General Population, and 2.7 times higher for the FASD-CADEC children. While the FASD-affected or parental alcohol children comprise 20.4% of total children enrolled in school, their aggregated costs make up 38.2% of the total education costs.

Table 4: Total and Marginal Costs of Education Funding (2006)

	Number of children enrolled	Children funded at Level 2	Children funded at Level 3	Total costs of education funding	Average costs of education	Incremental education costs compared to General Population
	N	%	%	$	$	$
FASD-PW	450	36.2*	14.0*	3,304,514	7,343	5,166
PA	311	3.2 (1)	(s)	702,458	2,259	82
PA-PW	35	17.1*(1)	0	124,294	3,551	1,374
FASD-CADEC	79	38.0*	7.6*	460,818	5,833	3,656
General population	3,407	1.9	1.0	7,418,198	2,177	-

(s) the estimate is suppressed due to a small count between 1 and 5 observations
(1) Statistically significant difference with respect to the FASD-PW group

The rates for educational funding are standardized: The basic rate of funding for each child in the province is $1,866 per year; Level 2 funding is $8,780 per year; and Level 3 is $19,530 per year both are in addition to Level 1 (Manitoba Education, Citizenship, and Youth). The total cost of education funding is the summation of the following:

1. the number of children with basic funding multiplied by $1,866
2. the number of children with Level 2 funding multiplied by $8,780
3. the number of children with Level 3 funding multiplied by $19,530
4. $500 children-in-care component for each FASD-PW and PA-PW child

Average cost for the population is derived by taking the total cost of education funding and dividing by the number of children enrolled in school in 2006. Note that the PA children's costs of education approach the general population's average costs.

The findings reveal that, compared to the General Population group, the children in care and FASD-CADEC children:

- Have a higher chance of accessing level 2 or 3 special rate funding
- Have lower high school graduation rates and have a lower likelihood of completing 8 or more credits in Grade 9 which is a predictor of successful high school completion
- Have lower average marks and are less likely to have ever written standard provincial examinations in language arts or math
- Have a higher chance of being retained in school
- Have a lower likelihood of being enrolled in school after age 15 if FASD-affected
- Have incrementally higher education costs, particular for the FASD-affected children

These outcomes raise the probability that alcohol-affected individuals will have reduced lifetime participation and employment rates in the labour market, as well as lower earnings. The fiscal impact of these educational outcomes is known to be a higher reliance on social services, including housing subsidies and income assistance, often of lifelong duration (Reid & Dudding, 2006). Such costs are excluded, as they are outside the scope of the current review.

An Overview of Subsidized Child Care Costs

In Table 5, the average cost of subsidized child care funding for FASD-PW children is shown to be more than double the cost incurred for children in the General Population group. While the FASD-PW children comprise 10.2% of children accessing subsidized child care, their aggregated costs make up 19.5% of the total costs of subsidized child care. Moreover, a higher percentage of FASD-PW and PA children access subsidized child care compared to the General Population group.

Table 5: Estimated Costs of Subsidized Child Care Services

Group	Number of children under age 16	Children accessing subsidized child care	Subsidized infants and preschoolers	Subsidized school age kids	Total costs of subsidized child care	Average costs of subsidized child care	Marginal costs above General Population
	N=	N=	%	%	$	$	$
FASD-PW	498	72	48.8	26.4	232,336	467	249
PA	556	87	24.7	(s)	~	~	~
PA-PW	41	(s)	(s)	(s)	~	~	~
FASD-CADEC	93	10	(s)	(s)	~	~	~
General pop.	4,380	277	11.8	8.8	956,384	218	-

(s) suppressed to small counts; either one or both of the estimates for children aged 6-10 or 11-15 (school age kids) is suppressed due to a small count between 1 and 5 observations

~ estimate is indeterminate due to suppressed data

PA-PW and FASD-CADEC groups: estimates are indeterminate, since data on the percentage of children accessing subsidized child care is suppressed.

PA group: though estimates are available on the percentage of children accessing subsidized child care, no information is available on the average period of time the children were in care during 2006. Consequently, the total, average, and marginal costs are indeterminate.

5. DETAILED STUDY FINDINGS

The following section outlines specific details on the study findings which include:

- costs and utilization of physician services, including reasons for physician visits
- costs and utilization of hospital services (inpatient and day procedures), including the reasons for these services
- costs and utilization of prescription medications (government-and-privately paid), including the frequency of different drug classifications
- costs and utilization of special education services
- costs and utilization of subsidized child care services

Costs and Utilization of Physician Services

In this section, specific findings are reported related to the costs of physician services, beginning with a diagram of service utilization and average cost estimates. Figure 3 illustrates that a higher percentage of children in care (CIC) and FASD-CADEC groups visited a physician in 2006 compared to the General Population group. Moreover, the average costs per child are higher for the CIC and FASD-CADEC groups compared to the General Population group. However, only the FASD-PW and PA groups have estimates that are statistically different from the General Population group.

Table 6 reports the average number of physician visits for the five groups of children. The estimates are calculated by taking the total number of physician visits in each group and dividing by the number of children in the group. In the second column "Average number of visits", there is a statistically significant difference in the estimates of the FASD-PW and PA groups compared to the General Population group. However, there is no statistically significant difference between the estimates of the FASD-PW and PA or PA-PW groups, which suggests the possibility that these three groups of children may have similar patterns of physician visits. In other words, the reliability of the difference in the estimates for these groups is uncertain. Females aged 16 and older have a significantly higher number of physician visits compared to males for all groups, including the general population. Likewise, females in the PA group have higher average physician visits compared to males in any age category.

Figure 3: Percentage of Children with a Physician Visit and Average Costs per Child by Group (2006)

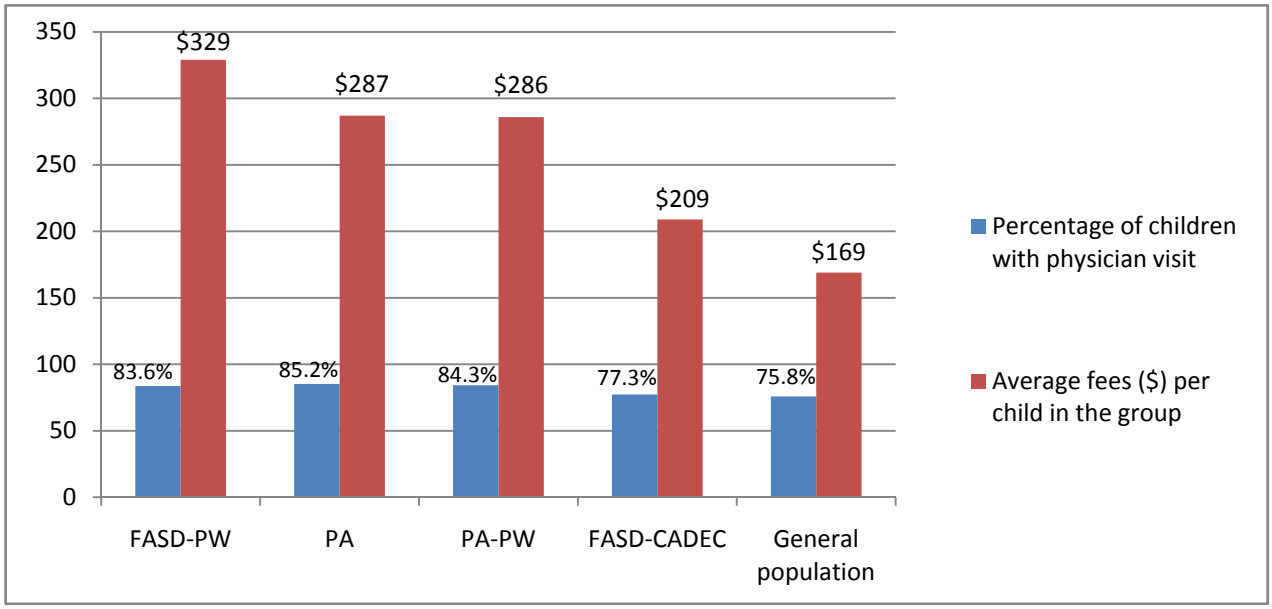


Table 6: Average Number of Physician Visits per Child by Age Category, Gender, and Group (2006)

Group	Average number of visits	Age 0-5 Average # of visits		Age 6-10 Average # of visits		Age 11-15 Average # of visits		Age 16+ Average # of visits	
		Male	Female	Male	Female	Male	Female	Male	Female
FASD-PW	4.4*	4.7	6.4	4.3*	5.6*	4.0*	3.8*	2.7	7.1*
PA	5.0*	6.1*	6.5*	2.9 (1)	4.3*	3.5*	4.8*	3.6	8.4*
PA-PW	4.1	5.0	8.0	3.6	1.6(1)	2.5	5.9*	1.5	5.7
FASD-CADEC	3.5	5.7	3.0	3.3	5.0*	3.5*	2.8	2.2	7.2
General pop.	3.0	5.0	4.4	2.4	2.5	2.3	2.4	2.4	3.9

*Statistically significant difference with respect to the General Population group
(1) Statistically significant difference with respect to the FASD-PW group
Note: PA-PW group estimates may not be reliable due to a small sample size (n=51)

It is not surprising that children in care have more physician visits than the general population. This may be related to the reasons that brought them into care, such as abuse or neglect, and follow-up appointments to an initial medical assessment. There is an expectation that foster parents will have children medically assessed when they first come into care, as some may have had their health needs neglected, and it is a way to get them in medical routines again. In addition, the stress of coming into care may make the children more vulnerable to communicable infections and other health conditions.

Older female teens 16+, as well as 11–15, may access physician services for a range of reasons: birth control, pregnancy, and potentially sexually transmitted infections (STIs) or sexual assault (perhaps by peers or third party individuals, not necessarily sexual abuse). Indeed, pregnancy is a gender-specific condition that can change the service needs for older adolescent girls compared to boys. The pregnancy rate in 2006 for the CIC group was 1.0% (13 pregnancies, which resulted in 10 live births, or 0.8%) compared to 0.4% in the General Population group (0.2% in live births). The mean age of pregnancy for the CIC children was 16.8 years compared to 17.6 years in the General Population group, but as young as 15.6 years in the PA group.

The second column of Table 7 shows that children who are affected by FASD or parental alcohol misuse are more likely to visit a physician compared to the General Population group. A higher percentage of FASD-PW females visited a physician in 2006 compared to their male counterparts in all age categories. The difference in the estimates of the PA, PA-PW, and FASD-CADEC groups compared to the FASD-PW group is not statistically significant. Here again, this implies that there may not be much difference in the estimates (percentage of children with a physician visit in 2006) between the FASD-affected children and those children for whom parental alcohol is a presenting issue.

However, there is a statistically significant difference in the estimates of the General Population group compared to the FASD-PW and PA groups of children. Only one PA category broken down by gender and age is statistically different from the General Population (Male, Age 6-10). The PA-PW and FASD-CADEC group estimates in the second column “Percentage of Children” are not statistically different from the General Population. Tests of statistical significance were not calculated for the age and gender columns due to small counts.

Table 7: Percentage of Children with a Physician Visit by Age Category, Gender, and Group (2006)

Group	Children with a visit	Age 0-5 %		Age 6-10 %		Age 11-15 %		Age 16+ %	
	%	Male	Female	Male	Female	Male	Female	Male	Female
FASD-PW	83.6*	78.3	88.2	83.2*	88.9*	81.9*	90.0*	70.5	86.4
PA	85.2*	88.6	91.5	84.0*	78.8	81.3	80.0	90.0	85.7
PA-PW	84.3	100.0	100.0	85.7	60.0	81.8	91.7	75.0	(s)
FASD-CADEC	77.3	100.0	100.0	82.1	72.7	85.7	68.4	57.9	100.0
General pop.	75.8	88.0	85.3	72.2	75.9	70.4	70.7	69.7	78.2

*Statistically significant difference with respect to the General Population group
(s) the estimate is suppressed due to a small count between 1 and 5 observations
Note: PA-PW group estimates may not be reliable due to small sample size (n=51) and similarly with the FASD-CADEC results
The PA-PW and FASD-CADEC groups are excluded from the tests of statistical significance by gender and age breakdown due to small counts

Table 8 reveals that approximately two-thirds of physician visits occur in the Winnipeg area. Compared to the General Population group, there are a higher percentage of physician visits in North and South Eastman, as well as the Interlake and Burntwood areas for FASD-affected children who are also permanent wards. The Eastman area has more foster homes than most other regions, with the exception of the Winnipeg area. The PA group of children has a significantly higher percentage of physician visits in the Burntwood area. The PA-PW and FASD-CADEC samples sizes are quite small (n=51 and n=119 respectively) and thus some estimates are suppressed. Consequently, the reported estimates may not be reliable.

Whereas the previous tables in this section reported on service utilization, including location of physician visits, Table 9 lists the average physician costs per child, which is adjusted by age and gender within each group. The estimate is calculated by aggregating physician costs for all children in each group and dividing by the number of children in the group.

In the two oldest age categories, the costs of physician visits are higher for females compared to males with one exception, FASD-PW children aged 11-15. In the second column, "Avg costs per child in the group", the CIC and FASD-CADEC groups had higher average costs of physician visits per child in 2006, though only the FASD-PW and PA estimates are significantly different from the General Population group. In 2006, the costs of physician services for the FASD-PW and PA children were 1.7 to 1.9 times higher than the average costs for the General Population group. Moreover, the estimates of the FASD-PW and PA groups are not statistically different,

which suggests that children for whom parental alcohol is an identified issue may have similar physician visit costs compared to children who are FASD-affected.

Table 8: Location of Physician Visits within Manitoba

	Central	North Eastman	South Eastman	Interlake	Nor-Man	Parkland	Burntwood	Brandon	Assiniboine	Wpg
	%	%	%	%	%	%	%	%	%	%
FASD-PW	6.2	3.8	5.5	5.4	1.3	3.3	5.4	3.8	2.4	62.9
PA	2.3	0.6	1.0	4.8	2.0	4.6	8.8	3.5	0.7	71.7
PA-PW	4.8	(s)	3.3	(s)	(s)	4.3	17.1	(s)	(s)	65.2
FASD-CADEC	2.4	1.7	5.4	1.7	3.7	2.2	(s)	10.2	2.7	69.1
General pop.	6.1	2.3	3.9	4.3	1.7	3.4	1.9	4.6	3.6	68.2
(s): suppressed; PA-PW group: North Eastman, Interlake, Nor-Man, Brandon, and Assiniboine make up 5.3% of physician visits										

Table 9: Average Costs of Physician Visits/Services per Child – by Age Category, Gender, and Group (2006)

Group	Avg costs per child in the group	Age 0-5 $		Age 6-10 $		Age 11-15 $		Age 16+ $	
	$	Male	Female	Male	Female	Male	Female	Male	Female
FASD-PW	329*	304	393	250*	644*	302*	233*	243*	541*
PA	287*	305	314*	141(1)	276*(1)	198	341*	164	814*
PA-PW	286	205	620	333	62 (1)	161	436*	92	350
FASD-CADEC	209	519	154	138	271	202	226	124	603
General pop.	169	253	205	128	127	140	160	153	270

*Statistically significant difference with respect to the General Population group.
(1) Statistically significant difference with respect to the FASD-PW group
Note: PA-PW group estimates may not be reliable due to small counts

In Table 10, average costs are estimated for *users* of physician services in 2006. Here again, the costs for the children in care and FASD-CADEC groups are 25%-75% higher than the value of the General Population's user average costs. The estimates are statistically different from the General Population group, except for the PA-PW children. In general, the user costs of physician services are higher for females compared to males, particularly in the two older age categories. One exception is the FASD-PW group in the Age 11-15 category.

For both males and females in all groups, average costs are not necessarily increasing as the children age. However, females who are aged 16 and older have considerable higher costs than the youngest age category, 0-5 (exception: PA-PW). The opposite is true for males, since they have lower average costs for physician visits in the Age 16+ category compared to the youngest age category, 0-5.

Table 10: Average Costs of Physician Visits per *User* of Services – by Age Category, Gender, and Group (2006)

Group	Average costs per child user of services	Age 0-5 $		Age 6-10 $		Age 11-15 $		Age 16+ $	
	$	Male	Female	Male	Female	Male	Female	Male	Female
FASD-PW	364*	367	445*	278*	676*	334*	241	302*	611*
PA	330*(1)	339	343*	167(1)	338*(1)	243	388*(1)	183	949*
PA-PW	339 (1)	205	620	388*	103 (1)	197	476*(1)	123	420
FASD-CADEC	262*(1)	519	154(1)	160(1)	331*(1)	226	330	214	603
General pop.	208	283	233	164	155	182	200	206	320

*Statistically significant difference with respect to the General Population group
(1) Statistically significant difference with respect to the FASD-PW group
Note: PA-PW group estimates may not be reliable due to small sample size (n=51)

Table 11 summarizes the average fees per physician service used by each group in 2006. In the second column, "Average fees per child user of services", the estimates are 15-35% higher in the FASD-PW, PA, and FASD-CADEC groups compared to the General Population group, suggesting that more costly services are used by the former three groups.

However, the age and gender breakdown suggests that, for the FASD-PW female children, the higher average fees are incurred in the two youngest age categories, 0-5 and 6-10, as well as for males aged 11-15. Compared to all other age categories and groups of children, FASD-PW females aged 6-10 used the most expensive services. Average fees for females aged 16+ mirrors the General Population group. Conversely, for both males and females, the PA children incur higher fees per physician visit in the two oldest age categories (11-15 and 16+), as well as females aged 6-10. The average fees are more indeterminate in the PA-PW and FASD-CADEC groups, most likely due to small sample sizes. Also, the average fees are relatively constant across age categories in the General Population group.

Table 11: Average Fees per Physician Service Used – by Age Category, Gender, and Group (2006)

Group	Average fees per child user of services	Age 0-5 $		Age 6-10 $		Age 11-15 $		Age 16+ $	
	$	Male	Female	Male	Female	Male	Female	Male	Female
FASD-PW	42*	44*	41*	39*	59*	47*	34*	40*	33
PA	37*(1)	34*(1)	33*(1)	34(1)	41*(1)	37*(1)	43*(1)	37	52*(1)
PA-PW	27*(1)	16*(1)	28 (1)	36	31 (1)	41*	24*(1)	10*(1)	29
FASD-CADEC	36*(1)	49*	39	30(1)	37*(1)	31(1)	49*(1)	34	37
General pop.	31	32	29	32	30	32	32	30	33

*Statistically significant difference with respect to the General Population group
(1) Statistically significant difference with respect to the FASD-PW group
Note: PA-PW group estimates may not be reliable due to small sample size (n=51)

Table 12 provides a breakdown of the ambulatory physician visits, as well as the obstetrician and gynecology visits for prenatal and postpartum care, based on tariffs and diagnosis codes. Office visits are included in the counts of physician visits. Office visits have diagnosis codes, and those codes are used to identify the reason for the visit. Appendix A lists the formal definitions of the causes of ambulatory visits, which are based on the International Statistical Classification of Diseases and Related Health Problems (ICD-9-CM).

Ambulatory visits are medical services provided on an outpatient basis. Included in the ambulatory physician visits category are physician tariffs for office visits, day surgery, emergency department services, and outpatient clinics, such as rehabilitation and diagnostic services. The research team contemplated the exclusion of obstetrician and gynecology visits for prenatal and postpartum care. However, teen pregnancy and childbirth adds to health care costs, and it should be counted.

There are some limitations in terms of the consistency of data availability. Consequently, the following exclusions apply:

The ambulatory physician visits category excludes claims for optometrist visits, oral surgery, dental, periodontal, and chiropractor contacts. Since some of these expenditures are paid privately by the children's guardians, a complete and consistent count for the services of these health care providers to the children in our sample groups was unavailable.

Table 12: Causes of Ambulatory Physician Visits, Including Office Visits, by Group (2006)

Causes of Physician Visits	General Population	FASD-PW	FASD-CADEC	PA	PA-PW
	%	**%**	**%**	%	**%**
Mental Disorders	4.6	**30.9**	**23.1**	5.7	**9.1**
Diseases of the Respiratory System	**26.1**	**13.9**	**21.6**	**25.8**	**25.2**
Factors Influencing Health Status and Contact With Health Services	**14.2**	**11.7**	**9.7**	**13.3**	**16.2**
Diseases of the Nervous System and Sense Organs	**11.5**	**7.5**	5.8	**9.7**	7.1
Fractures, Wounds, and Injuries + Poisoning and Complications + External Causes of Injury and Poisoning	**9.9**	**6.9**	**10.0**	**8.3**	**8.6**
Symptoms, Signs, and Ill-Defined Conditions	**8.0**	6.5	**9.0**	6.9	4.3
Certain Conditions Originating in the Perinatal Period	0.1	4.5	2.7	(s)	(s)
Diseases of the Skin and Subcutaneous Tissue	7.4	4.4	6.8	8.0	(s)
Infectious and Parasitic Diseases	6.4	3.2	2.9	**10.0**	5.7
Diseases of the Genitourinary System	2.4	3.1	1.7	2.5	**8.6**
Diseases of the Digestive System	3.5	2.6	3.2	5.1	5.2
Diseases of the Musculoskeletal System and Connective Tissue	2.7	1.4	(s)	1.3	3.3
Congenital Anomalies	0.9	1.4	(s)	0.5	(s)
Endocrine, Nutritional and Metabolic Diseases, and Immunity Disorders	0.6	0.8	(s)	0.8	(s)
Diseases of the Circulatory System	0.3	0.6	(s)	(s)	(s)
Complications of Pregnancy, Childbirth and the Puerperium	0.1	0.3	(s)	(s)	(s)
Neoplasms	0.9	(s)	(s)	1.4	(s)
Diseases of the Blood and Blood-Forming Organs	0.4	(s)	(s)	0.4	(s)
Suppressed estimates (due to small count)	0	0.3	3.5	0.3	6.7
	100%	**100%**	**100%**	**100%**	**100%**

Bold: top five conditions
See Appendix A for a list of ICD-9-CM definitions
(s) suppressed due to small count or not applicable
Office visits are included in the counts of physician visits.
Office visits have diagnosis codes, which are used to identify the cause of the visit.

In-patient visits and special visits (i.e. contact with a physician while admitted to a hospital) are excluded since this is considered to be double-counting. The MCHP concept dictionary suggested that there will be a regular physician claim for these visits. Likewise, concomitant care is excluded in order to avoid double-counting. Also excluded are visits to technical specialists, such as pathology, x-ray and radiology, surgery and surgical assistance, anesthetic

and anesthesia assistance claims, since MCHP captures the services of these technical specialists in certain laboratories only. Similarly, heart tracing "ECG", allergy care, immunization, injection, lab smear, and x-ray radium, are excluded due to limitations in terms of consistently available data.

In Table 12, the most frequent causes of ambulatory physician visits are fairly similar across the five groups of children. These include Diseases of the Respiratory System; Factors Influencing Health Status and Contact with Health Services; Diseases of the Nervous System and Sense Organs; Fractures, Wounds, Injuries, and Poisoning. However, there is one exception. FASD-PW and FASD-CADEC children have physician visits that are categorized as Mental Disorders at a substantially higher rate than the General Population or PA groups of children. The estimate for the PA children is comparable to the General Population group, and the PA-PW estimate is slightly higher than the latter.

For a gender breakdown of physician visits, the reader is referred to Appendix C-1, which shows that 38.1% of ambulatory physician visits by FASD-PW males are categorized as mental disorders, which is considerably higher than 22.1% of FASD-PW females who have ambulatory physician visits categorized as mental disorders. The gender split is approximately equal for the FASD-CADEC children.

For an age breakdown of ambulatory physician visits, the reader is referred to Appendix C-2 Causes of Ambulatory Physician Visits, Including Office Visits, by Age Category and Group (2006). Ambulatory visits that are categorized as Mental Disorders correspond with the adolescence years. The proportion of visits related to mental disorders increases approximately threefold across age groups for the General Population group (from 4.2% in the 6-10 age category to 12.5% in the 16+ age category) and PA group (from 4.5% for children aged 6-10 to 13.7% in the 16+ age category). However, for the FASD-PW children, there is a fivefold increase in the proportion of visits from 8.3% in the youngest age category to 38.2% for children aged 11-15. In the 16+ age category, the percentage of visits categorized as mental disorders drops off to 22.0% for the FASD-PW children.

Indeed, it is possible (though not likely) that mental disorders did not increase at all, but only increased in their relative importance compared to other diagnostic categories. One Ontario study found that children with mental disorders have a lower chance of family reunification compared to other foster children, thus partly explaining a high rate of mental disorders among permanent ward children (Burge 2007).

In terms of social explanations for these findings, the adolescent years are linked to crises and disruption for youth, for example, disrupted placements, school attendance, and peer relationships at a critical time, as they are advancing toward age of majority (Reid & Dudding, 2006). Based on an earlier FASD study, it is known that the adolescent years are a vulnerable period for this population, in terms of placement breakdown (Fuchs, Burnside, Marchenski, & Mudry, 2007). Moreover, school breakdowns are more likely in the adolescent stage.

Also, it is known that FASD and ADHD often co-occur. Fuchs, et al. (2005) found that 39% of their sample of children with FASD was also diagnosed with ADHD. That represented approximately 74% of those with a mental health diagnosis. Therefore the most likely reason for the significantly high proportion of children in the both FASD-PW and FASD-CADEC groups with mental health disorders is a diagnosis of ADHD.

Other notable findings are that PA children had a higher percentage of physician visits for infectious and parasitic diseases compared to all other groups, and PA-PW children had a higher frequency of physician visits categorized as diseases of the genitourinary system. Both PA and PA-PW children have a higher chance of being affected by diseases of the digestive system.

Costs and Utilization of Hospitalization Services (Inpatient and Day Procedures)

Figure 4 summarizes the average hospitalization costs per child user, as well as the percentage of children in each group accessing hospital services in 2006. Hospital services include both inpatient and day procedures. Inpatient access is defined as a stay in a hospital for one or more days. Outpatient services include day procedures following which the patient is released the same day. FASD-PW and PA children incur higher average costs during a hospital visit, which suggests that they have more expensive procedures or require a longer stay.

For 1,309 children who are FASD-affected or for whom parental alcohol is an issue, excluding the PA-PW children for whom total cost data was suppressed due to a small count; the costs are $573,739 in 2006, compared to a representative sample of 4,964 children in the General Population group with total costs of $821,688.

Considering the entire sample of children for whom hospitalization costs are tallied in this study (n=6,273), the FASD-affected or parental alcohol children comprise 20.9% of total children,

however, their hospital costs make up 41.1% of the total expenditures. The average total costs per child in each population group are listed in Table 13.

Figure 4: Average Costs per Child User of Services and Percentage of Children Using Hospital Services

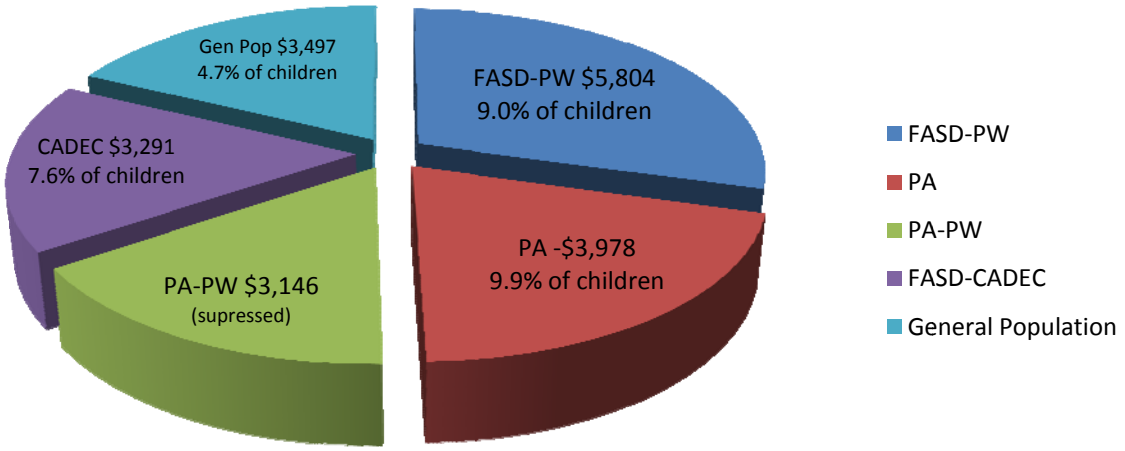


Table 13: Average Costs of Hospitalization per Child (Direct and Indirect Costs) – By Age Category, Gender and Group (2006)

Group	Avg costs per child in the group	Age 0-5 $		Age 6-10 $		Age 11-15 $		Age 16+ $	
	$	Male	Female	Male	Female	Male	Female	Male	Female
FASD-PW	520	373	256	236	1,921	496	129	401	692
PA	393	475	166	56	821	114	425	38	1,355
PA-PW	308	(s)	(s)	501	0	51	777	0	389
FASD-CADEC	249	2,586	0	15	0	148	315	300	932
General pop.	166	174	89	110	59	104	90	95	1,186

(s) the estimate is suppressed due to a small count between 1 and 5 observations
As discussed in the methodology section, tests of statistical significance by gender and age are not available through MCHP, since too many children have zero hospitalization costs

In Table 14, hospitalizations are counted if the individual spent one or more days in a hospital during 2006, whether or not they were admitted before January 1 2006 or stayed after December 31 2006. Direct hospitalization costs are calculated based on average cost per weighted case of $2,953.45 multiplied by the resource intensity weight (RIW) of each case. Further explanation of average costs per weighted case is provided in the methodology section.

Table 14: Average Costs of Hospitalization for *Users* of Services (Direct and Indirect Costs) – By Gender, Age Category, and Group (2006)

Group	Children using services	Average costs per child user of services	Age 0-5 $		Age 6-10 $		Age 11-15 $		Age 16+ $	
	%	$	Male	Female	Male	Female	Male	Female	Male	Female
FASD-PW	9.0*	5,804	2,145	727	3,509	17,289*	10,282*	2,365	3,493	3,808*
PA	9.9*	3,978	3,483	1,225	2,614	16,265*	1,817(1)	3,942	376	4,744
PA-PW	(s)	3,146	0	0	3,508	0	564	4,663	0	2,331
FASD-CADEC	7.6	3,291	7,758	0	411	0	2,078	2,993	5,708	2,797
General population	4.7	3,497	2,118	1,757	2,764	2,300	3,022	2,169	3,180	10,530

*Statistically significant difference with respect to the General Population group
(1) Statistically significant difference with respect to the FASD-PW group
(s) the estimate is suppressed due to a small count between 1 and 5 observations
Third column: none of the average fees per child user estimates are statistically significant with respect to the General Population group; The estimates of statistical significance for the PA-PW and FASD-CADEC groups compared to the general population were suppressed by MCHP due to substantial zero values

The estimates broken down by age and gender suggest that user costs of hospital services deviate significantly from the General Population group for FASD-PW and PA females in the Age 6-10 category, as well as FASD-PW males aged 11-15. However, the General Population estimates rise rapidly for females aged 16 and older. These higher costs are not matched by the expenditures incurred for the CIC or FASD-CADEC groups of children.

Table 15 summarizes the frequencies of hospitalization (inpatient and day procedures), which are adjusted by population group and age category in 2006. For example, the 603 FASD-PW children had a total of 84 hospitalizations (13.9%) and the sample of 4,964 children in the General Population had 310 hospitalizations (6.2%). Likewise, the 603 FASD-PW children had 25 day procedures (4.1%), whereas the 4,964 children in the General Population had 140 day procedures (2.8%). Similar calculations are applied to the inpatient hospitalization category.

Estimates by age breakdown are provided for the day procedure and inpatient hospitalizations combined. Appendix C-3 summarizes the frequency of hospitalizations (Inpatient and Day Procedures) adjusted for both gender and age category in 2006. However, much data is suppressed due to small counts between 1 and 5 observations.

Table 15: Frequency/Percentage of Hospitalizations (Inpatient and Day Procedures) Per Population Group and Age Category (2006)

Group	Percentage of hospitalizations in each group	Day Procedures	Inpatient Hospitalizations	Age 0-5	Age 6-10	Age 11-15	Age 16+
	%	%	%	%	%	%	%
FASD-PW	13.9 (b)	4.1 (a) (b)	9.8 (b)	32.5	17.0	6.2	21.9
PA	13.6 (a)	5.5	8.2	16.8	5.2	13.3	41.9
PA-PW	13.7	(s)	(s)	0	(s)	(s)	(s)
FASD-CADEC	9.2	(s)	5.0	(s)	(s)	(s)	(s)
General pop.	6.2	2.8	3.4	10.1	4.1	4.7	8.6

(s) the estimate is suppressed due to a small count between 1 and 5 observations
(a) group has a lower probability of having a zero count than the General Population group
(b) group estimates of hospitalizations in the population are significantly higher than the General Population when accounting for the excess zeroes
For Day Procedures only: though not shown in the table, (a)+(b) are applicable to the differences of the FASD-PW and PA group estimates; (b) is applicable to the difference of estimates of the PA and FASD-CADEC groups (the latter estimate is suppressed)
The data for the number of hospitalizations per population (i.e. the zero-inflated models) does not lend itself to be analyzed down to the group level, such as group by gender, group by age category, or group by gender and age category. There is not enough data to accurately model this measure.

The findings reported in Table 14 suggest costly (and potentially a greater severity of) health conditions facing some children with FASD. But also, in Table 15, the high incidence of hospitalization for preschoolers in the PA groups is demonstrated. This may be capturing events prior to the child coming into care. For example, it may be related to the precipitating causes of coming into care, such as abuse and neglect. It is indeterminate at this time whether or not these hospitalizations occurred in the children's lives pre- or post- coming into the care of a child welfare agency.

To test the statistical significance of the estimates between the different groups (3 CIC groups, FASD-CADEC, and General Population) for the average number of hospitalizations, a zero-inflated Poisson regression model was estimated. Because the majority of children were not admitted to hospitals, there were excess zeros in the data. With this model, there is interest in

predicting the existence of excess zeros, for example, the probability that a group was a hospital user, in addition to predicting the number of hospitalizations. The model was estimated using variables, such as age, gender, and demographic group in our model.
Here again, the FASD-PW estimate of the hospitalizations in the population group was significantly higher than the general population when accounting for the excess zeroes. Likewise, this finding is also applicable to day procedures and inpatient hospitalizations. For the day procedures category, the FASD-PW group has a lower probability of having a zero count compared to the General Population. This was also the finding for the percentage of hospitalizations (inpatient and day procedures) in the PA group of children.

An unanticipated finding was that the PA group of children had a statistically significant and higher rate of day procedures when accounting for the excess zeroes, compared to the FASD-PW children. Similarly, the PA children had a lower probability of having a zero count of day procedures compared to the FASD-PW children (both not shown in the table). For some children, this finding may be related to medical procedures arising from neglect that precede coming into care, though more precise details are not available due to suppressed counts at MCHP.

A result not reported in Table 15 is that, compared to 30.7% of the General Population group, 75% of the day procedures for PA children are related to diseases of the digestive system. The majority - 83% - are children aged 0-5 years, compared to 39.4% in the General Population group. Diseases of the digestive system include gastrointestinal conditions, mal-absorption of nutrients, diseases of the gallbladder, liver, appendix, and intestinal conditions. This classification also includes diseases of oral cavity, salivary glands and jaws, including (but not exclusively) disorders of tooth development, erosion of teeth due to poor diet, periodontal conditions, and anomalies of the jaw. As will be addressed shortly, this subcategory accounts for the majority of hospital admissions.

Table 16 summarizes the percentage of children with a hospitalization (inpatient or day procedure) within each grouping, whereas Table 15 reported the percentage of hospitalizations for each of the five groups of children. For example, in Table 16, to calculate the FASD-PW estimate of 9.0% in the second column, the 54 FASD-PW children who had a hospitalization were divided by the 603 children in the group. Similarly, 235 (or 4.7%) of the 4,964 children in the General Population group were hospitalized in 2006. Nearly all of the PA-PW estimates are suppressed due to small counts between 1 and 5 observations in each category.

Table 16: Percentage of Children with a Hospitalization (Inpatient and Day Procedures) by Age Category and Group (2006)

Group	Percentage of children hospitalized	Day Procedures	Inpatient Hospitalizations	Age 0-5	Age 6-10	Age 11-15	Age 16+
	%	%	%	%	%	%	%
FASD-PW	9.0*	3.3*	6.0*	25.0*	8.2*	5.1	14.3*
PA	9.9*	5.3 *(1)	5.3*	13.6*	3.6 (1)	8.8*	22.6*
PA-PW	(s)	(s)	(s)	0	(s)	(s)	(s)
FASD-CADEC	7.6	(s)	5.0	(s)	(s)	(s)	(s)
General pop.	4.7	2.4	2.6	6.8	3.4	3.8	7.0

* statistically significant difference with respect to the General Population group
(1) statistically significant difference with respect to FASD-PW
(s) the estimate is suppressed due to a small count between 1 and 5 observations
Due to small counts, MCHP could not provide the statistical significance of the difference between the FASD-CADEC and General Population estimates

A higher percentage of both FASD-PW and PA children were hospitalized compared to the General Population group. The difference in the estimates of these groups is statistically significant. FASD-PW and PA children had an approximately equal chance of being hospitalized in 2006. The difference in their estimates is not statistically significant. Hospitalizations (inpatient and day procedures combined) of FASD-PW and PA children also vary by age category. Children in the youngest and oldest age categories have a substantially higher percentage of hospitalizations compared to children aged 6-10 and 11-15. As well, this finding is applicable to the General Population group. FASD-PW children aged 6-10 have a significantly higher percentage of hospitalizations compared to the PA and General Population groups. Another unexpected finding was that the PA group of children aged 11-15 and 16+ was more likely to visit a hospital than the FASD-PW or General Population groups.

Though much data is suppressed due to small counts between 1 and 5 observations, Appendix C-4 shows the percentage of children with a hospitalization (inpatient and day procedure) by both gender and age category in 2006. A further breakdown of the estimates indicates that, compared to males, the FASD-PW females have a significantly higher likelihood of being hospitalized, though only slightly higher in the 11-15 category. Also, data for males aged 0-5 is suppressed, but it is noted that 35.3% of females in this age category were hospitalized.

The reasons for hospitalizations are reported in Table 17. Appendix A lists the formal definitions of the causes of hospitalization visits, which is based on the International Statistical Classification of Diseases and Related Health Problems (ICD-10-CA).

Table 17: Causes of Hospitalizations (Inpatient and Day Procedure) By Group (2006)

Classifications of Hospitalization	General Pop. %	FASD-PW %	PA %
Mental Disorders	2.9	**14.3**	**15.0**
Diseases of the Respiratory System	**12.3**	**11.9**	**8.8**
Factors Influencing Health Status and Contact With Health Services	**14.6**	7.1	(s)
Diseases of the Nervous System and Sense Organs	9.4	8.3	(s)
Fractures, Wounds, and Injuries + Poisoning and Complications + External Causes of Injury and Poisoning	12.0	(s)	(s)
Symptoms, Signs, and Ill-Defined Conditions	4.5	(s)	(s)
Diseases of the Skin and Subcutaneous Tissue	4.2	(s)	(s)
Infectious and Parasitic Diseases	1.9	(s)	-
Diseases of the Genitourinary System	2.6	(s)	(s)
Diseases of the Digestive System	**21.4**	**17.9**	**40.0**
Diseases of the Musculoskeletal System and Connective Tissue	2.3	(s)	(s)
Congenital Anomalies	3.6	(s)	(s)
Endocrine, Nutritional and Metabolic Diseases, and Immunity Disorders	1.9	(s)	-
Diseases of the Circulatory System	(s)	(s)	(s)
Complications of Pregnancy, Childbirth and the Puerperium	2.9	10.7	(s)
Neoplasms	1.9	-	(s)
Diseases of the Blood and Blood-Forming Organs	(s)	-	(s)
Suppressed	1.6	29.8	36.2
	100%	**100%**	**100%**

Bold: top three conditions
(s) Estimate is suppressed due to a small count between 1 and 5 observations
- not applicable

Estimates for PA-PW and FASD-CADEC groups are excluded, since many were suppressed due to small counts. For FASD-affected children, as well as children for whom parental drinking is an issue in a child welfare agency, the three main conditions causing hospitalization were diseases of the digestive system, mental disorders and diseases of the respiratory system. Only 2.9% of the hospitalized General Population sample (keeping in mind that this is only 4.7% of children) was classified as being hospitalized for having a mental disorder, compared to 14.3% and 15.0%

of the FASD-PW and PA groups, respectively. Slightly fewer FASD-PW and PA hospitalized children fell into the category of diseases of the respiratory system, compared to the General Population group.

When day procedures and inpatient hospitalization are combined, 40% of hospitalized PA children are admitted for diseases of the digestive system. Here again, diseases of the digestive system include gastrointestinal conditions, mal-absorption of nutrients, diseases of the gallbladder, liver, appendix, and intestinal conditions. This category also includes diseases of oral cavity, salivary glands and jaws, including (but not exclusively) disorders of tooth development, erosion of teeth due to poor diet, periodontal conditions, and anomalies of the jaw. The conditions could be both stress-related and poverty-related.

In fact, in Table 17, Diseases of the Digestive System account for 21.4% of children's hospitalizations in the General Population, of which 59.1% are diseases of oral cavity, salivary glands and jaws. Likewise, Diseases of the Digestive System account for 17.9% of children's hospitalizations in the FASD-PW group (40.0% PA group), of which 40.0% (78.1% PA) are diseases of oral cavity, salivary glands and jaws.

Table 17 also provides an interesting set of figures for Complications of Pregnancy, Childbirth and the Puerperium (period after childbirth). The estimate of 2.9% for the General Population group and 10.7% for the FASD-PW group reflects teen pregnancy for both population groups. It is known that Manitoba had one of the highest teen pregnancy rates in Canada for a few years (Dryburgh 2000), though this has dropped somewhat in recent years.

Although much of the data was suppressed due to small counts, Table 18 shows the number one leading cause of hospitalization in each age category. The most common reason for hospitalization was related to diseases of the digestive system. However, mental disorders were the number one reason for hospitalizing FASD-PW and PA children aged 11-15. Pregnancy and childbirth was the number one reason for hospitalizing FASD-PW female children aged 16+, indicating a higher risk of teen pregnancy than the general population.

Although not shown in the previous tables, a review of the percentage of children hospitalized per cause demonstrated again the relatively high proportion of children impacted by FASD or parental alcohol issues who were receiving hospital services related to mental health. Mental disorders were the cause of inpatient hospitalization for 25.0% of PA children's hospitalizations, 20.3% of the FASD-PW group and only 5.3% of the General Population. The FASD-PW and PA

children were also more likely to have inpatient hospitalizations classified as diseases of the digestive system (17.0% and 16.7%, respectively) compared to the General Population (13.6%). The data on Fractures, Wounds, Injuries, and Poisoning was suppressed for all groups except for the General Population due to low counts. Therefore, incidents of maltreatment, as well as the injury or illness that led to the child to being hospitalized and potentially coming into the care of a child welfare agency, is not available for further analysis.

Table 18: Number One Leading Cause of Hospitalization By Age Category and Group

Group	Age category	Complications from pregnancy/childbirth	Mental disorders	Diseases of digestive system	Fractures, wounds, injuries and poisoning
		%	%	%	%
FASD-PW	0-5			(s)	
	6-10			25.8%	
	11-15		41.2%		
	16+	34.8%			
PA	0-5			52.4%	
	6-10			(s)	
	11-15		66.7%		
	16+			46.2%	
General population	0-5			28.6%	
	6-10			21.9%	
	11-15				19.7%
	16+			18.0%	

(s) the condition was identified as being the number one cause of hospitalization for the particular age category; however, the count was between 1 and 5, and so the estimate was suppressed
The PA-PW and FASD-CADEC estimates are not included, since they were all suppressed due to low counts

The literature does point to the prevalence of children in care who require psychiatric services (DosReis, Zito, Safer, & Soeken, 2001; Takayam, Bergman, & Connell, 2004), and children with mental health crises may require inpatient hospitalization. Most of the inpatient hospitalizations for PA children in the age category 11-15 were classified as mental disorders (71.4%). For FASD-PW children, the corresponding rate was 50%. Though more detailed data are suppressed, these findings are consistent with previous studies that have documented the relationship between being in care and requiring mental health services. Further, studies have

identified several factors that are associated with increased need for mental health services, including child abuse, depression, ADHD, and developmental delay (DosReis, Zito, Safer & Soeken, 2001).

Children with mental health crises may require inpatient hospitalization For example, most of the inpatient hospitalizations for PA children in the age category 11-15 were classified as mental disorders (71.4%). For FASD-PW children, the corresponding rate was 50%, which could be attributed to crisis response in connection to a placement breakdown. Though more detailed data are suppressed, it could also be argued based on the literature that some of these mental health issues were related to attempted suicides or sexual assaults (Brezo, Paris, Vitaro, Hebert, Tremblay, & Turecki, 2008; DeMarco, Tonmyr, Fallon, & Trocme, 2007; Hebert, Parent, Daigneault, & Tourigny, 2006).

The data on suicide attempts while in care recorded for this sample of children was examined for five years. In that time period, 10 children with an FASD diagnosis made a total of 12 attempts for an attempted suicide rate of 16.58 per thousand. There were no attempts recorded for FASD-CADEC group. In the PA group there were 6 attempts and the number of children attempting were suppressed. Numbers were also suppressed for the small PA-PW sample. In the General Population sample there were 11 attempts recorded for nine children. Therefore the suicide rate in the General Population group was 1.81. This is a strong indication of the increased risk of suicide for youth in care with FASD.

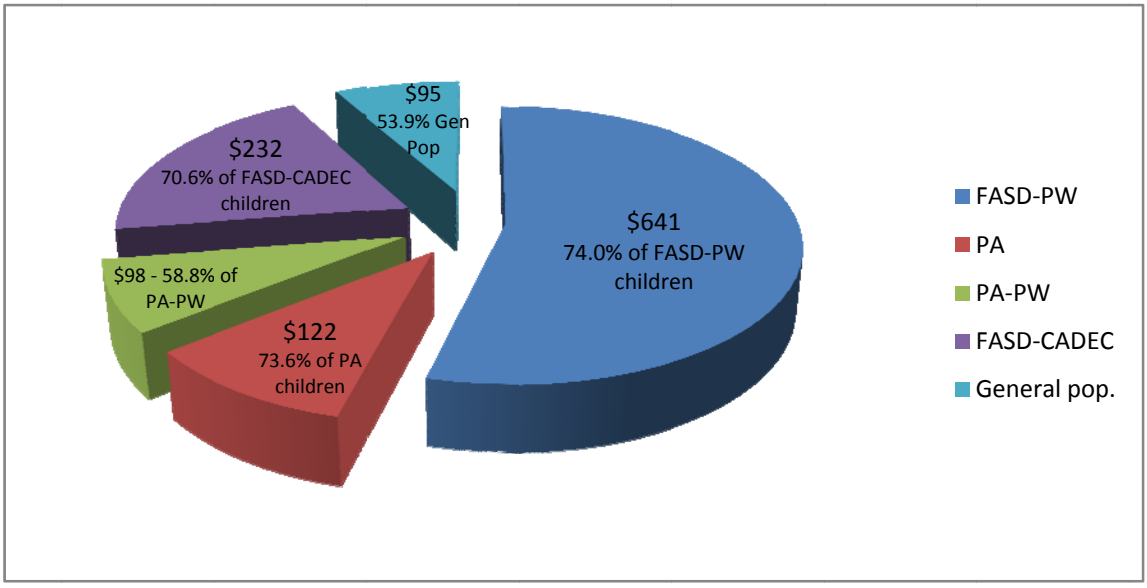
Costs and Utilization of Prescription Medications

(Includes Pharmacare and out-of-pocket *or* private insurance)

The estimate of the percentage of PA-PW children using prescription drugs is comparable to the General Population and the difference between the two estimates is not statistically significant; however, the small PA-PW sample size may yield unreliable estimates, making any comparison or interpretation rather difficult.

Figure 5 illustrates that the FASD-PW children consume the biggest share of average total expenditures on prescription drugs. Second is the FASD-CADEC group, followed by the PA and PA-PW children. Prescription medications are one health expenditure category where we observe a substantial deviation between the costs of health care provided to FASD-PW and PA groups of children.

Figure 5: Average Costs of Prescriptions per Child and Percentage of Children Using Prescription Medications by Group (2006)



In Table 19, we report a three-way cross-tabulation – group, gender, and age category - of the mean number of prescriptions per child in 2006. FASD-PW children are prescribed medications at five times the rate of children in the General Population sample. Likewise, the PA and FASD-CADEC children are prescribed medications at 2.5 times the rate of children in the general population. The differences of the estimates are statistically significant. Here again, the PA-PW estimates may not be reliable due to a small sample size, but the difference of estimates compared to the General Population group is not statistically significant.

In the younger age categories (0-5 and 6-10) of the FASD-PW group, females have a higher average number of prescriptions compared to males, whereas this situation is reversed in the two highest age categories (11-15 and 16+). FASD-PW males aged 11 and older receive 6.0-6.5 times the medication compared to males of a similar age in the General Population group. The average number of prescriptions issued to FASD-PW males increases at a rate of 3.5 times as they age, for example, from a mean of 4.2 prescriptions in the youngest age category to a high of 15.0 prescriptions in the 11-15 age category. This substantial increase is not observed to the same degree in the other groups of children, though prescriptions double from 6.2 to 12.4 as the FASD-PW female ages and they triple for the FASD-CADEC females from 4.3 to 12.5. Moreover, in all age categories, females have a higher mean number of prescriptions in the PA-PW group compared to males.

Table 19: Mean Number of Prescriptions per Child by Age Category, Gender and Group (2006)

Group	Mean number of prescriptions	Age 0-5 #		Age 6-10 #		Age 11-15 #		Age 16+ #	
		Male	Female	Male	Female	Male	Female	Male	Female
FASD-PW	12.1 *	4.2	6.2*	11.7*	13.7*	15.0*	8.7*	13.6*	12.4*
PA	6.1 *(1)	6.5*	6.9*	3.2*(1)	6.6*(1)	7.0*(1)	5.8*	4.1(1)	8.7
PA-PW	4.5 (1)	4.7	10.7	2.7 (1)	3.0 (1)	3.4 (1)	6.9*	1.3(1)	4.3
FASD-CADEC	6.3 *(1)	4.0	4.3	5.6*(1)	4.9 (1)	7.2*(1)	7.9*	4.2(1)	12.5
General pop.	2.4	3.2	2.5	1.9	2.0	2.3	2.0	2.2	4.5

*Statistically significant difference with respect to the General Population group
(1) Statistically significant difference with respect to the FASD-PW group

Some of the observed differences in the mean number of prescribed medications in the population groups may be attributed to children receiving diagnoses at different times. For instance, the inclusion in their respective groups implies that the FASD-PW and FASD-CADEC children would have been diagnosed prior to 2006, whereas some of the PA or PA-PW children may not have been diagnosed yet, if in fact they do have FASD, and are not as highly medicated.

The total and average costs of prescription medication are summarized by gender in Table 20. Privately-paid prescriptions include out-of-pocket expenditures and/or prescriptions that are covered by private insurance. There are statistically significant differences in the government-paid estimates for both male and female FASD-PW children compared to the General Population group. Likewise, the difference in estimates is statistically significant for females in the PA group compared to the General Population. Male youth have higher government-paid costs in the FASD-PW group compared to their female counterparts, whereas females have higher government-paid expenditures in the FASD-CADEC group.

The share of privately-paid prescriptions (i.e. out-of-pocket or private insurance) in the General Population group is between 38% (male) and 43% (female) of total prescription costs (not shown in Table 20). Conversely, families of FASD-PW children absorb 2.6% of the children's prescription costs privately. However, this finding should be qualified, since it is a reflection of the payment system through social allowances for children in care. Particularly for permanent ward children who come into care earliest and spend the majority of their lives in care, it is highly probable that the costs outside of social allowances are paid by child and family services

agencies. There are many examples of prescriptions, which are not covered by social allowances that the foster parent pays in full, after which they make a claim for full reimbursement by a child welfare agency.

Table 20: Costs of Prescription Medication – by Gender and Group (2006)

Group	Percentage of children using prescription drugs	Total Costs $	Average costs per child in the group: Government-paid $		Average costs per child in the group: Privately-paid $		Average costs per child *user* in the group: Govt.-paid $		Average costs per child *user* in the group Privately-paid $	
	%		Male	Female	Male	Female	Male	Female	Male	Female
FASD-PW	74.0*	386,682	703*	502*	18*	13	975*	652*	25*	17
PA	73.6*(1)	71,755	112(1)	114*(1)	8*(1)	11*	158 (1)	150*(1)	11*(1)	14*
PA-PW	58.8 (1)	4,973	41 (1)	142	10	0	78 (1)	218	19	0
FASD-CADEC	70.6 (1)	27,662	134(1)	224	78	54	189 (1)	309 (1)	111	75
General pop.	53.9	469,411	69	43	42	32	130	78	79	59

*statistically significant difference with respect to the General Population group
(1) Statistically significant difference with respect to the FASD-PW group
Due to small counts, the PA-PW group is excluded from the tests of statistical significance in the last two columns: Average cost per child user, privately paid, male and female

The share of privately-paid prescriptions in the families of PA children is approximately 6-9% of their total prescription costs. The families of FASD-CADEC children absorb approximately 19.5% of female prescriptions and 37% of male prescriptions costs privately. Stade et al. (2006) found that families of FAS/FAE children incurred 38.7% of the children's prescription medications and dispensing fees.

These estimates are aggregated in Table 21 and reveal that the majority of expenditures are incurred by the government, as opposed to out-of-pocket or private insurance company coverage.

It is also useful to examine the sample of children who had some known period of time in care in 2006 (FASD-PW, PA-PW, and PA groups, known as Child in Care or CIC group) and those with a diagnosis of FASD but not known to be in care in 2006 (FASD-CADEC) with the general population. For children with FASD or for whom parental alcohol misuse is an issue (CIC and FASD-CADEC groups), 95.1% of their prescription costs are covered by a government-sponsored program, and only 4.9% of their medication costs are paid out-of-pocket or covered by an insurance plan. In some situations, families are reimbursed by the child welfare agency. This is an expected finding, since children in care would have most prescriptions covered by social

allowances. Conversely, 60.4% of the prescription costs for the General Population group are covered by government programs, with 39.6% paid out-of-pocket or by an insurance company.

Table 21: Government-Paid and Privately-Paid Percentage of Prescriptions

	Sample size (n)	Government-paid prescription costs $	%	Privately-paid prescription costs $	%	Total (100%) Prescription costs $
FASD-PW	603	376,787	97.4	9,895	2.6	386,682
PA	587	66,332	92.4	5,423	7.6	71,755
PA-PW	51	4,721	94.9	252	5.1	4,973
FASD-CADEC	119	19,394	70.1	8,268	29.9	27,662
Sub-total: FASD/PA groups	**1,360**	**467,234**	**95.1**	**23,838**	**4.9**	**491,072**
General population	**4,964**	**283,729**	**60.4**	**185,682**	**39.6**	**469,411**
FASD-CADEC children are not in care, and their guardians may have a private insurance plan						

For 1,360 children who are FASD-affected or had parental alcohol misuse as a presenting issue with a child welfare agency (CIC and FASD-CADEC), total costs are $491,072 in 2006, compared to a representative 4,964 children in the General Population with costs totaling $469,411. If we consider the entire sample of children for whom prescription costs are tallied in this study (n=6,324), the FASD-affected or parental alcohol children comprise 21.5% of total children; however, their drug costs make up 51.1% of the total costs.

For most groups of children, costs are either increasing or remain constant from the youngest (0-5) to the oldest (16+) age categories. The only deviation from this pattern is the PA-PW group, where the deviation could be attributed to a small sample size yielding unreliable estimates. The average cost for each group, age category, and gender is listed in Table 22.

For the children who are FASD-affected or for whom parental alcohol is an issue (CIC and FASD-CADEC), 72.9% are users of prescription drugs, whereas only 53.9% of children in the General Population had a prescription in 2006. As shown in Figure 5 at the start of this section, not all children are users of prescription medications. The average costs are much lower in the General Population sample, since approximately half of the children were prescribed a medication compared to almost three-quarters of the children in the FASD-PW, PA and FASD-CADEC groups.

Table 22: Average Costs of Prescriptions per Child by Age Category, Gender, and Group (2006)

Group	Avg costs per child in the group	Age 0-5 $		Age 6-10 $		Age 11-15 $		Age 16+ $	
	$	Male	Female	Male	Female	Male	Female	Male	Female
FASD-PW	641*	77	212*	602*	722*	914*	460*	672*	475*
PA	122*(1)	117	96*	60 (1)	142*(1)	243 (1)	142(1)	116 (1)	153
PA-PW	98 (1)	72	150	61 (1)	30 (1)	51 (1)	184	16 (1)	149
FASD-CADEC	232*(1)	76	53	202*(1)	105 (1)	313 (1)	398*	98 (1)	367
General pop.	95	95	50	65	62	173	80	93	139

*Statistically significant difference with respect to the General Population group
(1) Statistically significant difference with respect to the FASD-PW group

Whereas the previous table reported the average costs based on the number of children in each group, Table 23 summarizes the percentage of children with a prescription in 2006 by gender and age category. A notable finding is the high percentage of females aged 16 and older in the FASD-PW and PA groups who are prescribed medications compared to males of that age and children in all other age categories. This could be related to birth control or anti-depressants. However, a similar finding applies to the General Population group with the exception of males aged 0-5.

Table 23: Percentage of Children with a Prescription by Age Category, Gender and Group (2006)

Group	Children with a prescription %	Age 0-5 %		Age 6-10 %		Age 11-15 %		Age 16+ %	
		Male	Female	Male	Female	Male	Female	Male	Female
FASD-PW	74.0*(1)	47.8	70.6	71.4*	77.8*	77.7*	75.5*	67.2*	81.8*
PA	74.0*(1)	75.8*(1)	75.4*	68.1*	74.7*	66.7*	75.4*	(s)	90.5*
PA-PW	59.0	66.7	33.3	(s)	60.0	72.7	75.0	25.0	(s)
FASD-CADEC	71.0	100.0	100.0	75.0	72.7	71.4	57.9	57.9	100.0
General pop.	54.0	65.0	59.0	49.0	53.0	49.0	50.0	52.0	64.0

*Statistically significant difference with respect to the General Population group
(1) Estimates are statistically different with respect to the PA-PW group
(s) the estimate is suppressed due to a small count between 1 and 5 observations
Due to small counts, the PA-PW and FASD-CADEC groups are excluded from the tests of statistical significance by age and gender

Table 24 reports findings on the average costs per *child user* of prescription medications in each group. Of note is that prescription medication users in the FASD-PW group incur five times the average costs of children in the general population, and the difference in the estimates is statistically significant. The PA and PA-PW children have similar costs compared to the General Population, and their estimates are significantly different from the FASD-PW groups.

To reiterate, the use of prescription medications is one health care category in which there is a major deviation of costs between the PA and FASD-PW children. The high average costs for the latter could potentially reflect the co-occurrence of FASD with other diagnosed conditions, such as attention-deficit hyperactivity disorder (ADHD). In Fuchs et al. (2005), almost half of the children with FASD had a diagnosed "other mental health condition", mainly ADHD. Once the children with a suspected mental health condition are added in as prescription users, this totals approximately 60% of the population, which may explain the high rate of children using prescription drugs shown in the second column of Table 24.

Similar to a previous result in Table 22, for most groups of children, costs are either increasing or remain constant from the youngest (0-5) to the oldest (16+) age categories. The only deviation is the PA-PW male group, which could be attributed to a small sample size that yields unreliable estimates. Moreover, a few estimates in the age 16+ category are suppressed due to small counts (PA, male and PA-PW, female). Average costs are more stable in the General Population group.

Table 24: Average Costs per *User* of Prescription Medication by Age Category, Gender, and Group (2006)

Group	Children using prescription drugs	Average costs per child user of medications	Age 0-5 $		Age 6-10 $		Age 11-15 $		Age 16+ $	
	%	$	Male	Female	Male	Female	Male	Female	Male	Female
FASD-PW	74.0*	867*	161	300*	843*	928*	1,176*	609*	1,000*	581*
PA	73.6*(1)	166 (1)	155	127*(1)	88*(1)	189*(1)	364(1)	188(1)	(s)	169(1)
PA-PW	58.8 (1)	166 (1)	108	451	(s)	50 (1)	70*(1)	245(1)	66 (1)	(s)
FASD-CADEC	70.6 (1)	329 (1)	76	53 (1)	270*(1)	144 (1)	439 (1)	688*	169(1)	367
General population	53.9	176	145	85	133	118	351	161	177	217

*Statistically significant difference with respect to the General Population group
(1) Statistically significant difference with respect to the FASD-PW group
(s): the estimate is suppressed due to a small count between 1 and 5 observations

Table 25 records the frequency of prescribed medications by group in 2006. The General Population group is less likely to have two or more prescriptions and more likely to have just one prescription, compared to all other groups. A significantly higher percentage of children in the General Population group (46.1%) were not prescribed a medication, compared to only 26.0% of the FASD-PW children, 26.4% of the PA children, and 29.4% of the FASD-CADEC children. Here again, it is rather difficult to assess the reasons for a deviation of the PA-PW group estimates from the other CIC and FASD-CADEC groups. However, the small sample size may generate unreliable estimates. Moreover, many of the PA-PW estimates are suppressed (45.1%) due to small counts between 1 and 5 observations.

In the table of Appendix C-5, we conducted a similar analysis; however, the PA-PW and FASD-CADEC groups were excluded due to a considerable amount of data being suppressed. The frequency of the number of different types of medications is reported for each age category: 0-5, 6-10, 11-15, and 16+. Here again, approximately 60-70% of children in all age categories of the General Population group had one or fewer medications prescribed in 2006 compared to approximately 40% of FASD-PW and PA children, though data is suppressed in some age categories (e.g. PA children age 16 and older).

Table 25: Frequency of Prescribed Medications by Group (2006)

Number of prescriptions	FASD-PW %	PA %	PA-PW %	FASD-CADEC %	General Population - %
0 – no prescriptions	26.0	26.4	41.2	29.4	46.1
1	16.8	13.5	-	16.0	22.0
2	15.1	13.6	13.7	16.0	13.4
3	14.3	9.4	-	17.7	7.5
4	9.3	9.2	-	7.6	4.3
5	5.3	4.6	-	-	2.3
6	4.6	6.5	-	-	1.7
7	2.5	4.4	-	-	1.0
8	2.2	4.1	-	-	0.6
9	-	2.6	-	-	0.3
10	1.8	1.7	-	-	0.3
>10	-	2.5	-	-	0.1
Suppressed	2.1	1.5	45.1	13.3	0.4
	100%	**100%**	**100%**	**100%**	**100%**

Table 26 shows the frequency of drug prescriptions for those children who were actually prescribed a medication. The General Population group is prescribed nervous system drugs less frequently, since approximately 20% of these children were prescribed a drug which falls into this classification compared to 60.0% and 69.2% of FASD-affected children and 25.1% and 31.6% of children in the parental alcohol groups. The top three drug classifications are consistent across the groups: drugs related to nervous system and respiratory conditions, as well as general anti-infectives for systemic use. Formal definitions of these drug classifications are provided in Appendix B.

Table 26: Frequency of Types of Drugs (ATC1) for Children Prescribed a Medication in 2006

Drug Classification	General Population - %	FASD-PW %	FASD-CADEC - %	PA %	PA-PW %
Nervous System	**19.9**	**69.2**	**60.0**	**25.1**	**31.6**
Respiratory System	**17.8**	**7.5**	**9.3**	**18.5**	**17.7**
General Antiinfectives for Systemic Use	**30.1**	**6.7**	**12.8**	**20.6**	**21.6**
Cardiovascular System	3.3	**5.8**	**2.8**	2.8	**-**
Alimentary Tract and Metabolism	**6.3**	**2.5**	1.6	**6.3**	**8.7**
Dermatologicals	**7.9**	**2.5**	**6.3**	6.1	**4.3**
Genito Urinary System and Sex Hormones	3.2	1.7	1.9	-	(s)
Systemic Hormonal Prep. Excluding Sex Hormones	2.5	1.5	-	-	-
Blood and Blood Forming Organs	-	0.9	-	1.6	3.9
Sensory Organs	3.1	0.7	1.1	2.8	(s)
Antiparasitic Products, Insecticides, and Repellants	2.3	-	1.6	**10.8**	3.9
Musculo-Skeletal System	-	-	1.9	2.2	3.5
Other (including suppressed counts)	3.6	1.0	0.7	3.2	4.8
	100%	**100%**	**100%**	**100%**	**100%**

Bold: top five drug classifications
(s) Suppressed due to a small count between 1 and 5 observations;
- not applicable
See Appendix B for a description of the specific drugs that fall into the above-noted categories
Interpretation of data in this table: Not all children are prescribed a medication as shown in Table 24; however, for those children who are prescribed a drug, this table lists the relative proportion of the drug compared to other categories of prescribed medications

Likewise, Table 27 summarizes the frequency of drug prescriptions by age category for FASD-PW, PA, and General Population groups only. As FASD-PW children who are prescribed medication age, the percentage of prescriptions for nervous system drugs they receive increases (from 30.4% in the youngest age category to 77.4% for children ages 16 and older). The opposite situation occurs for the other two most commonly prescribed drugs, respiratory

system drugs or general anti-infectives. The Genito Urinary System and Sex Hormone prescriptions are used by youth aged 11-15 and 16+.

Table 27: Frequency of Types of Drugs (ATC1) Prescribed by Age Category and Group in 2006

Type of Drug	Age 0-5 %			Age 6-10 %			Age 11-15 %			Age 16+ %		
	FASD-PW	**PA**	**Gen. Pop.**	**FASD-PW**	**PA**	**Gen. Pop.**	**FASD-PW**	**PA**	**Gen. Pop.**	**FASD-PW**	**PA**	**Gen. Pop.**
Nervous System	**30.4**	**22.7**	**12.1**	**60.9**	**22.7**	**21.6**	**73.7**	**34.1**	**25.8**	**77.4**	**24.1**	**19.9**
Respiratory System	**17.4**	**21.0**	**17.0**	**11.8**	17.9	**22.8**	**6.0**	**17.7**	**17.9**	3.0	5.8	11.2
General Antiinfectives for Systemic Use	**27.9**	**24.4**	**40.7**	7.3	**18.2**	**32.2**	5.0	**14.9**	**23.8**	**6.8**	**21.0**	**19.5**
Cardiovascular System	7.0	2.6	3.0	**9.3**	2.8	3.7	**5.7**	2.8	3.8	-	4.5	2.2
Alimentary Tract and Metabolism	4.0	7.4	8.0	4.7	7.2	3.0	1.4	2.8	6.1	1.5	6.3	8.9
Dermatologicals	4.0	6.2	8.2	1.3	6.1	6.0	3.0	5.9	7.4	2.9	7.2	11.4
Genito Urinary System and Sex Hormones	-	-	-	-	-	-	2.2	2.8	-	**3.5**	**15.2**	**15.2**
Systemic Hormonal Prep. Excluding Sex Hormones	(s)	1.6	3.0	2.0	-	1.6	1.7	-	2.9	-	-	2.2
Blood and Blood Forming Organs	(s)	1.2	-	1.0	2.5	-	-	-	-	2.7	3.6	-
Sensory Organs	3.5	3.5	4.0	1.2	2.5	3.4	0.3	2.3	2.6	0.4	-	-
Antiparasitic Products, Insecticides, and Repellants	(s)	7.6	1.8	0.4	**18.0**	2.8	0.4	10.1	2.4	0.4	6.3	2.0
Musculo-Skeletal System	4.0	-	1.2	-	1.9	1.5	-	4.2	2.1	0.9	5.8	4.0
Suppressed or other	1.8	1.8	1.0	0.1	0.2	1.4	0.6	2.4	5.2	0.5	0.2	3.5
	100%	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Bold: top three drug classifications
(s) Suppressed
- not applicable
Interpretation of data in this table: Not all children are prescribed a medication as shown in Table 24; however, for those children who are prescribed a drug, this table lists the relative proportion of the drug compared to other categories of prescribed medications

As shown in Appendix C-6, these medications are mostly oral contraceptives and in a few situations medications are prescribed for bladder or urinary tract conditions. A notable finding, for those who are prescribed this classification of drug, is that the same proportion of FASD-PW and PA youth are receiving prescriptions for contraceptives compared to the General Population group (around 72-78%). This does assume that a higher percentage of the FASD-PW and PA youth are prescribed injections of Depo-Provera as a method of contraception. The

reader is referred to Appendix C-6. Depo-Provera has other uses, but it is likely that a large proportion of prescriptions are related to contraception.

Prescription user costs are also increasing with age for FASD-PW children, for example, from $234 in the age 0-5 category to $954 for children aged 11-15, and $804 in the age 16+ category (not shown in Table 27). The evidence shows that the lion's share of the drug costs are for nervous system drugs.

Potentially, there are a few explanations for the high rate of prescribed nervous system medications as the children get older in the FASD-PW group. First, it could be the result of the issues that led to admission to care, the trauma and attachment disruption often associated with coming into care, as well as the experience of spending most of their life in care. Second, it could be the result of a co-occurring condition, such as ADHD. Also, once an individual is prescribed these nervous system medications, there may be a high probability of long-term use, possibly into and through adulthood.

Conversely, there is more consistency in the percentage of PA children receiving a prescription over the four age categories. This is reflected in the relatively constant average user costs of $142 in the age 0-5 category, $258 for children aged 11-15, and this is reduced to $182 in the age 16+ category (not shown in Table 27). Interestingly, the jump in average user costs in the 11-15 age category coincides with an increased percentage of PA children being prescribed nervous system drugs (from 23% for ages 0-10 to 34% for ages 11-15) in this age category.

Likewise, costs and frequency of prescribed medication are relatively constant across age categories in the General Population group. Costs range from an average of $178 in the 0-5 age category to a slightly higher average of $265 for children over ages 11-15, and are reduced to $199 in the age 16+ category (not shown in Table 27). The utilization of nervous system drugs increases in the two age categories, 6-10 and 11-15; however, the percentage of children prescribed these drugs drops off for children ages 16 and older. Respiratory system drugs are fairly constant across the age categories. In the General Population group, approximately 41% of children ages 0-5 are prescribed anti-infective drugs compared to 24%-28% in the PA and FASD-PW groups, respectively. The percentage of children using anti-infectives drops in half as children age (40.7% to 19.5%). The reader is referred to Appendix C-7 for a breakdown of cardiovascular system drugs prescribed to the children, of which a significant percentage is antihyperintensive medications. A further analysis of prescribing health care providers is provided in Appendix C-8 and C-9.

Nervous System Drugs and Extent of Use in the Five Population Groups

Since nervous system drugs constitute a substantial share of the prescribed medications, more detailed information and data is provided in the tables that follow. Table 28 summarizes the types of nervous system drugs by generic name that were prescribed to the children in the five population groups, as well as the reasons or ailments for which the medications are used. The medications treat various conditions, such as ADHD, depression, social phobias and anxiety disorders, post-traumatic stress, obsessive compulsive disorders, seizures, migraine headaches, and pain.

Table 28: Nervous System Medications - Anesthetics, analgesics, antiepileptics, anti-Parkinson drugs, psycholeptics, psychoanaleptics, and other nervous system drugs

Drugs (Generic Name)	Type of drug and/or treatment for the following conditions:
Risperidone	An antipsychotic drug that treats schizophrenia, bipolar disorder, anxiety disorders; OCD; depression; autism
Quetiapine	An antipsychotic drug that treats schizophrenia, bipolar disorder
Olanzapine	antipsychotic; treats schizophrenia; depressive episodes associated with bipolar disorder; treats resistant depression
Haloperidol	Used for the management of acute and chronic psychosis, including schizophrenia and manic states. It can also be used for Tourette's syndrome
Methylphenidate HCL or Hydrochloride	Ritalin, which is used for the treatment of attention deficit hyperactivity disorder (ADHD) and narcolepsy
Dextroamphetamine Sulfate	Used in the treatment of attention deficit hyperactivity disorder (ADHD) and narcolepsy (falling asleep at inappropriate times without any control)
Atomoxetine Hydrochloride	Used for attention deficit hyperactivity disorder (ADHD)
Fluoxetine	Prozac; used for depression; obsessive-compulsive disorder
Citalopram Hydrobromide	Celexa: depression treatment
Bupropion HCL	Antidepressant
Mirtazapine	Anti-depressant used for moderate to severe depression
Imipramine HCL	Tofranil; classified under suicidality and antidepressant drugs; anxiety
Paroxetine HCL	Paxil; antidepressant; it is used to treat depression, obsessive-compulsive disorder, panic disorder, social phobia (social anxiety disorder), generalized anxiety disorder, and post-traumatic stress disorder
Trazodone HCL	Trialodine (Trazodone), an antidepressant -mood elevator, is used to treat depression. Trazodone is a psychoactive compound with sedative and anti-depressant properties. Trazodone may also be used for relief of an anxiety disorder (e.g., sleeplessness, tension) and chronic pain

Valproic Acid	Used as an anticonvulsant and mood-stabilizing drug, primarily in the treatment of epilepsy, bipolar disorder, and less commonly major depression. It is also used to treat migraine headaches and schizophrenia
Lithium Carbonate	Lithium is used for the treatment of the manic episodes of manic-depressive illness, also called bipolar disorder
Sertraline	Anti-depressant; treats obsessive compulsive disorder; panic; social anxiety
Lorazepam	Treats anxiety
Diazepam	Diazepam is an anti-anxiety medication in the benzodiazepine family, the same family that includes Lorazepam (Ativan)
Clobazam	Used to treat anxiety disorders
Phenobarbital	Used for the control of certain types of seizures; also used for the treatment of insomnia (difficulty sleeping) and as a sedative to relieve the symptoms of anxiety or tension.
Methotrimeprazine	This medication has calming, sedating and pain relieving actions. It is used for a variety of reasons which may include treatment of anxiety disorders, sleep disorder, psychiatric illness, nausea and vomiting or pain relief.
Acetaminophen	e.g. Tylenol and other; pain relief, allergies, colds
Acetaminophen CPD Codeine	For postoperative pain relief; Codeine is in a group of drugs called narcotic pain relievers. Acetaminophen is a less potent pain reliever that increases the effects of codeine
Hydroxyzine HCL	Hydroxyzine is used for the short-term treatment of nervousness and tension that may occur with certain mental/mood disorders (e.g., anxiety, dementia). It is also used to treat itching from allergies and other causes (e.g., reactions to certain drugs).
Sumatriptan	Treats headaches including migraines
Divalproex sodium	Divalproex sodium is an anticonvulsant (antiseizure) drug. It is also used to treat mania and to help prevent migraine headaches.
Topiramate	Topiramate is a medication that is used to treat epilepsy and to prevent migraine headaches.
Trihexyphenidyl Hydrochloride	Trihexyphenidyl is used, in conjunction with other drugs, for the relief of certain symptoms of Parkinson's disease. It is also used to control certain side effects induced by antipsychotic drugs such as Thorazine and Haldol.

Drug information was retrieved directly from the following sources:
MedicineNet.com (online at: http://www.medicinenet.com/)
C-Health (online at: http://chealth.canoe.ca/)
Drugs.com (online at: http://www.drugs.com/)
Depression-Guide.com (online at: http://www.depression-guide.com/trazodone.htm)
Wikipedia (online at: http://en.wikipedia.org/wiki/Valproic_acid)
WebMD (online at: http://www.webmd.com/)

Table 29 shows findings on the percentage of children with a prescription for a nervous system medication. A considerably higher percentage of the children in care and FASD-CADEC children

have prescriptions for nervous system medications compared to the General Population group. A high percentage of PA children are prescribed nervous system drugs; however, in the two younger age categories, the drug Acetaminophen (e.g. drugs for pain relief, allergies, colds, etc.) constitutes the majority of prescribed nervous system medications. As will be shown in Table 31, once the PA children reach the 6-10 and 11-15 age categories, Ritalin and other ADHD drugs begin to account for a larger share of total prescriptions to these children.

Table 29: Percentage of Children with a Nervous System Drug Prescription by Age Category, Gender and Group (2006)

Group	Children with a prescription	Age 0-5 %		Age 6-10 %		Age 11-15 %		Age 16+ %	
	%	Male	Female	Male	Female	Male	Female	Male	Female
FASD-PW	55.4*	(s)	(s)	55.5*	58.7*	66.3*	48.2*	55.7*	54.5*
PA	45.7*	50.8*(1)	50.0*(1)	37.2*(1)	50.5*	39.6*(1)	43.1*	(s)	38.1
PA-PW	39.2*	(s)	(s)	(s)	(s)	(s)	58.3*	(s)	(s)
FASD-CADEC	47.9	(s)	(s)	50.0*	(s)	53.6*	36.8*	36.8*	(s)
General pop.	11.6	11.7	11.6	9.9	9.3	12.1	9.8	14.3	21.8

*Statistically significant difference with respect to the General Population group
(1) Statistically significant difference with respect to the FASD-PW group
(s) the estimate is suppressed due to a small count between 1 and 5 observations

Table 30 lists the mean number of prescriptions for nervous system drugs by age category, gender and group in 2006. It is evident from this analysis that the FASD-affected children, particularly in the older age categories, are prescribed a substantially higher number of nervous system drugs. Whereas FASD-PW male and female children are prescribed a similar number of nervous system drugs in the 0-5 age category, as the children age, males are prescribed 1.9 and 1.5 times more medication compared to females in the 11-15 and 16+ age categories, respectively. In addition, the PA children are prescribed a threefold higher average number of medications compared to the General Population group (second column), as well as a higher mean number of prescriptions in all four age categories.

In Table 30, the average number of prescribed medications to PA males increases from ages 6-10 to the 11-15 age category, which also corresponds with a higher percentage of ADHD drugs and Risperidone, which is prescribed to this group.

Table 30: Mean Number of Prescriptions per Child for Nervous System Drugs by Age Category, Gender, and Group (2006)

Group	Mean number of prescriptions	Age 0-5 #		Age 6-10 #		Age 11-15 #		Age 16+ #	
		Male	Female	Male	Female	Male	Female	Male	Female
FASD-PW	8.4 (a) (b)	1.5	1.6	7.9	6.9	11.4	5.9	11.9	7.8
PA	1.5 (a)	1.4	1.6	0.7	1.6	3.1	1.5	1.3	2.0
PA-PW	1.4 (a)	(s)	(s)	0.6	1.2	1.5	2.7	(s)	(s)
FASD-CADEC	3.8 (a) (b)	(s)	(s)	3.9	1.5	5.0	4.9	2.1	6.3
General pop.	0.5	0.4	0.3	0.5	0.3	0.7	0.4	0.4	0.9

(a) group has a lower probability of having a zero count than the General Population
(b) estimates of mean number of nervous system prescriptions in the population group are significantly higher than the general population group when accounting for the excess zeroes
(s) Suppressed due to a small count between 1 and 5 observations
There is not enough data to accurately model the tests of statistical significance for the breakdown of gender and age

Similar to the previous discussion in the hospitalization section, to test the statistical significance of the estimates between the different groups (CIC groups; FASD-CADEC; and General Population) for the average number of nervous system prescriptions, a zero-inflated Poisson regression model was estimated. The reason is that the majority of children were not prescribed a nervous system drug, so there are excess zeros in the data because many individuals in the population groups are not users of these medications. With this model, there is interest in predicting the existence of excess zeros, for example, the probability that a group was a user of nervous system drugs, in addition to predicting the number of prescriptions. The model was estimated using variables, such as age category, gender, and demographic group in our model.

Table 31 reveals that a high percentage of children in the General Population group (88.4%) have no prescriptions for nervous system drugs, compared to the children in care and FASD-CADEC groups. The FASD-PW children are the least likely to have no prescriptions for nervous system medications, and followed by the FASD-CADEC children. These FASD-affected children have a higher likelihood of being prescribed two or more nervous system medications.

For those children who have been prescribed a nervous system medication (in other words, individuals who do not have zero prescriptions in Table 31), Table 32 provides a breakdown of the types of drugs and/or the ailments that are treated by using these medications. Keeping in mind that majority of children in the General Population group (88.4%) have not been

prescribed medications for nervous system conditions, 20.4% of those who are prescribed this drug classification receive the Ritalin medication. Likewise, 10% are prescribed another ADHD drug, 8.3% are prescribed the antipsychotic drug, Risperidone, and at least 9.4% are prescribed drugs for depression (some estimates are suppressed).

Table 31: Frequency of Prescribed Nervous System Medications by Group (2006)

Number of prescriptions	FASD-PW %	PA %	PA-PW %	FASD-CADEC %	General Population - %
0 – no prescriptions	44.6	54.3	60.8	52.1	88.4
1	29.5	40.2	31.4	31.1	10.0
2	16.6	3.9	(s)	13.5	1.3
3	6.6	1.0	(s)	(s)	0.2
4	1.8	(s)	(s)	(s)	(s)
Suppressed	0.9	0.6	7.8	3.3	0.1
	100%	**100%**	**100%**	**100%**	**100%**
(s) the estimate is suppressed due to a small count between 1 and 5 observations					

In the FASD groups of children, the majority of prescribed medications, in fact 80-90%, are antipsychotics, Ritalin and other ADHD drugs, as well as treatment for depression. This is very significant considering around half of FASD-affected children (FASD-PW 55.4%; FASD-CADEC 47.9%) are prescribed nervous system drugs.

Though a fairly significant 45.7% of PA children were prescribed nervous system medications in 2006, only 21.5% of prescribed medications are antipsychotics, Ritalin and other ADHD drugs, as well as anti-depressants. However, the data adjusted by age category in Table 33 tells a story. The majority of nervous system drugs prescribed to PA children in the 0-5 age category are for Acetaminophen (pain relief) drugs (96.8%). However, 14.7% of prescriptions in the 6-10 age category are for the ADHD drugs, Ritalin and Dextroamphetamine Sulfate. There is a sharp increase in ADHD drugs to 30.4% in the age 11-15 category, plus antidepressants are added to the mix of drugs for this group (27.6%). In the 16+ age category, much of the data was suppressed due to small counts, but 16.7% of prescriptions were for Valproic Acid used mainly for mood stabilization and the treatment of epilepsy.

The sample size for the PA-PW children was too small to permit a further cross-tabulation by age category. However, we note the estimates in Table 33, which reveal that 50.7% of prescribed medications for PA-PW children were ADHD drugs and antidepressants.

Table 32: Nervous System Drugs Prescribed by Group (2006)

Drug Classification (Generic Name)	Type of drug and/or treatment for the following conditions:	General Pop. %	FASD-PW %	FASD-CADEC%	PA%	PA-PW%
Methylphenidate HCL or Hydrochloride (Ritalin)	Ritalin, which is used for the treatment of attention deficit hyperactivity disorder (ADHD) and narcolepsy	**20.4**	**30.9**	**28.4**	**6.5**	**19.2**
Risperidone	An antipsychotic drug that treats schizophrenia, bipolar disorder, anxiety disorders; OCD; depression	**8.3**	**28.1**	**20.1**	1.9	*
Quetiapine	An antipsychotic drug that treats schizophrenia, bipolar disorder		**4.8**	5.1		
Olanzapine	antipsychotic ; treats schizophrenia; bipolar disorder; treatment resistant depression		2.6			
Dextroamphetamine Sulfate	Used for ADHD	**10.0**	**13.8**	**23.3**	**4.5**	
Atomoxetine Hydrochloride	used in the treatment of ADHD		2.8		1.7	**15.1**
Fluoxetine (Prozac)	Prozac; used for depression	4.9	3.6		**3.2**	*
Citalopram Hydrobromide	Celexa: depression treatment	2.2				**16.4**
Bupropion HCL	Antidepressant		2.2			
Mirtazapine	Anti-depressant used for moderate to severe depression				1.6	
Imipramine HCL	Tofranil; classified under suicidality and antidepressant drugs; anxiety			3.4		
Trazodone HCL	antidepressant; anxiety disorder (e.g., sleeplessness, tension) and chronic pain			1.8		
Valproic Acid	Used as an anticonvulsant and mood-stabilizing drug, primarily in the treatment of epilepsy, bipolar disorder, and less commonly major depression, migraine headaches and schizophrenia	2.3				
Sertraline	Anti-depressant; treats obsessive compulsive disorder; panic; social anxiety				2.1	
Clobazam	Used to treat anxiety disorders	2.2				
Acetaminophen	Pain relief, allergies, colds	**25.2**	2.4	**5.4**	**65.9**	**37.0**
Acetaminophen CPD Codeine	For postoperative pain relief;	4.6		2.2	2.7	*
Hydroxyzine HCL	For treatment of nervousness and tension that may occur with certain mental/mood disorders (e.g., anxiety, dementia). It is also used to treat itching from allergies and other causes (e.g., reactions to certain drugs).				2.5	*
Divalproex sodium	Divalproex sodium is an anticonvulsant (antiseizure) drug. It is also used to treat mania and to help prevent migraine headaches.			2.7		
Other (incl. suppressed *)		19.9	8.8	7.6	7.4	12.3
Bold: top four drugs		**100%**	**100%**	**100%**	**100%**	**100%**

Interpretation of data in the table: Not all children are prescribed a nervous system drug, as shown in Table 29. For individuals who are prescribed a nervous system drug, this table lists the relative proportion of the drug compared to other categories of prescribed medications

Table 33: Frequency of Nervous System Drugs Prescribed By Age Category and Group (2006)

Type of Drug (Generic Name)	Age 0-5 %			Age 6-10 %			Age 11-15 %			Age 16+ %		
	FASD-PW	PA	Gen. Pop.	FASD-PW	PA	Gen. Pop.	FASD-PW	PA	Gen. Pop.	FASD-PW	PA	Gen. Pop.
Risperidone (antipsychotic)	32.8			27.2		8.1	24.1	6.2	15.1	38.6		
Quetiapine (antipsychotic)				2.5			4.4			9.0		
Olanzapine (antipsychotic)				4.0			2.2		3.7	1.9		
Haloperidol (antipsychotic)						2.4						
Methylphenidate HCL or Hydrochloride (Ritalin)				34.8	3.2	27.5	34.9	21.0	30.1	17.6		5.7
Dextroamphetamine Sulfate (ADHD drug)	9.8			12.0	11.5	10.1	13.7	4.5	18.0	16.4		
Atomoxetine Hydrochloride (ADHD)	14.8			3.6		9.3	3.7	4.9				
Fluoxetine (depression)				2.6		2.1	2.4	11.1	4.4	8.0		16.2
Citalopram Hydrobromide						2.4		2.9				8.1
Bupropion HCL (depression)							3.5			0.9		
Mirtazapine (depression)								5.8				
Imipramine HCL (depression)												
Paroxetine HCL (depression)										2.1		
Trazodone HCL (depression)												
Valproic Acid (depression)			11.7								16.7	
Lithium Carbonate (depress)									1.4			3.1
Sertraline (depression)								7.8				3.4
Lorazepam (anxiety)												
Diazepam (anxiety)												3.7
Clobazam (anxiety)			3.9						2.9			
Phenobarbital (anxiety)			2.9									
Methotrimeprazine												3.1
Acetaminophen (for pain)	31.1	96.8	69.1	3.1	70.5	27.7	1.6	21.8	10.8	1.6	27.8	8.6
Acetaminophen CPD Codeine (for pain)									4.9	1.3	24.1	13.8
Hydroxyzine HCL		1.8	2.7		3.7							
Sumatriptan												
Divalproex sodium								4.9				
Topiramate			4.4		3.2							
Trihexyphenidyl Hydrochloride												6.8
Suppressed or other	11.5	1.4	5.3	10.2	7.9	10.4	9.5	9.1	8.7	2.6	31.4	27.5
	100%	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Interpretation of data in the table: Not all children are prescribed a nervous system drug, as shown in Table 29. For individuals who are prescribed a nervous system drug, this table lists the relative proportion of the drug compared to other categories of prescribed medications

Special Education Costs and Service Utilization

Many of the children in the FASD-PW, PA, PA-PW and FASD-CADEC groups access special education services. As discussed in the methodology section, we had access through MCHP to the enrolment and assessment data from the Manitoba Department of Education. Table 34 lists the findings for the percentage of FASD-affected and PA children receiving Level 2 and 3 funding through the Manitoba education system, as well as comparisons to the General Population group. For this calculation, we estimated the number of children who receive Level 2 or 3 funding out of all the children in the five population groups who were aged 5 and older and still enrolled in school. We also gathered data on enrolment as of age 16 and older, graduation rates, as well as the percentage of children who have earned 8 or more credits in Grade 9.

Table 34: Education Descriptives and Special Rate Funding (%)

	Level 2 2006 (A)	Level 2 2005/6 (B)	Level 3: 2006 (C)	Level 3 2005/6 (D)	Age 16+ still enrolled in school in 2006	Graduation rate 2005 (E)	Graduation rate 2006 (F)	8+ credits in Grade 9 (G)
FASD-PW	36.2*	38.4*	14.0*	13.6*	51.4*	26.5*	18.5*	32.4*
PA	3.2 (1)	3.1 (1)	(s)	(s)	67.7	0	0	(s)
PA-PW	17.1*(1)	15.8*(1)	0	0	(s)	0	0	(s)
FASD-CADEC	38.0*	39.5*	7.6*	7.0*	28.0*(1)	(s)	(s)	(s)
General population	1.9	2.0	1.0	1.0	64.9	45.9	56.7	69.0

Columns:

(A) percentage of kids >5, still in school, and receiving Level 2 funding in 2006 academic year
(B) percentage of kids >5, still in school, and receiving Level 2 funding in 2005 or 2006 academic year
(C) percentage of kids >5, still in school, and receiving Level 3 funding in 2006 academic year
(D) percentage of kids >5, still in school, and receiving Level 3 funding in 2005 or 2006 academic year
(E) percentage of kids who graduated by the end of the 2005 academic year, out of all the youth who were 16+ years old (as of December 31 2005) and enrolled in 2005
(F) percentage of kids who graduated by the end of the 2006 academic year, out of all the youth who were 16+ years old (as of December 31 2006) and enrolled in 2006
(G) Percentage of kids who were enrolled in Grade 9 who received 8+ credits in the first year of Grade 9

*Statistically significant difference with respect to the General Population group

(1) Statistically significant difference with respect to the FASD-PW group

(s) the estimate is suppressed due to a small count between 1 and 5 observations

Level 2 support is available for children who are severely multi-handicapped, severely psychotic, deaf or hard of hearing, severely visually impaired, or very severely emotionally or

behaviorally disordered, or the child has a diagnosis of a moderate Autism Spectrum Disorder. Level 3 support may be accessed on behalf of a child who is profoundly multi-handicapped, profoundly deaf, blind, profoundly emotionally and behaviorally disordered, or has a diagnosis of a severe to profound Autism Spectrum Disorder (Manitoba Education, Citizenship and Youth 2007).

The findings in Table 34 reveal that a much higher percentage of FASD-affected children access special education services (level 2 and 3 funding) compared to PA children or the General Population group. The differences in the estimates are statistically significant. Nevertheless, only 50.2% of FASD-PW children and 45.6% of FASD-CADEC children accessed special education funding in 2006.

Though the descriptive statistics in Table 34 suggest that many FASD-affected children do not have special education funding accessed on their behalf by the schools, the appropriate context is necessary. An expert consultant from the Manitoba Department of Education advised that funding does not necessarily equate with educational services. The school divisions are required to apply for special education rates of funding based on the child's level of functioning or level of severity. The fact that some school divisions receive special rate funding simply means that an application was submitted and accepted. It does not imply that non-funded children do not receive appropriate services in the school system.

The funding decision around Level 2 and 3 rates is often based on functioning or the spectrum of need arising from the disorder and not necessarily a diagnosis of FASD. This approach would capture co-occurring conditions, as well. However, many children with a lower severity of FASD may have a high level of functioning in relative terms. A child's record of school attendance may also influence the funding decision. We note that a relatively high percentage of the PA-PW children (17.1%) are funded at Level 2. These children may have other diagnoses, such as emotional behavioral disorders (EBD). The key issue is that a diagnosis of FASD does not equate with access to special rate funding, as such determinations are based on the child's functioning, not diagnosis alone.

In addition, our estimates do not capture the full costs of special education, as schools may have received block funding to better meet the needs of their students. For example, schools located in communities considered to be at risk due to poverty, lack of adequate housing, transient populations and other community challenges are eligible for block funding to address the impact these social factors have on the provision of education. Schools may use block

funding to hire educational assistants to meet the needs of any student enrolled in the school who needs extra support. Consequently, for those services covered by block funding, special needs costs for children with FASD or affected by parental alcohol use cannot be isolated from the cost of supports for the entire school.

Table 34 also shows that a lower percentage of FASD-affected children are still enrolled in school after age 15 compared to the General Population or PA groups. FASD-PW children have lower graduation rates and have a lower chance of having completed eight or more credits in Grade 9. This finding is congruent with other studies tracking school outcomes for youth in care in general, where the deleterious impact of growing up in care is well documented (Courtney & Dworsky, 2005; Kufeldt, 2003; Merdinger et al., 2005). In a trajectory of care study, Fuchs et al. (2007) also found that many of the youth with FASD have a placement break down after age 12, which further disrupts school attendance.

In Table 34, Columns E and F, a student is considered as having graduated from high school if they received 28 or more credits while in high school or has a yearend status indicating that they received a school diploma, provincial diploma, or mature student diploma. Here again, the graduation rates of FASD-PW children are considerably lower than the General Population group, and the difference of the estimates is statistically significant[9]. Though not shown in Table 34, there were 105 FASD-PW children aged 16 and older in 2006. Of these children 51.4% were enrolled in school and 6.7% had already graduated. However, another 41.9% were not enrolled and neither had they graduated from high school. The latter estimate is considerably higher than the General Population group, in which only 17.3% were not enrolled or had not graduated.

Table 35 provides a comparative analysis of average high school marks for the FASD-affected and PA children compared to the General Population group. The children in care and FASD-CADEC groups of children have lower average marks in 2006 than children who were ever in high school between 2000 and 2006 academic years (column A).

These findings provide evidence that FASD, and even alcohol for that matter, plays a significant role in school outcomes. Here again, the contextual aspects of these findings must be

[9] Graduation in the General Population group is lower than the rate reported at Manitoba Education, Citizenship, and Youth, since the rates are not calculated using the same method. Manitoba Education calculates their graduation rate by taking the total number of graduates in the public and funded independent high schools and dividing by the total Grade 9 enrollment four years previous. Consequently, the rate of 77.1% in 2006 is much higher than the 56.7% estimate, which is reported in Table 34 (MECY 2008).

considered. Our consultant from the Manitoba Department of Education has advised that alcohol-affected children may be assigned different course designations, which are adjusted in consideration of their cognitive disabilities. For example, some children are assigned modified or individualized educational programs (the latter is usually assigned to children funded at level 3), and so they will not participate in provincial examinations or standards tests from which many of the figures in Table 35 were derived (Johnson, 2001; Manitoba Education, Training & Youth (METY) 1995a; 1995b).

Table 35: Average Marks

	Average high school marks if attended between 2000-2006 (A)	Average high school marks in 2006	Average LA marks (standard exams) (B)	Average LA marks (standard exams) in 2006	Average Math marks (standard exams) (C)	Average Math marks (standard exams) in 2006	Standard exam marks: Grade 12 combined Math and LA (D)	Standard exam marks: Grade 12 combined Math and LA in 2006
FASD-PW	63.4*	62.5*	48.7*	59.0	54.7	46.7	51.5*	52.8
PA	55.7*(1)	55.8*(1)	-	-	-	-	-	-
PA-PW	49.7*(1)	48.3*(1)	-	-	-	-	-	-
FASD-CADEC	59.5*(1)	60.0*	47.0	50.0	41.8	-	45.3*	50.0
General population	72.7	72.4	65.9	61.8	64.1	62.3	65.1	62.0

Columns:

(A) Average high school marks for kids who were ever in high school between 2000 and 2006 academic years
(B) Average marks for Grade 12 standard language arts exams for those who have ever written
(C) Average marks for Grade 12 standard math exams for those who have ever written
(D) Average marks for Grade 12 standard exams - Math and Language Arts (LA) combined - for those who have ever written

*Statistically significant difference with respect to the General Population group

(1) Statistically significant difference in the estimates with respect to the FASD-PW group

- no estimate is available

The PA and PA-PW children are excluded from the analysis. MCHP has informed us that no child from these two groups had ever written a standard LA or Math exam.

Though average marks for those who have ever written Grade 12 standard exams - Math and Language Arts (LA), plus Math and Language Arts combined - are much lower for the FASD-PW children compared to the General Population group, a minority of those who are FASD-affected ever write these exams. The sample counts in each of the categories provided in Table 35 were very low. For example, whereas 93 of 483 students (19.3%) aged 16+ in the General Population

who were enrolled in high school or had graduated wrote standard language arts exam, fewer than 5 out of 61 of their FASD-PW counterparts wrote the provincial exam.

In addition, some of the PA, PA-PW, and FASD-CADEC estimates of average Language Arts and Math marks were excluded in Table 35, since no child from those groups had ever written a standard Language Arts or Math exam. Again, this is a reflection of modified or individualized course designations, which exclude the children's participation in the provincial examinations. It is most likely the situation that FASD affected -and- children from the PA groups who wrote the standard exams have a higher level of cognitive ability and functioning.

In Table 36, we provide descriptive statistics on the percentage of children who were ever retained in school. The results show that the FASD-PW, PA, PA-PW and FASD-CADEC children have much higher retention rates compared to the General Population group. The estimates are comparable in both years 2005 and 2006. Guevremont, Roos and Brownell, (2007) found that school retention has high predictive power in terms of school dropout rates. In fact, there is heightened risk of school withdrawal by 8 times if a child has been retained more than once and 3 times if held back once.

Table 36: Percentage of Children Who Were Ever Retained in School (2005 and 2006)

Group	Children in K-8 ever retained (2005)	Children in K-8 ever retained (2006)
	%	%
FASD-PW	38.8*	41.8*
PA	20.2*(1)	18.2*(1)
PA-PW	50.0*	60.0*
FASD-CADEC	22.2*(1)	25.0*(1)
General population	10.1	10.0
*Statistically significant difference with respect to the General Population group (1) Statistically significant difference with respect to the FASD-PW group		

In the current study, individual data was not available on the specific reasons for retention, as well as follow-up supports in order to prevent future retention. Neither is it possible to obtain retention rates for each grade, which would assist in deciphering whether or not retention

occurred earlier on in the child's schooling. For example, it is not unusual for children to be held back in kindergarten or grade 1 at the parent's request. We have no indication of the children who have been retained as a consequence of being late starters, as opposed to being retained in the late primary school or junior high years.

As shown in Table 37, the average cost of education funding for FASD-PW children is 3.4 times the cost incurred for children in the General Population, and 2.7 times higher for the FASD-CADEC children. While the FASD-affected or parental alcohol children comprise 20.4% of total children enrolled in school, their aggregated costs make up 38.2% of the total education costs.

Table 37: Total and Marginal Costs of Education Funding (2006)

	Number of children enrolled	Children funded at Level 2	Children funded at Level 3	Total costs of education funding	Average costs of education	Incremental education costs compared to General Population
	N	%	%	$	$	$
FASD-PW	450	36.2*	14.0*	3,304,514	7,343	5,166
PA	311	3.2 (1)	(s)	702,458	2,259	82
PA-PW	35	17.1*(1)	0	124,294	3,551	1,374
FASD-CADEC	79	38.0*	7.6*	460,818	5,833	3,656
General population	3,407	1.9	1.0	7,418,198	2,177	-

(1) Statistically significant difference with respect to the FASD-PW group
(s) the estimate is suppressed due to a small count between 1 and 5 observations

Average cost per user does not vary across the five groups of children: the basic rate of funding for each child in the province is $1,866 per year; Level 2 funding is $8,780 per year; and Level 3 is $19,530 per year (Manitoba Education, Citizenship, and Youth 2007). The total cost of education funding is the summation of the following:

1. the number of children with basic funding multiplied by $1,866
2. the number of children with Level 2 funding multiplied by $8,780
3. the number of children with Level 3 funding multiplied by $19,530
4. $500 children-in-care component for each FASD-PW and PA-PW child

Average cost for the population group is derived by taking the total cost of education funding and dividing by the number of children enrolled in school in 2006. We note that the PA children's costs of education approach the general population's average costs.

Based on a personal communication with staff from the Finance Branch at Manitoba Education, school authorities regularly report the number of children under the care of a Child and Family Services agency in their division, following which the aggregated data is used to calculate the children-in-care component of the student services grant. In Table 37, we include the grant of $500 per child-in-care, which totals $242,500 in 2006 for the FASD-PW and PA-PW children only, since they were in care for the entire year. The costs are still underestimated, since it is possible that school divisions are also accessing the $500 children-in-care grant on behalf of the PA group of children, who had some proportion of time in care in 2006. Since it is indeterminate whether or not the child was in care at the time of submission of the statistical data by the school division to the Department of Education, valuation is rather difficult. However, the value of the additional costs could be as high as $155,500.

Similarly, there is transportation support provided for level 2 and 3 funded pupils who are accessing transporting services because they are unable to walk to school. According to staff from the Finance Branch at Manitoba Education, this funding is a student-specific grant. Here again, many of the CIC and FASD-CADEC children are may be accessing transporting services, but we have no means of identifying which pupils in our groups are eligible for this funding. These costs are excluded from Table 37, thus underestimating the true costs of education.

To sum, the findings reveal that, compared to the General Population group, the CIC and FASD-CADEC children:

- Have a higher chance of accessing level 2 or 3 special rate funding
- Have lower high school graduation rates and have a lower likelihood of completing 8 or more credits in Grade 9
- Have lower average marks and are less likely to have ever written standard provincial examinations in language arts or math
- Have a higher chance of being retained in school
- Have a lower likelihood of being enrolled in school after age 15 if FASD-affected
- Have incrementally higher education costs, particular for the FASD-affected children

These outcomes raise the probability that alcohol-affected individuals will have reduced lifetime participation and employment rates in the labour market, as well as lower earnings. The fiscal impact of these educational outcomes is known to be a higher reliance on social services, including housing subsidies and income assistance, for the duration of their lives. Such costs are excluded from the current study.

Children in Subsidized Child Care

In this section, we report findings on the percentage of children for whom subsidized child care was accessed in 2006. Subsidized child care funding is available to families in Manitoba with qualifying reasons, such as medical or special needs, or low family income, as well as to children in care of a child welfare agency. Cost of non-subsidized child care and the rate of accessing day care outside of subsidized child care services were not available. The number of children in child welfare care in our study must be considered in the interpretation of the findings in comparison to the General Population, as a higher likelihood of accessing subsidized day care is expected for the CIC groups. Additionally, it must be noted that the PA group of children has a higher proportion of children in the preschool age category (42.6% age 0 – 5) compared to the FASD-PW group (6.4% age 0 – 5) and the General Population group (23.8%).

As expected, subsidized child care is concentrated in the two youngest age categories. Table 38 reveals that compared to the General Population, the FASD-PW children have a much higher likelihood of accessing subsidized day care funding. The difference of the FASD-PW estimates compared to the General Population group is statistically significant. Subsidized child care funding is mostly accessed for children aged 0-10 for both groups. However, in Manitoba, subsidized child care funding for before and after school child care programs is available until the last day of the year that the child turns 12, unless there are extenuating circumstances and approval is sought to extend the funding (under very rare circumstances only). This would explain why we observe 5.1% of FASD-PW and 1.3% of children in the General Population age 11 – 15 accessing subsidized child care funding.

The PA group of children, with a higher proportion of preschoolers, is also more likely to access a subsidized child care. For example, 15.1% of PA children were in subsidized day care, which is statistically different from 5.6% of children in the General Population group. Further, a higher percentage of PA children accessed subsidized child care compared to the FASD-PW group and the difference is statistically significant (second column). However, the third column identifies

that of the 41FASD-PW children ages 0 – 5, almost half of them are in subsidized child care, while only a quarter of the 251 preschoolers in the PA group are in subsidized child care. It is quite possible that being a permanent ward helps the child to settle into a routine, which could include daycare and a stable placement, where the PA group may still be in flux having more recently come into care, not being in a stable placement yet, or in an emergency placement.

Table 38: Percentage of Subsidized Children in Day Care by Age Category (2006)

Group	Percentage of Subsidized Children in Day Care -%	Age 0-5 %	Age 6-10 %	Age 11-15 %	Age 16+ %
FASD-PW	12.1*	48.8*	21.3*	5.1*	0
PA	15.1*(1)	24.7*(1)	12.9*(1)	(s)	0
PA-PW	(s)	(s)	(s)	(s)	0
FASD-CADEC	8.4	(s)	18.0*	(s)	0
General population	5.6	11.8	7.5	1.3	0

*Statistically significant difference with respect to the General Population group
(1) Statistically significant difference with respect to the FASD-PW group
(s) the estimate is suppressed due to a small count between 1 and 5 observations
How to read the table: Column 2: Of the children in the population group, these estimates reveal the percentage of children who are in a subsidized day care spot.
Columns 3 to 6: of the children in the age category, these estimates reveal the percentage that is accessing subsidized day care.

In Table 39, we list the findings by group, gender, and age category; however, the PA-PW and FASD-CADEC groups are excluded due to suppressed data resulting from low counts. The findings show that females and males are equally as likely to access subsidized childcare; however, a higher percentage of females aged 6-10 use subsidized child care.

Table 39: Percentage of Subsidized Children in Day Care by Gender and Age Category (2006)

Group	Percentage of children %	Age 0-5 %		Age 6-10 %		Age 11-15 %		Age 16+ %	
		Male	Female	Male	Female	Male	Female	Male	Female
FASD-PW	12.1*	50.0*	47.1*	19.3*	25.0*	(s)	9.1*	0	0
PA	15.1*(1)	25.6*(1)	23.7*(1)	11.7	14.0*	(s)	(s)	0	0
General pop.	5.6	10.9	12.8	7.1	8.1	1.4	1.1	0	0

*Statistically significant difference with respect to the General Population group
(1) Statistically significant difference with respect to the FASD-PW group
(s) the estimate is suppressed due to a small count between 1 and 5 observations

As shown in Table 40, the average costs of subsidized child care funding for FASD-PW children is more than double the costs incurred for children in the General Population group. Though the FASD-PW comprise 10.2% of children accessing subsidized child care, their aggregated costs make up 19.5% of the total costs of subsidized child care.

Table 40: Estimated Costs of Subsidized Child Care Services

Group	Number of children under age 16	Children accessing subsidized child care	Subsidized infants and preschoolers	Subsidized school age kids	Total costs of subsidized child care	Average costs of subsidized child care	Marginal costs above General Population
	N=	N=	%	%	$	$	$
FASD-PW	498	72	48.8	26.4	232,336	467	249
PA	556	87	24.7	(s)	~	~	~
PA-PW	41	(s)	(s)	(s)	~	~	~
FASD-CADEC	93	10	(s)	(s)	~	~	~
General pop.	4,380	277	11.8	8.8	956,384	218	-

(s) suppressed to small counts; either one or both of the estimates for children aged 6-10 or 11-15 (school age kids) is suppressed due to a small count between 1 and 5 observations

~ estimate is indeterminate due to suppressed data

PA-PW and FASD-CADEC groups: estimates are indeterminate, since data on the percentage of children accessing subsidized child care is suppressed.

PA group: though estimates are available on the percentage of children accessing subsidized child care, no information is available on the average period of time the children were in care during 2006. Consequently, the total, average, and marginal costs are indeterminate.

The rate of subsidized funding for full-time attendance in a day care spot for each child is the following:

1. Infants: $26.00 per day
2. Preschoolers: $16.80 per day
3. School age children: $7.60 per day

Though parents or guardians are responsible for the payment of a $2.00 per day non-subsidized fee, in many situations, the Child and Family Services agency will cover these costs. Therefore, these costs are included in the estimates of FASD-PW, PA-PW and PA children.

In Table 40, average costs are derived by taking the total cost of subsidized day care and dividing by the number of children under age 16 in the population group. Marginal cost is calculated by subtracting the General Population's average cost figure.

6. DISCUSSION

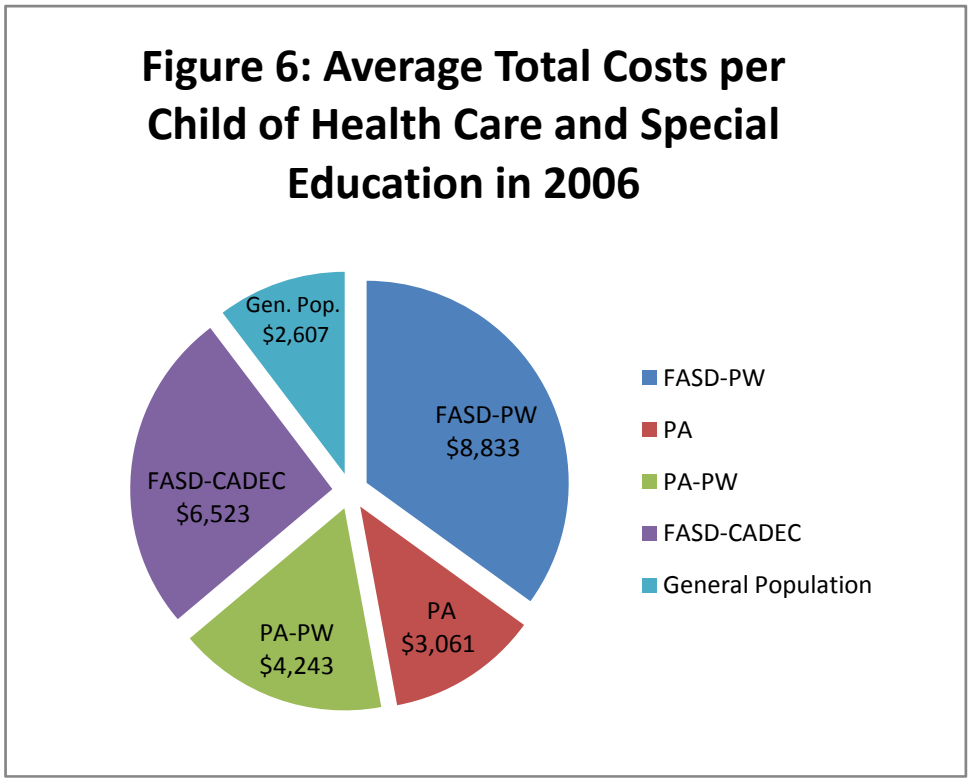
The intent of Phase II of the Economic Impact Study is to broaden our understanding of the costs associated with FASD-affected and children affected by parental alcohol misuse to include costs of health care, special education and subsidized child care services. It is widely recognized that children with a diagnosis of FASD present child welfare agencies, as well as the health and education sectors, with an array of complex and variable needs, as a consequence of a range of detrimental health outcomes. These observable facts are corroborated by the empirical findings in this study. FASD-affected children who are permanent wards used more services in all categories that were examined in 2006. The services they used are more costly compared to a random sample of children in the general population. Other U.S. studies have found that children in the care of child protective services have high service needs related to developmental issues, chronic health conditions, and special education (Casanueva, Cross, & Ringeisen, 2008; Ringeisen, Casanueva, Urato, & Cross, 2008).

Compared to the General Population, the empirical evidence reveals a similar finding of higher costs and service utilization for the PA group of children for whom problematic parental drinking was an identified issue at a child welfare agency. In the categories of physician costs and hospitalizations, the findings revealed that FASD-PW children have the highest utilization and costs, followed by the PA group of children. However, the FASD-CADEC group is second to the FASD-PW children concerning prescription medications and special education costs. Several of the differences in the estimates between the FASD-PW and PA groups of children are not statistically significant, which implies that many of the estimates did not yield true and reliable differences between these two groups of children.

This is an important finding, since a thesis of this study is that it is short-sighted to only investigate how FASD, the most extreme impact of parental alcohol abuse, affects children. Until the current study, there has been a significant research gap in costing the adverse health and education outcomes for children with no diagnosed FASD who are affected by their parents' misuse of alcohol. This analysis reveals an equally detrimental impact in some cost areas for those children without an FASD diagnosis, but for whom parental alcohol misuse is a risk factor that contributed to their being a child in care. FASD is but one identifiable outcome of prenatal substance abuse. Children, who have been exposed to alcohol prenatally, as well as those who have been affected by parental alcohol abuse postnatally, may also be at risk of deleterious outcomes, even if they do not have FASD. Further, given that children with FASD were generally found by Fuchs et al. (2007) to be admitted to care mainly for reasons related to

parental conditions or conduct (including substance abuse) and not related the child's diagnosis of FASD, it is important to consider the impact of both prenatal and/or postnatal parental alcohol abuse on children.

Recent studies by Fuchs et al. examined the effect of FASD on trajectories of care (2007) and the cost of child welfare care (2008). Many of these children with FASD would have come into care with siblings who did not have a diagnosis of FASD yet were in the situation of needing protection from the same parental risk factors as the children with FASD. Additionally, children with a familial history of FASD may also come into care as a result of parental alcohol abuse. As a result of these common familial risks and subsequent admission to care that both children with FASD and those without may experience, it is becoming increasingly important to better understand the experiences of children who do not have FASD but may have been affected by their parents' use of alcohol.



In the current study, FASD-PW and PA children have similar estimates for several cost and utilization categories, some of which are not deemed statistically different, but there are a few

important exceptions. The PA group of children had prescribed medications and costs that mirror the General Population in contrast to the FASD-PW group. These lower estimates have a tendency to reduce the average total costs for the PA group of children, as shown in Figure 6. The other gap in costs is the special education category, which raised aggregated average costs in the FASD-CADEC group. Though there is evidence that the PA group of children have detrimental education outcomes (e.g. higher retention and lower marks compared to the General Population group), any special rate funding is largely allocated to FASD-affected children based on level of functioning. The PA group of children, though potentially requiring additional supports in school, may not be eligible for special services funding in the education system.

This study is limited in the sense that it provides a picture of service utilization and fiscal costs at a moment in time, in contrast to a longitudinal analysis over time. Though valuable data is provided on the PA-PW and FASD-CADEC children, the reader is cautioned that the sample sizes were quite small (n=51 and n=119, respectively). Consequently, the estimates may be unreliable due to small counts, particularly cross-tabulations of health and education variables by gender and age. Some of the disaggregated data adjusted by age and gender was suppressed.

The estimates in this study are the tip of the iceberg. They underestimate the outcomes of FASD-affected children and those affected by parental alcohol misuse, since many related social services that are linked to the health and education sectors are excluded due to data limitations. Key findings for the CIC (children in care, which includes the FASD-PW, PA, PA-PW groups) and FASD-CADEC groups are highlighted and compared to the estimates for the General Population group in the following:

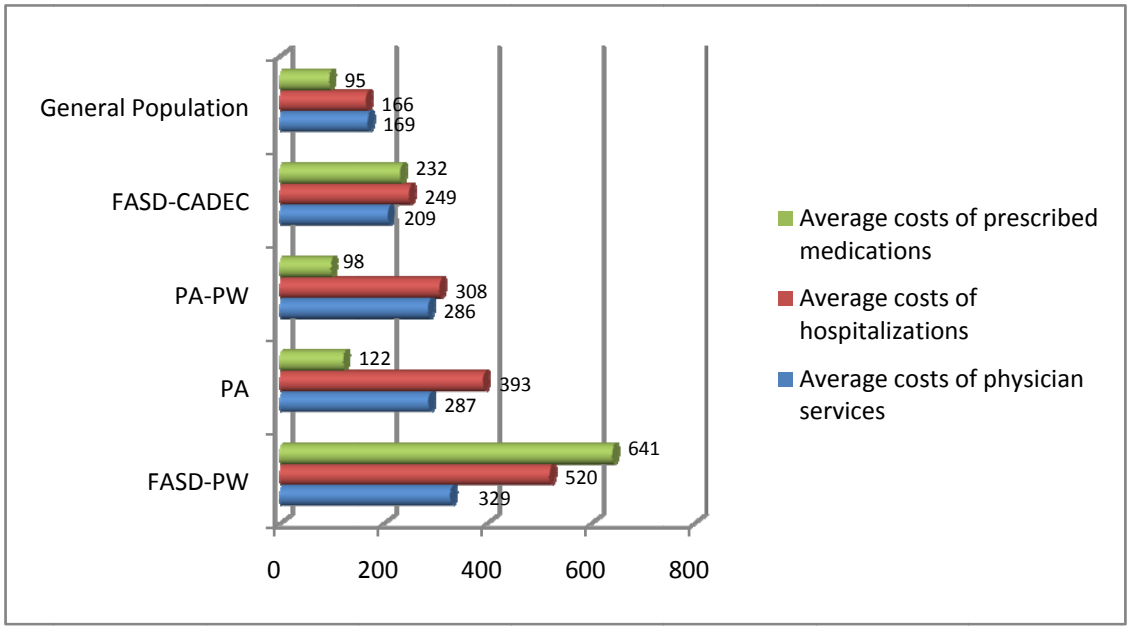
- **Total health care costs**: taking into consideration all health care costs captured in this study, including hospitalizations (inpatient and day procedures), physician visits, and prescription drugs, the FASD-affected and parental alcohol children comprise 21.5% of total children examined in this study; however, their health costs make up 41.1% of total costs.

- **Average total health care costs:** the mean costs for the FASD-PW group are 3.5 times higher than the General Population. Put differently, there is an additional $1,001 in health care costs incurred each year for every permanent ward child who is FASD-affected, compared to the General Population group. The PA group's average costs are 1.8 times higher than the General Population group.

- **Physician utilization and costs**: compared to the General Population group, the CIC and FASD-CADEC children were more likely to access physician services, had more visits, and the average costs per visit were higher. The CIC and FASD-CADEC children have smaller differences in the percentage of physician visits and total average costs, as well as the average physician fees per visit. The implication is that there may not be significant differences in the service utilization and costs of FASD-affected children compared to those children for whom problematic parental drinking was a key issue at a child welfare agency.

Health Care Utilization and Costs

Figure 7: Average Total Costs of Health Care per Child by Physician Visits, Hospitalizations, and Prescription Medications (2006)



- For FASD-affected children, the most common reason for ambulatory physician visits, including office visits, is mental disorders. The frequency of visits increases with age,

which may correspond to school and placement breakdown during the adolescent years.

- **Hospitalizations and costs:** the FASD-affected and parental alcohol children comprise 20.9% of total children, however, their hospital costs make up 41.1% of the total expenditures. The number of hospitalizations and associated average costs are highest for children in FASD-PW group, followed by children in the PA group. A similar percentage of children in these two groups were hospitalized for either inpatient or day procedures in 2006 (9.0% and 9.9% respectively), which is approximately double the use of hospitalization services by the General Population group.

- Similar to the findings of physician visits, in 2006, between 14-15% of hospitalizations for FASD-PW and PA children are related to mental disorders compared to 2.9% in the General Population group. In addition, mental disorders are the number one leading cause of hospitalization for FASD-PW and PA children aged 11-15. For most other age categories, the leading cause of hospitalizations is related to diseases of the digestive system and, more specifically, diseases of the oral cavity, salivary glands, and jaws.

- **Prescription medications:** The findings reveal that prescription medications are an important driver of the total health care costs for the FASD-affected population. While the FASD-affected or parental alcohol children comprise 21.5% of the children in the combined population groups, their drug costs make up 51.1% of the total costs of prescriptions.

- The children in the FASD-PW sample are prescribed medications at five times the rate of children in the General Population sample, and nervous system drugs account for a substantial proportion of these prescriptions. Around 97% of these costs are government-paid. The children in the PA and FASD-CADEC groups were prescribed medications at 2.5 times the rate of children in the General Population group. Approximately 20% more FASD-PW and PA children use prescription drugs compared to the general population. Prescribed medications also increase with age category for the FASD-affected children.

- **Prescriptions for nervous system drugs**: Around half of the FASD-affected children were prescribed a nervous system medication in 2006, compared to 11% of the General Population group. A separate analysis of nervous system drugs revealed that, of those

children who were prescribed medications in the General Population group, 20% of these children were prescribed a nervous system drug. On the other hand, 60-69% of their FASD-affected counterparts and 25-31% of the PA children were prescribed a nervous system drug. The analysis makes evident the fact that FASD-affected children, particularly in the older age categories, are prescribed a significantly higher number of nervous system drugs. ADHD drugs and other antipsychotics account for the majority of drugs prescribed to the FASD-PW and FASD-CADEC children (77-83%).

Special Education Services and Funding

The average cost of education funding for FASD-PW children is 3.4 times the cost incurred for children in the General Population, and 2.7 times higher for the FASD-CADEC children. While, in our sample, the FASD-affected or parental alcohol children comprise 20.4% of total children enrolled in school, their aggregated costs make up 38.2% of the total education costs. The findings reveal that, compared to the General Population group, the CIC and FASD-CADEC children:

- Have a higher chance of accessing level 2 or 3 special rate funding
- Have lower high school graduation rates and have a lower likelihood of completing 8 or more credits in Grade 9
- Have lower average marks and are less likely to have ever written standard provincial examinations in language arts or math
- Have a higher chance of being retained in school
- Have a lower likelihood of being enrolled in school after age 15 if FASD-affected
- Have incrementally higher education costs, particular for the FASD-affected children

These outcomes raise the probability that alcohol-affected individuals will have reduced lifetime participation and employment rates in the labour market, as well as lower earnings. The fiscal impact of these educational outcomes is known to be a higher reliance on social services, including housing subsidies and income assistance, for the duration of their lives. Such costs are excluded from the current study, but it is known that children of problem drinkers may have a higher probability of experiencing detrimental outcomes in the labour market, for example, unemployment and lower wages (Balsa 2008).

Subsidized Child Care Costs and Utilization

- For children whose families accessed child care services in 2006, a higher percentage of CIC and FASD-CADEC children were funded for subsidized day care. Around half of the FASD-PW children aged 0-5 had subsidized day care compared to 24.7% of the PA children, and 11.8% of the General Population group. These estimates drop in the age 6-10 category, but still are considerably higher for the FASD-PW and PA children compared to the General Population group.

- The average cost of subsidized child care funding for FASD-PW children is more than double the cost incurred for children in the General Population group. While the FASD-PW children comprise 10.2% of children accessing subsidized child care, their aggregated costs make up 19.5% of the total costs of subsidized child care. Cost comparisons for the other CIC and FASD-CADEC groups were not possible due to suppressed or unavailable data.

To sum, in Phase 1 of the Economic Impact of Children in Care with FASD study, the fiscal costs in the Manitoba child welfare system were estimated for 400 FASD-affected permanent ward children in 2006. These children were in care for 146,000 days in 2006 at a total cost of $9.5 million or $23,760 per annum for each child ($65 per day), which far exceeds the fees covered by basic maintenance. Similar to the findings of the current Phase II study, the average special needs expenditure increased as the children aged (Fuchs et al. 2008).

Given the significant proportion of FASD-affected children in care, as well as the nature of their needs, it is imperative to understand the service demands of this population to agencies, governments, and communities. This study has furthered our understanding of the needs of children whose entry into care is related to parental alcohol misuse but who do not have a diagnosis of FASD. A major shortcoming of past studies is the lack of emphasis on the intergenerational costs of parental alcohol misuse for children who do not have diagnosed FASD. The findings of this study lead to a conclusion that, not only should the additional information on the PA group of children help to support efforts in preventing FASD, but also parental alcohol use should be addressed at an earlier stage. Too many children with alcohol-abusing parents are ending up in care and suffering serious consequences in many domains of their lives.

7. CONCLUDING REMARKS

Over the past two decades, FASD is increasingly recognized as having far-reaching and costly society outcomes. Though FASD is an important area of emphasis for economic costing exercises, it is only one specific consequence of substance abuse, which contributes uniquely to the fiscal costs. Until this study, much investigation was lacking on the far-reaching economic impacts when children without diagnosed FASD are adversely affected by problematic parental drinking. A particular strength of this study is the investigation of children in care with parental substance abuse issues, as well as FASD-affected children.

The findings reveal that the FASD-PW and PA groups of children account for the majority of the average total costs of health care, which include physician services, hospitalizations and prescription medications. Nervous system drugs, such as anti-psychotics and ADHD drugs, account for a large proportion of prescribed drugs to FASD-affected children, and a surprisingly high number of PA children. Though there is evidence that the PA children have detrimental education outcomes (e.g. higher retention and lower marks compared to the General Population group), any special rate funding is largely allocated to FASD-affected children based on level of functioning. PA children, though potentially requiring additional supports in school, are not accessing special services at same rate as the general population in the education system.

To conclude, closing the gap in knowledge around the economic costs of FASD-affected individuals can help to make better public policy, which partly focuses on preventing children from being born with significant FASD related disabilities in future. An emphasis on primary prevention would effectively expand the public policy approach to FASD in Canada, as well as creating efficiencies in the allocation of scarce resources. More recently, the costs of substance abuse to the federal, state, and local governments was estimated in the hundred of billions in the United States. However, for every fiscal dollar spent to address substance abuse, 95.6 cents is allocated to reactive direct costs, for example, in the health care, justice, education, and child welfare sectors. Most of the costs incurred as a consequence of the social problem are potentially preventable, but only 1.9 cents of every dollar was allocated to prevention and early intervention strategies (Califano et al. 2009).

Moreover, from a health policy perspective, there is wide social and political interest in the cost of illness and health care in general. Until now, the current body of research has not identified that substantial health and educational resources may be consumed each year by children

affected by their parents' misuse of alcohol even if they do not have a diagnosis of FASD. Phase I and II of the Economic Impact Study are a starting point only, but this research provides a more accurate picture of the utilization of resources in the Manitoba health care and education sectors, as well as other social services. It is important for addressing future programming in the area of services to FASD-affected children, as well as confronting challenges faced by children affected by problematic parental drinking.

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APPENDIX A: CAUSES OF AMBULATORY VISITS

Based on the International Statistical Classification of Diseases and Related Health Problems

For the top causes of ambulatory visits, we list the detailed ICD-9-CM and ICD-10-CA codes in Appendix A, which are also available online. These are Mental Disorders; Diseases of the Respiratory System; Factors Influencing Health Status; Diseases of the Nervous System and Sense Organs; Fractures, Wounds, Injuries and Poisoning; Symptoms, Signs, and Ill-Defined Conditions; Infectious and Parasitic Diseases; Diseases of the Genitourinary System; Diseases of the Digestive System. Further details on the remaining classifications of ambulatory visits are available at the following websites:

ICD-9-CM codes are used for medical claims (physician visits).
Available online: http://icd9cm.chrisendres.com/icd9cm/index.php?action=contents

ICD-10-CA codes are used for hospital data.
Available online at: http://www.who.int/classifications/apps/icd/icd10online/

5 = Mental Disorders

ICD-9-CM: 290 - 319

290-299 Psychoses: **290-294** Organic Psychotic Conditions; **295-299** Other Psychoses; **300-316** Neurotic Disorders, Personality Disorders, and Other Nonpsychotic Mental Disordershttp://icd9cm.chrisendres.com/icd9cm/index.php?action=child&recordid=2422; **317-319** Mental Retardation

ICD-10-CA: F00 - F99, G312, G442, R410

F00-F09 Organic, including symptomatic, mental disorders; **F10-F19** Mental and behavioral disorders due to psychoactive substance use; **F20-F29** Schizophrenia, schizotypal and delusional disorders; **F30-F39** Mood [affective] disorders; **F40-F48** Neurotic, stress-related and somatoform disorders; **F50-F59** Behavioral syndromes associated with physiological disturbances and physical factors; **F60-F69** Disorders of adult personality and behaviour; **F70-F79** Mental retardation; **F80-F89** Disorders of psychological development; **F90-F98** Behavioral and emotional disorders with onset usually occurring in childhood and adolescence; **F99** Unspecified mental disorder; **G312** Degeneration of nervous system due to alcohol; **G442** Tension-type headache; **R410** Disorientation unspecified

8 = Diseases of the Respiratory System

ICD-9-CM: 460 - 519

460-466 Acute Respiratory Infections; **470-478** Other Diseases of the Upper Respiratory Tract; **480-488** Pneumonia and Influenza; **490-496** Chronic Obstructive Pulmonary Disease and Allied Conditions; **500-508** Pneumoconioses and Other Lung Diseases Due to External Agents; **510-519** Other Diseases of Respiratory System

ICD-10-CA: A481, J00 - J99, R091, Z902

J00-J06 Acute upper respiratory infections; **J09-J18** Influenza and pneumonia; **J20-J22** Other acute lower respiratory infections; **J30-J39** Other diseases of upper respiratory tract; **J40-J47** Chronic lower respiratory diseases; **J60-J70** Lung diseases due to external agents; **J80-J84** Other respiratory diseases principally affecting the interstitium ;**J85-J86** Suppurative and necrotic conditions of lower respiratory tract; **J90-J94** Other diseases of pleura; **J95-J99** Other diseases of the respiratory system; **A481** Legionnaires' disease; **R091**Pleurisy; **Z902** Acquired absence of lung

18 = Factors Influencing Health Status and Contact with Health Services

ICD-9-CM: V01 - V89

V01-V06 Persons with Potential Health Hazards Related to Communicable Diseases; **V07-V09** Persons with Need for Isolation, Other Potential Health Hazards and Prophylactic Measures; **V10-V19** Persons with Potential Health Hazards Related to Personal and Family History; **V30-V39** Live born Infants According to Type of Birth; The following fourth-digit subdivisions are for use with categories V30-V39: 0 Born in hospital; 1 Born before admission to hospital; 2 Born outside hospital and not hospitalized; The following two fifths-digits are for use with the fourth-digit .0, Born in hospital: 0 delivered without mention of cesarean delivery; 1 delivered by cesarean delivery; **V40-V49** Persons with a Condition Influencing their Health Status; **V50-V59** Persons Encountering Health Services For Specific Procedures and Aftercare; Note: Categories V51-V58 are intended for use to indicate a reason for care in patients who may have already been treated for some disease or injury not now present, or who are receiving care to consolidate the treatment, to deal with residual states, or to prevent recurrence; **V60-V69** Persons Encountering Health Services in Other Circumstances; **V70-V82** Persons Without Reported Diagnosis Encountered During Examination and Investigation of Individuals and Populations; **V83-V84** Genetics; **V85** Body Mass Index; **V86** Estrogen Receptor Status; **V87** Other Specified Personal Exposures and History Presenting Hazards to Health; **V88** Acquired Absence of Other Organs and Tissue; **V89** Other Suspected Conditions Not Found

http://icd9cm.chrisendres.com/icd9cm/index.php?action=child&recordid=11073**ICD-10-CA: Z00 - Z99**

Z00-Z13 Persons encountering health services for examination and investigation; **Z20-Z29** Persons with potential health hazards related to communicable diseases; **Z30-Z39** Persons encountering health services in circumstances related to reproduction; **Z40-Z54** Persons encountering health services for specific procedures and health care; **Z55-Z65** Persons with potential health hazards related to socioeconomic and psychosocial circumstances; **Z70-Z76** Persons encountering health services in other circumstances; **Z80-Z99** Persons with potential health hazards related to family and personal history and certain conditions influencing health status

6 = Diseases of the Nervous System and Sense Organs

ICD-9-CM: 320 - 389

320-326 Inflammation Diseases of the Central Nervous System; **327** Organic Sleep Disorder; **330-337** Hereditary and Degenerative Diseases of the Central Nervous System; **338** Pain; **339** Other Headache Syndromes; **340-349** Other Disorders of the Central Nervous System; **350-359** Disorders of the Peripheral Nervous System; **360-379** Disorders of the Eye and Adnexa; **380-389** Diseases of the Ear and Mastoid Process

ICD-10-CA: E750, E751, E754, F842, G00 - G99, H00 - H95, Q150, R441

G00-G09 Inflammatory diseases of the central nervous system; **G10-G13** Systemic atrophies primarily affecting the central nervous system; **G20-G26** Extrapyramidal and movement disorders; **G30-G32** Other degenerative diseases of the nervous system; **G35-G37** Demyelinating diseases of the central nervous system; **G40-G47** Episodic and paroxysmal disorders; **G50-G59** Nerve, nerve root and plexus disorders; **G60-G64** Polyneuropathies and other disorders of the peripheral nervous system; **G70-G73** Diseases of myoneural junction and muscle; **G80-G83** Cerebral palsy and other paralytic syndromes; **G90-G99** Other disorders of the nervous system; **E750** GM 2 gangliosidosis**;** **E751** Other gangliosidosis**;** **E754** Neuronal ceroid lipofuscinosis, Batten disease**;** **F842** Rett's syndrome**;** **Q150** Congenital glaucoma; **R441** Visual hallucinations; **H00-H06** Disorders of eyelid, lacrimal system and orbit; **H10-H13** Disorders of conjunctiva; **H15-H19** Disorders of sclera and cornea; **H20-H22** Disorders of iris and ciliary body; **H25-H28** Disorders of lens; **H30-H36** Disorders of choroid and retina; **H40-H42** Glaucoma; **H43-H45** Disorders of vitreous body and globe; **H46-H48** Disorders of optic nerve and visual pathways; **H49-H52** Disorders of ocular muscles, binocular movement, accommodation and refraction; **H53-H54** Visual disturbances and blindness; **H55-H59** Other disorders of eye and Adnexa; **H60-H62** Diseases of external ear; **H65-H75** Diseases of middle ear and mastoid; **H80-H83** Diseases of inner ear; **H90-H95** Other disorders of ear

17 = Fractures, Wounds, and Injuries + Poisoning and Complications + External Causes of Injury and Poisoning

ICD-9-CM: 800 - 999, E80 - E99

Fractures: **800-804** Fracture of Skull; **805-809** Fracture of Neck and Trunk; **810-819** Fracture of Upper Limb; **820-829** Fracture of Lower Limb; **830-839** Dislocation; **840-848** Sprains and Strains of Joints and Adjacent Muscles; **850-854** Intracranial Injury, Excluding Those with Skull Fracture; **860-869** Internal Injury of Thorax, Abdomen, and Pelvis; **870-897** Open Wounds; **870-879** Open Wound of Head, Neck, and Trunk; **880-887** Open Wound of Upper Limb; **890-897** Open Wound of Lower Limb; **900-904** Injury to Blood Vessels; **905-909** Late Effects of Injuries, Poisonings, Toxic Effects, And Other External Causes; **910** Superficial injury of face, neck, and scalp except eye; **911** Superficial injury of trunk; **912** Superficial injury of shoulder and upper armhttp://icd9cm.chrisendres.com/icd9cm/index.php?action=child&recordid=9522; **913** Superficial injury of elbow, forearm, and wrist; **914** Superficial injury of hand(s) except finger(s) alone; **915** Superficial injury of finger(s); **916** Superficial injury of hip, thigh, leg, and ankle; **917** Superficial injury of

foot and toe(s); **918** Superficial injury of eye and Adnexa; **919** Superficial injury of other, multiple, and unspecified sites; **920-924** Contusion with Intact Skin Surface; **925-929** Crushing Injury; **930-939** Effects of Foreign Body Entering Through Orifice; **940-949** Burns; **950-957** Injury to Nerves and Spinal Cord; **958-959** Certain Traumatic Complications and Unspecified Injuries; **960-979** Poisoning By Drugs, Medicinal and Biological Substances; **980-989** Toxic Effects of Substances Chiefly Non-Medicinal as to Source; **990-995** Other and Unspecified Effects of External Causes; **996-999** Complications of Surgical and Medical Care, Not Elsewhere Classified; **E80** Disorders of porphyrin and bilirubin metabolism; **E83** Disorders of mineral metabolism; **E84** Cystic fibrosis; **E85** Amyloidosis; **E86** Volume depletion, Dehydration, Hypovolemia; **E87** Other disorders of fluid, electrolyte and acid-base balance; **E88** Other metabolic disorders; **E89** Postprocedural endocrine and metabolic disorders, not elsewhere classified; **E90** Nutritional and metabolic disorders in diseases classified elsewhere

http://icd9cm.chrisendres.com/icd9cm/index.php?action=child&recordid=9604**ICD-10-CA: S00 - T98, G972, G978, G979, H590, H5988, H599, I978, I979, J954, J9588, J959, K913, K918, K919, M022, M101, N98, N99, V01 - Y98**

S00-S09 Injuries to the head; **S10-S19** Injuries to the neck; **S20-S29** Injuries to the thorax; **S30-S39** Injuries to the abdomen, lower back, lumbar spine and pelvis; **S40-S49** Injuries to the shoulder and upper arm; **S50-S59** Injuries to the elbow and forearm ;**S60-S69** Injuries to the wrist and hand; **S70-S79** Injuries to the hip and thigh; **S80-S89** Injuries to the knee and lower leg; **S90-S99** Injuries to the ankle and foot; **T00-T07** Injuries involving multiple body regions; **T08-T14** Injuries to unspecified part of trunk, limb or body region; **T15-T19** Effects of foreign body entering through natural orifice; **T20-T32** Burns and corrosions; **T20-T25** Burns and corrosions of external body surface, specified by site; **T26-T28** Burns and corrosions confined to eye and internal organs; **T29-T32** Burns and corrosions of multiple and unspecified body regions; **T33-T35** Frostbite; **T36-T50** Poisoning by drugs, medicaments and biological substances; **T51-T65** Toxic effects of substances chiefly nonmedicinal as to source; **T66-T78** Other and unspecified effects of external causes; **T79** Certain early complications of trauma; **T80-T88** Complications of surgical and medical care, not elsewhere classified; **T90-T98** Sequelae of injuries, of poisoning and of other consequences of external causes; **G972** Intracranial hypotension following ventricular shunting; **G978** Other postprocedural disorders of nervous system; **G979** Postprocedural disorder of nervous system unspecified; **H590** Vitreous syndrome following cataract surgery; **H5988** Other intraoperative complications of eye and adnexa**; H599** Postprocedural disorder of eye and adnexa unspecified; **I978** other postprocedural disorders of circulatory system, not elsewhere classified**; I979** postprocedural disorder of circulatory system, unspecified **; J954** mendelson\'s syndrome**; J9588** Other intraoperative complications of respiratory system, not elsewhere classified**; J959** postprocedural respiratory disorder, unspecified**; K913** Postoperative intestinal obstruction**; K918** Other postprocedural disorders of digestive system NE**; K919** postprocedural disorder of digestive system, unspecified; **M022** Postimmunization arthropathy**; M101** lead-induced gout**; N98** Complications associated with artificial fertilization**; N99** Postprocedural disorders of genitourinary system, not elsewhere classified**; V01 - Y98** External causes of morbidity and mortality

16 = Symptoms, Signs, and Ill-Defined Conditions

ICD-9-CM: 780 - 799

780 General symptoms; **781** Symptoms involving nervous and musculoskeletal systems; **782** Symptoms involving skin and other integumentary tissue; **783** Symptoms concerning nutrition, metabolism, and development; **784** Symptoms involving head and neck; **785** Symptoms involving cardiovascular system; **786** Symptoms involving respiratory system and other chest symptoms; **787** Symptoms involving digestive system; **788** Symptoms involving urinary system; **789** Other symptoms involving abdomen and pelvis; **790** Nonspecific findings on examination of blood; **791** Nonspecific findings on examination of urine; **792** Nonspecific abnormal findings in other body substances; **793** Nonspecific abnormal findings on radiological and other examination of body structure; http://icd9cm.chrisendres.com/icd9cm/index.php?action=child&recordid=8319**794** Nonspecific abnormal results of function studies; **795** Other and nonspecific abnormal cytological, histological, immunological and DNA test findings; http://icd9cm.chrisendres.com/icd9cm/index.php?action=child&recordid=8362 **796** Other nonspecific abnormal findings; **797** Senility without mention of psychosis; **798** Sudden death, cause unknown; **799** Other ill-defined and unknown causes of morbidity and mortality

ICD-10-CA: E343, E790, G44, G47, G933, N23, N391, N394, R00 - R99, Z21

R00-R09 Symptoms and signs involving the circulatory and respiratory systems; **R10-R19** Symptoms and signs involving the digestive system and abdomen; **R20-R23** Symptoms and signs involving the skin and subcutaneous tissue; **R25-R29** Symptoms and signs involving the nervous and musculoskeletal systems; **R30-R39** Symptoms and signs involving the urinary system; **R40-R46** Symptoms and signs involving cognition, perception, emotional state and behaviour; **R47-R49** Symptoms and signs involving speech and voice; **R50-R69** General symptoms and signs; **R70-R79** Abnormal findings on examination of blood, without diagnosis; **R80-R82** Abnormal findings on examination of urine, without diagnosis; **R83-R89** Abnormal findings on examination of other body fluids, substances and tissues, without diagnosis; **R90-R94** Abnormal findings on diagnostic imaging and in function studies, without diagnosis; **R95-R99** Ill-defined and unknown causes of mortality; **E343** Short stature, not elsewhere classified**;** **E790** Hyperuricemia without signs of inflammatory arthritis and tophaceous disease**;** **G44** Other headache syndromes**;** **G47** Sleep disorders**;** **G933** Postviral fatigue syndrome**;** **N23** Unspecified renal colic**;** **N391** Persistent proteinuria, unspecified**;** **N394** Other specified urinary incontinence**;** **Z21** Asymptomatic human immunodeficiency virus (HIV) infection status

1 = Infectious and Parasitic Diseases

ICD-9-CM: 001 - 139

001-009 Intestinal Infectious Diseases; **010-018** Tuberculosis; **020-027** Zoonotic Bacterial Diseases; **030-041** Other Bacterial Diseases; **042** Human Immunodeficiency Virus (HIV) Infection; **045-049** Poliomyelitis and Other Non-Arthropod-Borne Viral Diseases and Prion Diseases of Central Nervous System; **050-059** Viral Diseases Accompanied by Exanthem; **060-066** Arthropod-Borne Viral Diseases; **070-079** Other

Diseases Due to Viruses and Chlamydiae; **080-088** Rickettisioses and Other Arthropod-Borne Diseases; **090-099** Syphilis and Other Venereal Diseases; **100-104** Other Spirochetal Diseases; **110-118** Mycoses; **120-129** Helminthiases; **130-136** Other Infectious and Parasitic Diseases; **137-139** Late Effects of Infectious and Parasitic Diseases

ICD-10-CA: A00 - B99, D860, G361, I790, I791, J020, J030, L081, L946, M023, M352, N341

A00-A09 Intestinal infectious diseases; **A15-A19** Tuberculosis; **A20-A28** Certain zoonotic bacterial diseases; **A30-A49** Other bacterial diseases; **A50-A64** Infections with a predominantly sexual mode of transmission; **A65-A69** Other spirochaetal diseases; **A70-A74** Other diseases caused by Chlamydiae; **A75-A79** Rickettsioses; **A80-A89** Viral infections of the central nervous system; **A90-A99** Arthropod-borne viral fevers and viral haemorrhagic fevers; **B00-B09** Viral infections characterized by skin and mucous membrane lesions; **B15-B19** Viral hepatitis; **B20-B24** Human immunodeficiency virus [HIV] disease; **B25-B34** Other viral diseases; **B35-B49** Mycoses; **B50-B64** Protozoal diseases; **B65-B83** Helminthiases; **B85-B89** Pediculosis, acariasis and other infestations; **B90-B94** Sequelae of infectious and parasitic diseases; **B95-B97** Bacterial, viral and other infectious agents; **B99** Other infectious diseases; **D860** Sarcoidosis of lung**; G361** acute and subacute haemorrhagic leukoencephalitis**; I790** aneurysm of aorta in diseases classified elsewhere**; I791** aortitis in diseases classified elsewhere**; J020** streptococcal pharyngitis**; J030** streptococcal tonsillitis**; L081** Erythrasma**; L946** Ainhum**; M023** Reiter's disease**; M352** Behçet's disease**; N341** Nonspecific urethritis

10 = Diseases of the Genitourinary System

ICD-9-CM: 580 - 629

580-589 Nephritis, Nephrotic Syndrome, and Nephrosis; **590-599** Other Diseases of Urinary System; **600-608** Diseases of Male Genital Organs; **610-612** Disorders of Breast; **614-616** Inflammatory Disease of Female Pelvic Organs; **617-629** Other Disorders of Female Genital Tract

ICD-10-CA: N00 - N99, Z906

N00-N08 Glomerular diseases ;**N10-N16** Renal tubulo-interstitial diseases; **N17-N19** Renal failure; **N20-N23** Urolithiasis; **N25-N29** Other disorders of kidney and ureter; **N30-N39** Other diseases of urinary system; **N40-N51** Diseases of male genital organs; **N60-N64** Disorders of breast; **N70-N77** Inflammatory diseases of female pelvic organs; **N80-N98** Noninflammatory disorders of female genital tract; **N99** Other disorders of genitourinary tract; **Z906** Acquired absence of other parts of urinary tract

OTHER CAUSES OF AMBULATORY VISITS (PHYSICIAN AND HOSPITAL) AND ICD CODES

2 = Neoplasms

ICD-9-CM: 140 - 239

ICD-10-CA: C00 - D48, K317, K635, Q850

3 = Endocrine, Nutritional and Metabolic Diseases, and Immunity Disorders
ICD-9-CM: 240 - 279
ICD-10-CA: C8800, D472, D76, D80 - D89, E00 - E90, H026, M10 - M11, M83, R771

4 = Diseases of the Blood and Blood-Forming Organs
ICD-9-CM: 280 - 289
ICD-10-CA: C945, D46, D50 - D89, I88, R72

7 = Diseases of the Circulatory System
ICD-9-CM: 390 - 459
ICD-10-CA: B332, G45, G46, I00 - I99, M30, M31, R001, R58

9 = Diseases of the Digestive System
ICD-9-CM: 520 - 579
ICD-10-CA: K00 - K93, R682

11 = Complications of Pregnancy, Childbirth and the Puerperium
ICD-9-CM: 630 - 677
ICD-10-CA: A34, F538, F539, O00 - O99

12 = Diseases of the Skin and Subcutaneous Tissue
ICD-9-CM: 680 - 709
ICD-10-CA: B432, L00 - L99

13 = Diseases of the Musculoskeletal System and Connective Tissue
ICD-9-CM: 710 - 739
ICD-10-CA: L871, M00 - M99, R262, R294, Z900

14 = Congenital Anomalies
ICD-9-CM: 740 - 759
ICD-10-CA: G901, P293, Q00 - Q99

15 = Certain Conditions Originating in the Perinatal Period
ICD-9-CM: 760 - 779
ICD-10-CA: A33, P00 - P99, Q860

APPENDIX B – Types of drugs in the ATC categories reported in Table 26 and 27

Nervous System - Anesthetics, analgesics, antiepileptics, anti-parkinson drugs, psycholeptics, psychoanaleptics, and other nervous system drugs

Respiratory System - Nasal preparations, throat preparations, anti-asthmatics, cough and cold preparations, antihistamines for systemic use, and other respiratory system products

General Antiinfectives for Systemic Use - Antibacterials for systemic use, antimycotics for systemic use, antimycobacterials, antivirals for systemic use, immune sera and immunoglobulins, and vaccines.

Cardiovascular System - Cardiac therapy, antihypertensives, diuretics, peripheral vasodilators, vasoprotectives, beta blocking agents, calcium channel blockers, agents acting on the renin-angiotensin system, and serum lipid reducing agents

Alimentary Tract and Metabolism - Stomatological preparations, antacids, drugs for treatment of peptic ulcers and flatulence, antispasmodic and anticholinergic agents and propulsives, antiemetics and antinauseants, bile and liver therapy, laxatives, antidiarrheals, intestinal antiinflammatory/antiinfective agents, antiobesity preparations (excl. diet products), digestives (incl. enzymes), drugs used in diabetes, vitamins, mineral supplements, tonics, anabolic agents for systemic use, appetite stimulants, and other alimentary tract and metabolism products.

Dermatologicals - Antifungals for dermatological use, emollients and protectives, preparations for treatment of wounds and ulcers, antipruritics (incl. antihistamines, anesthetics,etc), antipsoriatics, antibiotics and chemotherapeutics for dermatological use, corticosteroids, dermatological preparations, antiseptics and disinfectants, medicated dressings, anti-acne preparations, and other dermatological preparations.

Genito Urinary System and Sex Hormones - gynecological antiinfectives and antiseptics, other gynecologicals, sex hormones and modulators of the genital system, urologicals.

Systemic Hormonal Prep, Excl. Sex Hormones - Pituitary and hypothalamic hormones and analogues, corticosteroids for systemic use, thyroid therapy, pancreatic hormones, and calcium homeostasis.

Blood and Blood Forming Organs - Antithrombotic agents, antihemorrhagics, antianemic preparations, blood substitutes and perfusion solution, and other hematological agents.

Sensory Organs - Ophthalmologicals, otologicals, ophthalmological and otological preparations.

Antiparasitic Products, Insecticides and Repellents - Antiprotozoals, anthelmintics, and ectoparasiticides (incl. scabicides, insecticides and repellents).

Musculo-Skeletal System - Antiinflammatory and antirheumatic products, topical products for joint and muscular pain, muscle relaxants, antigout preparations, drugs for treatment of bone diseases, and other drugs for disorders of the musculo-skeletal system.

APPENDIX C: TABLES OF SELECTED ESTIMATES

Appendix C-1: Causes of Ambulatory Physician Visits, Including Office Visits, by Gender and Group (2006)

Conditions	General Population - %		FASD-PW %		FASD-CADEC %		PA %	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
Mental Disorders	4.7	4.5	**38.1**	**22.1**	**23.3**	**22.7**	4.5	6.7
Diseases of the Respiratory System	**26.7**	**25.5**	**13.3**	**14.6**	**19.7**	**24.5**	**27.5**	**24.5**
Factors Influencing Health Status and Contact With Health Services	**13.4**	**15.2**	**7.9**	**16.3**	**10.4**	**8.6**	**12.8**	**13.6**
Diseases of the Nervous System and Sense Organs	**12.0**	**11.0**	**6.2**	**9.1**	6.4	4.9	**10.2**	**9.3**
Fractures, Wounds, and Injuries + Poisoning and Complications + External Causes of Injury and Poisoning	**11.4**	**8.1**	**8.2**	5.3	**9.2**	**11.0**	**9.5**	7.4
Symptoms, Signs, and Ill-Defined Conditions	**7.9**	**8.0**	5.8	**7.4**	**10.0**	**7.4**	6.7	7.1
Certain Conditions Originating in the Perinatal Period	*	*	5.0	3.9	3.6	*	*	*
Diseases of the Skin and Subcutaneous Tissue	7.4	7.6	4.8	3.9	8.4	4.3	7.7	**8.3**
Infectious and Parasitic Diseases	5.7	7.2	2.7	3.8	3.6	*	**9.1**	**10.7**
Diseases of the Genitourinary System	1.4	3.8	1.0	5.7	*	4.3	0.7	3.9
Diseases of the Digestive System	3.8	3.3	2.2	3.0	2.4	4.3	5.5	4.8
Diseases of the Musculoskeletal System and Connective Tissue	2.4	3.1	1.6	1.3	*	*	1.2	1.4
Congenital Anomalies	1.2	0.5	1.9	0.9	*	*	*	0.7
Endocrine, Nutritional and Metabolic Diseases, and Immunity Disorders	0.5	0.6	0.7	1.0	*	*	0.9	0.8
Diseases of the Circulatory System	0.3	0.3	0.7	0.6	*	*	*	*
Complications of Pregnancy, Childbirth and the Puerperium	*	0.2	*	0.8	*	*	*	*
Neoplasms	1.0	0.7	*	*	*	*	3.1	*
Diseases of the Blood and Blood-Forming Organs	0.3	0.5	*	*	*	*	*	0.5

Bold: top five conditions
*Suppressed estimates due to a small count *or* not applicable
Ambulatory visits are medical services provided on an outpatient basis. This includes day surgery, emergency department services, outpatient clinics, such as rehabilitation and diagnostic services
Formal definitions of the conditions are listed in Appendix A

Appendix C-2: Causes of Ambulatory Physician Visits, Including Office Visits, by Age Category and Group (2006)

Conditions	General Population - %				FASD-PW - %				FASD-CADEC - %				PA - %			
	0-5	6-10	11-15	16+	0-5	6-10	11-15	16+	0-5	6-10	11-15	16+	0-5	6-10	11-15	16+
Mental Disorders	0.9	4.2	6.5	**12.5**	**8.3**	**32.5**	**38.2**	**22.0**	*	**23.1**	**27.0**	**23.8**	1.2	4.5	**18.9**	**13.7**
Diseases of the Respiratory System	**28.8**	**29.8**	**23.4**	**16.3**	**22.1**	**15.4**	**12.4**	**10.7**	**24.1**	**29.9**	**18.4**	**11.9**	**30.5**	**26.4**	**16.8**	**9.0**
Factors Influencing Health Status and Contact With Health Services	**20.2**	**11.0**	**9.0**	**13.6**	**8.8**	**7.4**	**10.3**	**23.9**	**24.1**	*	**7.9**	**19.1**	**15.4**	7.2	**11.2**	**22.2**
Diseases of the Nervous System and Sense Organs	**14.5**	**12.8**	**8.4**	6.2	**17.1**	**9.4**	5.7	3.8	*	5.4	**7.9**	*	**11.9**	**9.6**	6.0	*
Fractures, Wounds, and Injuries + Poisoning and Complications + External Causes of Injury and Poisoning	4.2	**9.7**	**16.9**	**13.1**	5.5	**7.8**	**6.6**	**6.7**	*	**13.6**	**7.9**	**10.7**	**5.9**	**10.5**	**13.5**	7.6
Symptoms, Signs, and Ill-Defined Conditions	**8.5**	**8.8**	7.1	6.5	7.4	6.6	**6.5**	5.9	*	**10.9**	**8.6**	**8.3**	6.9	7.3	7.3	5.2
Certain Conditions Originating in the Perinatal Period	0.1	*	*	*	**10.1**	6.4	3.2	1.3	*	*	4.6	*	*	*	*	*
Diseases of the Skin and Subcutaneous Tissue	**6.9**	6.0	**8.1**	**11.0**	*	3.6	5.0	5.5	*	**7.5**	**7.9**	*	**7.7**	**8.5**	**9.1**	6.6
Infectious and Parasitic Diseases	6.2	7.6	6.3	5.0	2.8	2.8	2.9	4.8	*	*	*	*	**9.6**	**15.1**	5.6	6.1
Diseases of the Genitourinary System	1.5	2.4	2.7	5.2	4.2	1.0	2.2	**8.4**	*	*	*	7.1	1.5	0.9	3.9	**12.3**
Diseases of the Digestive System	5.0	3.0	2.4	2.6	5.1	3.5	1.8	1.5	*	*	*	*	5.4	5.5	1.7	**9.0**
Diseases of the Musculoskeletal System and Connective Tissue	0.5	2.0	5.9	4.3	*	1.0	1.5	2.5	*	*	*	*	*	1.3	3.3	5.2
Congenital Anomalies	0.9	0.8	0.8	0.9	4.6	1.3	1.6	*	*	*	*	*	0.5	*	*	*
Endocrine, Nutritional and Metabolic Diseases, and Immunity Disorders	0.3	0.7	0.6	1.1	*	*	1.4	*	*	*	*	*	0.4	2.0	*	*
Diseases of the Circulatory System	*	0.2	0.6	0.4	*	0.7	0.6	*	*	*	*	*	*	*	*	*
Complications of Pregnancy, Childbirth and the Puerperium	*	*	*	0.5	*	*	*	1.7	*	*	*	*	*	*	*	*
Neoplasms	1.2	0.6	0.9	0.5	*	*	*	*	*	*	*	*	2.5	*	*	*
Diseases of the Blood and Blood-Forming Organs	0.4	0.4	0.4	*	*	*	*	*	*	*	*	*	0.4	*	*	*

Bold: top five conditions
*Suppressed estimates due to a small count *or* not applicable

Appendix C-3: Frequency of Hospitalizations (Inpatient and Day Procedure) By Gender, Age Category, and Group (2006)

Group	Average hospitalizations	Age 0-5 %		Age 6-10 %		Age 11-15 %		Age 16+ %	
	%	Male	Female	Male	Female	Male	Female	Male	Female
FASD-PW	13.9 (b)	30.4	35.3	8.4	33.3	6.6	5.5	13.1	34.1
PA	13.6 (a)	18.2	15.3	(s)	7.1	(s)	18.5	(s)	57.1
PA-PW	13.7	0	0	(s)	0	(s)	(s)	0	(s)
FASD-CADEC	9.2	33.3	0	(s)	0	(s)	(s)	(s)	(s)
General pop.	6.2	13.9	5.6	4.5	3.6	4.6	4.8	5.0	12.3

(a) group has a lower probability of having a zero count than the General Population
(b) group estimates of hospitalizations in the population are significantly higher than the general population when accounting for the excess zeroes
(s) Suppressed due to a small count between 1 and 5 observations

Appendix C-4: Percentage of Children with a Hospitalization (Inpatient and Day Procedure) by Gender, Age Category, and Group (2006)

Group	Total Group %	Age 0-5 %		Age 6-10 %		Age 11-15 %		Age 16+ %	
		Male	Female	Male	Female	Male	Female	Male	Female
FASD-PW	9.0*	(s)	35.3*	6.7	11.1*	4.8	5.5	11.5*	18.2
PA	9.9*	13.6*	13.6*(1)	(s)	(s)	(s)	10.8*	(s)	(s)
PA-PW	(s)	0	0	(s)	0	(s)	(s)	0	(s)
FASD-CADEC	7.6	33.3	0	(s)	0	(s)	(s)	(s)	(s)
General pop.	4.7	8.2	5.1	4.0	2.5	3.4	4.1	3.0	11.3

*statistically significant difference compared to the General Population group
(1) Statistically significant difference with respect to the FASD-PW group
(s) Suppressed due to a small count between 1 and 5 observations

Appendix C-5: Frequency of the Number of Different Types of Medications By Age Category and Group (2006)

Number of prescriptions	Age 0-5 %			Age 6-10 %			Age 11-15 %			Age 16+ %		
	FASD-PW	PA	Gen. Pop.	FASD-PW	PA	Gen. Pop.	FASD-PW	PA	Gen. Pop.	FASD-PW	PA	Gen. Pop.
0 – no prescriptions	42.5	24.4	37.6	26.4	28.5	49.6	23.2	28.3	50.5	26.7	22.6	42.0
1	*	12.0	21.1	14.3	14.0	23.0	18.8	15.0	22.3	17.1	*	20.4
2	*	11.6	17.1	14.8	19.7	11.8	17.8	8.9	12.6	12.4	*	12.8
3	*	7.6	8.1	13.7	11.9	6.9	16.7	9.7	6.8	10.5	*	9.6
4	*	10.8	5.3	9.3	7.3	3.9	8.3	8.9	3.6	11.4	*	5.6
5	*	5.6	3.0	7.7	3.1	1.9	3.3	5.3	1.8	5.7	*	3.4
6	*	7.6	3.1	6.6	3.6	1.2	4.0	8.9	1.0	*	*	2.2
7	*	4.8	1.6	*	*	0.8	3.3	7.1	0.6	*	*	1.4
8	*	4.4	0.9	*	4.7	*	*	*	0.6	*	*	*
9	*	3.6	0.7	*	*	*	*	*	*	*	*	*
10	*	2.4	0.8	*	*	*	*	*	*	*	*	*
>10	*	2.4	*	*	*	*	*	*	*	*	*	*
Suppressed or n/a	57.5	2.8	0.7	7.2	7.2	0.9	4.6	7.9	0.2	16.2	77.4	2.6
	100%	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
*Suppressed *or* not applicable												

Appendix C-6: Types of Genito Urinary System and Sex Hormones Drugs (Generic Name) Prescribed by Group (2006)

Generic name	Prescribed for:	FASD-PW %	PA %	Gen Population %
Levonorgestrel /Ethinyl Estradiol	Oral Contraceptive	40.3	14.8	22.7
Desogestrel / Ethinyl Estradiol	Oral Contraceptive	16.1	33.3	9.3
Norgestimate - Ethinyl Estradiol	Oral Contraceptive			26.7
Ethynodiol Diacetate / Estradiol	Oral Contraceptive			1.6
Drospirenone / Ethinyl Estradiol	Oral Contraceptive		11.1	7.7
Ethinyl Estradiol Levonorgestrel	Oral contraceptive	4.8		5.1
Medroxyprogesterone Acetate	Depo-Provera: used for treating secondary amenorrhea; abnormal bleeding from the uterus due to hormonal imbalance; injection is used for contraception and for treating endometrial or renal cancer	12.9	12.9	4.8
Oxybutynin Chloride	Used for bladder and urinary conditions	11.3		4.0
Nitrofurantoin	anti- bacterial that is used to treat urinary tract infections			2.7
Cyproterone / Ethinyl Estradiol	Treat certain types of acne in women; regulates hormones that affect the skin			10.1
Other *or* suppressed		14.6	27.9	5.3
Total		**100%**	**100%**	**100%**

Interpretation of data in this table: For individuals who are prescribed Genito Urinary System and Sex Hormone Drugs in 2006 (which is a small number, e.g. from Table 26: 1.7% of prescriptions to FASD-PW children) this table lists the specific types of Genito Urinary System and Sex Hormone medications which were prescribed. As an example, the data should not be interpreted as 40.3% of FASD-PW children are prescribed the oral contraceptive: Levonorgestrel/Ethinyl Estradiol.

Appendix C-7: Types of Cardiovascular System Drugs (Generic Name) Prescribed by Group (2006)

Generic name	Prescribed for:	FASD-PW %	PA %	Gen Pop %
Clonidine Hydrochloride	An antihyperintensive; It is prescribed alone or in combination for the reduction of high blood pressure and is an adjunct for the treatment of cancer pain when pain persists during intraspinal opiate treatments. However, it is also used in the treatment of ADHD and also used for Tourette's Syndrome. These may be more likely uses for our population.	85.2	12.9	18.2
Hydrocortisone Acetate	Hydrocortisone acetate is a hormone used to treat local pain and swelling (inflammation) due to joint problems (e.g. arthritis, bursitis) or certain skin conditions (e.g., keloids, psoriasis)	4.0	74.3	39.9
Enalapril Maleate	It is used to treat high blood pressure (hypertension) in adults and children.	3.1		9.2
Epinephrine	Most likely used for respiratory conditions, major allergies, and asthma in our population groups. Also known as adrenalin e.g. signaling the heart to pump harder, increasing blood pressure, opening airways in the lungs, narrowing blood vessels in the skin and intestine to increase blood flow to major muscle groups	2.8	7.9	14.8
Losartan Potassium	An oral drug used to treat hypertension.	1.4		2.6
Amlodipine Besylate	Norvasc; it is prescribed for angina and is also prescribed for high blood pressure.			1.8
Digoxin	Digoxin increases the strength and vigor of heart contractions, and is useful in the treatment of heart failure			2.6
Propranolol Hydrochloride	Inderal, a type of medication known as a beta blocker, is used in the treatment of high blood pressure, angina pectoris, changes in heart rhythm, prevention of migraine headache, hereditary tremors, hypertrophic subaortic stenosis (related to exertional angina), and tumors of the adrenal gland.			3.3
Spironolactone	Spironolactone is a potassium-sparing diuretic (water pill) that prevents your body from absorbing too much salt and keeps your potassium levels from getting too low.			1.8
Captopril	used for treating high blood pressure, heart failure, and for preventing kidney failure due to high blood pressure and diabetes			1.5
Other *or* suppressed		3.5	4.9	4.3
Total		**100%**	**100%**	**100%**

Although MCHP classifies Clonidine Hydrochloride under the Cardiovascular System category, but this medication is likely used for ADHD. Likewise, Hydrocortisone Acetate is a topical medication, and it is unclear as to why this medication is classified as a cardiovascular drug by MCHP

Interpretation of data in this table: For individuals who are prescribed Cardiovascular System Drugs in 2006 (which is a small number, e.g. from Table 26: 5.8% of prescriptions to FASD-PW children) this table lists the specific types of Cardiovascular System medications which were prescribed. As an example, the data should not be interpreted as 85.2% of FASD-PW children are prescribed the drug for high blood pressure: Clonidine Hydrochloride

Appendix C-8: Health Care Professionals Prescribing Medications by Group (2006)

	FASD-PW	PA	PA-PW	FASD-CADEC	Gen Pop
Prescriber/Physician type	**%**	**%**	**%**	**%**	**%**
General Practitioners	29.5	71.2	57.1	41.9	54.7
Psychiatrists	7.4	0.4	5.9	2.4	1.0
Pediatrics	60.1	25.0	31.5	52.6	34.7
Obstetrics & Gynaecology	0.1	0.3	*	*	0.4
Other Medical Specialists	1.8	2.7	3.2	2.5	7.8
General Surgeons	0.5	*	*	-	0.5
Specialist Surgeons	0.6	0.3	*	*	0.9

Appendix C-9: Frequencies of the Number of Different Prescribing Physicians

Frequencies of the number of different prescribing physicians	FASD-PW	PA	PA-PW	FASD-CADEC	General Population
	%	**%**	**%**	**%**	**%**
0	27.4	27.9	41.2	30.3	47.3
1	29.9	20.1	23.5	22.7	28.8
2	18.7	18.6	*	26.1	13.6
3	11.1	12.1	*	10.1	5.5
4	5.6	8.4	*	5.9	2.5
5	2.3	5.8	*	*	1.1
6	2.5	2.4	*	*	0.4
7	*	2.0	*	*	0.4
8	*	1.4	*	*	0.1
9	*	*	*	*	0.1