CUMULATIVE RISK AND PROTECTIVE FACTORS: CASE STUDIES OF THE NEURODEVELOPMENT OF CHILDREN EXPOSED TO SUBSTANCES

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ABSTRACT

This research explored the impact of cumulative risk and protection on the neurodevelopment of children exposed prenatally to substances. My research was conducted at Breaking the Cycle (BTC), an early intervention program for substance-exposed children. I established theoretically grounded cross-domain cumulative risk and protection measures to quantify cumulative risk and protection, alongside qualitative case study descriptions, for three sibling groups at BTC. I also described each child's neurodevelopmental profile. The emerging patterns of cumulative risk and protection as they related to neurodevelopment highlighted the importance of a qualitative, cumulative, and cross-domain consideration of risk and protection. The results demonstrated that neurodevelopment and clinical progress are dependent on the balance between levels of cumulative risk and protection; however, in exploring the variability within and between sibling groups, there appeared to be an effect of early-intervention. This research has practice and policy implications for early intervention support with this population.

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INTRODUCTION

Prenatal substance exposure is a serious public health concern in North America given that such exposure is associated with deficits across many domains of functioning (Huizink, 2015; McQueen, Murphy-Oikonen, & Desaulniers, 2015). Specifically, children with prenatal substance exposure are considered at high risk for a range of biological, neurodevelopmental, and behavioural problems, as well as later psychopathology (Bandstra, Morrow, Mansoor, & Accornero, 2010). Research has shown that the adverse consequences of prenatal substance exposure can be exacerbated by risk factors across various domains within the perinatal environment (Carta et al., 2001; Conners et al., 2004). Domains represent categories in which related risk exposures can occur; the total cumulative risk across all relevant categories in the perinatal environment is encompassed across all of the domains. Domains can also represent categories of protective factors that capture the total cumulative protection. In the perinatal environment, domains of risk can include: mother, secondary parent, family, pregnancy, birth, child, parent-child interactions, social networks, and professional services. The constellation of maternal risk factors that often accompany prenatal substance use include: histories of trauma and abuse, increased exposure to parental and partner violence, mental health concerns, negative life events, intergenerational substance use, and homelessness (Conners et al., 2004; Kettinger, Nair, & Schuler, 2000; Nair, Schuler, Black, Kettinger, & Harrington, 2003; Slesnick & Erdem, 2012). Additionally, multiple risk factors specific to the child, family context, parent-child relationships, and the larger social network domains all contribute to the risks associated with prenatal substance exposure (Carta et al., 2001; LaGasse, Seifer, & Lester, 1999). Conversely, the accumulation of protective factors can attenuate the negative effects of cumulative risk, resulting in more positive developmental outcomes (Ackerman, Schoff, Levinson, Youngstrom,

& Izard, 1999; Crosnoe, Leventhal, Wirth, Pierce, & Pianta, 2010; Furstenberg, Cook, Eccles, Elder, & Sameroff, 1999; Ostaszewski & Zimmerman, 2006; Runyan et al., 1998; Spencer, 2005). However, there has been minimal investigation of domain-based cumulative risk and protective factors and the effect on neurodevelopment in samples of substance-exposed children. Even less is known about how cumulative protective factors interact with the constellations of risk surrounding prenatal substance use. The focus of the present study was to capture the cumulative risk and protection contexts that surround children exposed prenatally to substances in order to better understand how cumulative risk and protection relate to their neurodevelopmental profiles.

This study was conducted at *Breaking the Cycle (BTC)*, an early prevention and intervention program for pregnant and parenting women using substances and their young children (0 to 6 years old). In this study, I created theoretically grounded cross-domain cumulative risk and cumulative protective factor scores, with factors relevant to substance-exposed children receiving early-intervention services at BTC. I used these scores to describe the cross-domain cumulative risk and cumulative protective factors of two sibling dyads and one sibling quadrad with histories of prenatal substance exposure. I also described the neurodevelopmental profiles of these children across their time receiving services at BTC using routine developmental assessment data from BTC across social-emotional and cognitive domains; therefore, neurodevelopment was operationalized as encompassing social-emotional and cognitive development. It is understood that the measures used to assess neurodevelopment in this study may not represent the entire scope of neurodevelopment. Using a cross-domain case study investigation, I qualitatively described the cumulative risk and protective factors, as well as the neurodevelopmental profile, of the children in the three sibling groups. Overall, the focus of

this study was on the patterns of cumulative risk and protective factors as they related to the neurodevelopmental profiles of children who were exposed to substances prenatally.

Cumulative Risk and Protective Factors

Cumulative Risk Factors

A risk factor is defined as an individual or environmental factor (e.g., prenatal substance exposure) associated with an increased likelihood of developing negative or undesirable outcomes (Kraemer, Lowe, & Kupfer, 2005). Most children exposed to a single physical or psychosocial risk factor suffer minimal enduring consequences (Evans et al., 2013; Rutter, 1981). In contrast, children concurrently exposed to multiple risk factors are at high risk for poor developmental outcomes and psychological disorders (Rutter, 1979; Rutter, 1981; Sameroff, 2006). Therefore, cumulative risk is a construct used to conceptualize children's exposure to multiple risks and the additive impact on developmental outcomes (Evans et al., 2013). Children often present with constellations of risk rather than isolated instances of adverse circumstances; therefore, assessing cumulative risk exposure yields information about children who are at highest risk for impaired development (Evans et al., 2013). Correlations between developmental outcomes and sociodemographic, psychosocial, and biological profiles are often mediated by cumulative risk exposure (Evans et al., 2013; Madigan, Wade, Plamondon, Maguire, & Jenkins, 2017). Furthermore, cumulative risk exposure accounts for more of the variance in children's developmental trajectories than prenatal substance exposure alone (Carta et al., 2001). Studying multiple risk factor exposure can help identify highly vulnerable children who have experienced cumulative risk and are high priority candidates for interventions. Further, a better understanding of the effect of cumulative risk exposure on neurodevelopment can inform interventions that address the full range of salient risk factors rather than singular risk factors.

Cumulative risk analysis commonly combines a defined set of risk factors, dichotomizing risk on each indicator (i.e., present = 1, absent = 0), and computing a continuous score that summarizes the total sources of risk affecting the individual (Rauer, Karney, Garvan, & Hou, 2008). Risk assignment is accomplished by a statistical criterion (e.g., greater than one standard deviation above the mean, upper quartile) or based on *a priori* theoretical and conceptual categorization (e.g., being below the poverty line, single parenthood), with only high levels of risk exposure being captured (Evans, 2004). Cumulative risk models measure the quantity of risk factors rather than the quality of each risk factor, or the degree to which it impacts the outcome of interest (Evans, 2004; Hooper, Burchinal, Roberts, Zeisel, & Neebe, 1998).

Two models have been used to conceptualize cumulative risk exposure. First, threshold or quadratic cumulative risk models are based on a certain number of risk factors being present and surpassing an arbitrarily assigned level of risk (Appleyard, Egeland, van Dulmen, & Sroufe, 2005). After a certain number of risk factors are experienced, there is a quadratically negative impact on development, with the risk factors potentiating each other such that the effect of all of them together is greater than the sum of their individual effects (Rutter, 1979). Secondly, additive or linear cumulative risk models are based on the increasing number of risk factors experienced overall, with a linear decrease in positive developmental outcomes resulting as the risk exposure increases (Sameroff, Bartko, Baldwin, Baldwin, & Seifer, 1998). Conceptually, risk factors may combine in both an additive and interactive fashion, increasing vulnerability. Linear cumulative risk models are based upon the additivity of risk assumption that implies a linear relation between the number of risk factors and compromised child developmental outcomes, yet there is a lack of statistical testing for the additivity assumption in the cumulative risk literature (Lamela & Figueiredo, 2015; Sameroff, Seifer, & McDonough, 2004). Evidence

for both linear and nonlinear relationships between cumulative risk and target developmental outcomes have been reported in the cumulative risk literature (Evans et al., 2013). Nonetheless, the additive cumulative risk models have been found to be more predictive of developmental outcomes over the threshold cumulative risk models, despite requiring further investigation into the potential interactive effects between multiple risks (Appleyard et al., 2005; Evans et al., 2013).

Cross-Domain Risk Factors

In a review on cumulative risk and child development, Evans and colleagues (2013) discussed the need to combine single risk factors into domains to examine potential main and interactive effects. Some researchers have investigated exposure to risk across different life domains and the effects of this exposure on developmental outcomes (Ackerman et al., 1999; Brennan, Hall, Bor, Najman, & Williams, 2003; Whipple, Evans, Barry, & Maxwell, 2010). There is strong evidence that risk exposure across multiple domains presents more challenging adaptive demands on children relative to intense but concentrated intra-domain risk exposure (Evans et al., 2013). Studies on the number of domains of cumulative risk to which a child was exposed have indicated larger effect sizes, with an average 22.7% increment in adversity per risk factor exposure reported, compared to the 5.7% increment in adversity per risk factor exposure reported when investigating overall cumulative risk scores (Evans et al., 2013). Cross-domain cumulative risk models also enable the examination of main and interactive effects of domain-specific cumulative risk exposure on child development, with several studies reporting interactive effects between domains (Ackerman et al., 1999; Brennan et al., 2003; Carta et al., 2001; Mrug, Loosier, & Windle, 2008; Whipple et al., 2010).

Bronfenbrenner's bioecological theory of human development (Bronfenbrenner, 1979) provides a theoretical explanation as to why the effects of cumulative risk on child development exceed the effects of singular risk exposure. The bioecological theory posits that human development involves the interplay between the developing child and five unique systems that surround the child: microsystem, mesosystem, exosystem, macrosystem, and chronosystem (Bronfenbrenner & Morris, 1998; Bronfenbrenner, 1979; Bronfenbrenner & Evans, 2000). Exposure to multiple risks is likely to disrupt proximal developmental processes by interfering with the complex interactions required for healthy development (Evans et al., 2013). This model provides a child-centered taxonomy for the consideration of domains of risk, emphasizing the effect of child characteristics on development, as well as the impact of the physical and psychosocial dimensions of the surrounding environment. As children mature, their worlds expand and distal domains become more salient, thus a lifespan perspective emphasizes the need to consider cumulative risk across time and across all the surrounding systems (Bronfenbrenner & Morris, 1998; Bronfenbrenner & Evans, 2000). Therefore, Bronfenbrenner's (1979) bioecological model of human development depicts salient levels of environmental systems that can be delineated in a cross-domain cumulative risk model.

Cumulative Protective Factors

Most literature on cumulative risk has solely investigated risks or detrimental factors and their impact on development, infrequently investigating the effects of cumulative resources or cumulative protective factors as well (Evans et al., 2013). A small number of studies, some of which included populations of at-risk children, have indicated that, as protective factors accumulate, their benefits accrue and promote positive developmental outcomes (Crosnoe et al., 2010; Furstenberg et al., 1999; Runyan et al., 1998). Some researchers have even found that

measures of cumulative protective factors can attenuate the negative effects of cumulative risk (Ackerman et al., 1999; Ostaszewski & Zimmerman, 2006; Spencer, 2005). Not only have cumulative protective factor scores been inversely related to negative developmental outcomes, but cumulative protective factor scores have been found to interact with cumulative risk scores in predicting developmental outcomes, such that medium and high cumulative protective factor scores have muted the relationship between cumulative risk and negative outcomes in past studies (Ackerman et al., 1999). In contrast to scores assessing an accumulation of protective factors, individual protective factors are only weakly related to negative outcomes, suggesting that using a cumulative conceptualization of exposure to protective factors is advantageous to understanding developmental outcomes (Ackerman et al., 1999). Nonetheless, it has been found that the accumulation of protective factors, relative to exposure to multiple risk factors, explains very minimal variance in developmental outcomes (Gutman, Sameroff, & Cole, 2003; Pollard, Hawkins, & Arthur, 1999; Sameroff & Rosenblum, 2006).

Cross-Domain Protective Factors

Protective factors can include endogenous (e.g., high IQ, good temperament) and exogeneous (e.g., supportive relationships, high socioeconomic status) factors. In the context of children with prenatal substance exposure and histories of risk, early prevention and intervention services for the mother and child can also be conceptualized as protective processes designed to promote optimal development (Andrews, Motz, Pepler, Jeong, & Khoury, 2018). Nonetheless, limited work has taken domain-specific protective factors into consideration (Evans et al., 2013). This is problematic in that it fails to provide a holistic perspective of child development within contexts of both risk and protective factors. Combining protective factors into domains allows the potential main and interactive effects of cumulative protective factors to be examined, in

addition to allowing the interactive effects between domain-specific risk and protective factors to be examined (Evans et al., 2013).

Bronfenbrenner's bioecological theory of human development (Bronfenbrenner, 1979) offers support for a cross-domain consideration of cumulative protective factors. This model posits that developing children can more successfully handle singular risk disruptions in their surrounding systems (e.g., parental loss) if they have had the opportunity to cultivate alternative sources of the interrupted proximal process (e.g., a responsive and involved caregiver) (Evans et al., 2013). However, when multiple risk factors are encountered, it is more likely that this single protective, alternate relationship will also be disrupted, failing to buffer against any negative developmental outcomes (Evans et al., 2013). Bronfenbrenner's (1979) bioecological model of human development highlights a need to consider the interactive cumulative effects of cross-domain risk and protective factors.

Theoretically Grounded Scores

Evans and colleagues (2013) discussed the importance of grounding cumulative risk and protective factor research in a holistic theoretical framework that aids in delineating developmentally salient risk and protective domains. A theoretical foundation provides a rationale to account for the superior predictive power of multiple, relative to singular, risk and protective factor exposure on child developmental outcomes (Evans et al., 2013). In the current study, I utilized the Developmental Model of Transgenerational Transmission of Psychopathology (Figure 1; Hosman, van Doesum, & van Santvoort, 2009) to conceptualize various domains of risk and protective factors in the neurodevelopment of children exposed prenatally to substances and accessing early-intervention services. Although Hosman and colleagues' developmental model outlines the transgenerational transmission of

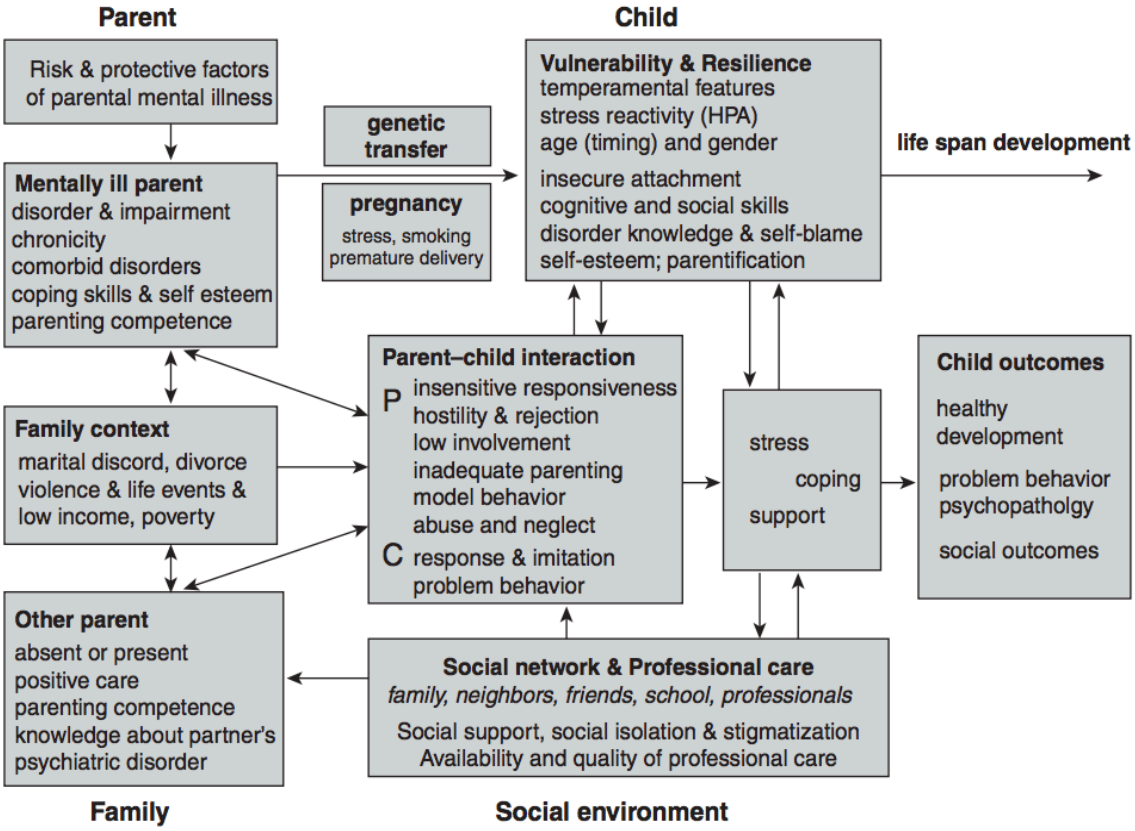


Figure 1. **Theoretical Model.** Reprinted from "Prevention of Emotional Problems and Psychiatric Risks in Children of Parents with a Mental Illness in the Netherlands. I. The Scientific Basis to a Comprehensive Approach," by C. M. H. Hosman, K. T. M van Doesum, F. Santvoort, 2009, Australian e-Journal for the Advancement of Mental Health, 8(3), 250-63. Copyright 2009 by the Taylor and Francis Group. Reprinted with permission.

psychopathology, similar developmental and relational domains and processes are related to neurodevelopment in substance-exposed children.

Hosman and colleagues' model was founded upon practice- and theory-based empirical knowledge, capturing information on the main domains of malleable risk and protective factors (Hosman et al., 2009). This model differentiates multiple interacting domains and systems of influence (i.e., parents, children, family, social network, professionals, community), recognizing

that risk and protective factors are linked across domains and each can serve as a relevant intervention target. The model also differentiates various mechanisms by which risk factors are transmitted (i.e., genetic risk, prenatal influences, parent–child interactions, family processes and conditions, and social influences; Goodman & Gotlib, 1999). This developmental model also differentiates developmental stages in the child's life (e.g., pregnancy, early development, lifespan development), with each stage associated with specific developmental processes and sensitive periods requiring stage-specific intervention (Hosman et al., 2009). The strength of this model is that it comprehensively captures both risk factors and the conditions promoting children's resilience and social-emotional development. Therefore, in this study, I created comprehensive cumulative risk and cumulative protective factor scores that build upon this holistic developmental model of domains of risk and protective factors that are relevant to consider in substance-exposed children participating in early-intervention programming with their mothers.

Neurodevelopmental Profiles of Substance-Exposed Children

Children with prenatal substance exposure are considered at high risk for various neurodevelopmental deficits (Bandstra et al., 2010; Black, Schuler, & Nair, 1993). Prenatal alcohol and marijuana exposure have been found to have long-lasting adverse effects on neurodevelopment, impacting attentional skills overall, with marijuana exposure associated with subsequent Attention Deficit Hyperactivity Disorder diagnoses (Fried, Watkinson, & Gray, 1992; Leech, Richardson, Goldschmidt, & Day, 1999; Williams & Ross, 2007). Marijuana exposure has not been found to affect overall academic achievement. In contrast, alcohol exposure affects both academic achievement and executive functioning, suggesting more global adverse effects (Williams & Ross, 2007). Prenatal alcohol exposure is the underlying etiology of

Fetal Alcohol Spectrum Disorder, characterized by congenital abnormalities, cognitive, behavioural, emotional, and adaptive functioning deficits (Williams & Smith, 2015).

Prenatal cocaine and opiate exposure have relatively temporary adverse effects on neurodevelopment that span a short time post-exposure (Williams & Ross, 2007). Cocaine exposure negatively impacts arousal regulation, auditory comprehension, language abilities, and academic achievement (Koren et al., 1998; Mayes, Grillon, Granger, & Schottenfeld, 1998; Nulman et al., 2001; Singer et al., 2004; Williams & Ross, 2007), while opiate exposure is associated with cognitive and psychomotor deficits (Hunt, Tzioumi, Collins, & Jeffery, 2008). Tobacco exposure affects academic achievement and memory, but not executive functioning (Williams & Ross, 2007). Studies investigating polysubstance exposure have also indicated impaired cognitive development overall (Moe, 2002; Slinning, 2004; van Baar, Soepatmi, Gunning, & Akkerhuis, 1994). In summary, studies of prenatal substance exposure indicate that these substances can have negative effects on the developing fetal brain. One objective of this study was to longitudinally describe the neurodevelopmental profile of children exposed prenatally to polysubstance use.

Effect of Cumulative Risk and Cumulative Protective Factors on Neurodevelopment

The body of research outlining the effects of prenatal substance exposure on neurodevelopmental outcomes has revealed many risk factors that impact the adverse effects of such toxins. The negative effects of prenatal marijuana exposure on neurodevelopment have been found to be heightened with maternal age (Williams & Ross, 2007). The risks associated with prenatal alcohol exposure on neurodevelopment are heightened with increased maternal age, a history of alcohol use, and high-level binge drinking. Negative effects of prenatal alcohol exposure are also heightened in children with minimal cognitive stimulation (Bailey et al., 2004;

Jacobson, Jacobson, Sokol, Chiodo, & Corobana, 2004). Maternal IQ and the quality of care in the home environment have both emerged as important determinants of neurodevelopment in children exposed prenatally to cocaine, with the adverse effects of cocaine exposure thought to ameliorate with increased maternal age, thus contrasting with the impact of maternal age on the effects of alcohol exposure (Singer et al., 1997, 2001, 2002, 2004). Furthermore, relative to healthy controls, children with prenatal cocaine exposure were more likely to be victims of emotional and physical neglect, have minimal contact with their biological fathers, have fewer toys, have less adequate housing, and live in chaotic home environments (Nulman et al., 2001). Similarly, the mothers consuming cocaine prenatally were more likely to be depressed, have fewer recourses, lack social support, spend less time with their children, and make frequent moves relative to healthy controls (Nulman et al., 2001). An optimal home environment for children was positively related to neurodevelopmental performance in children exposed to cocaine, with this support buffering against the adverse effects of substance exposure (Black et al., 1993). Overall, the effects of cocaine and opiate exposure on neurodevelopment are thought to be strongly mediated through the psychosocial functioning of the mother, with research outlining the need to consider the potentially interactive role of environmental risks (Lester et al., 2002; Williams & Ross, 2007). Prenatal tobacco exposure relates to the quality of the early caregiving environment, including maternal mental state, attitudes, personality, socioeconomic status, and education level (Wakschlag & Hans, 2002).

In contrast, parental IQ and the quality of the caregiving environment have been reported to be important factors conferring protection and resilience (Williams & Ross, 2007). Overall, various protective factors have been found to result in more positive outcomes in children exposed to substances including: support from school, immediate and extended family, the

presence of a stable adult figure, a positive relationship with a caregiver, minimal separation from primary caregiver in the first year of life, and individuals and services outside the family (Velleman & Templeton, 2007). Therefore, there is evidence that cumulative risk and protective factors can impact children's neurodevelopmental outcomes beyond substance exposure alone, and thus warrant consideration. In this study, I explored domain-specific cumulative risk and protective factors as they relate to the neurodevelopmental profiles of young children with prenatal substance exposure having received early-intervention services at BTC.

Objectives

The purpose of this study was to create cumulative risk and cumulative protective factor scores based on the Developmental Model of Transgenerational Transmission of Psychopathology, with domains relevant to neurodevelopment in substance-exposed children receiving early-intervention services at BTC (Hosman et al., 2009). This domain-specific conceptualization of risk and protective factors facilitated the consideration of both intra- and inter-domain risk and protective factors and their effects on neurodevelopment across three sibling groups with histories of prenatal substance exposure. Incorporating protective factors into this investigation enabled a holistic consideration of overall life circumstances. Utilizing routine developmental assessments at BTC, I also described the neurodevelopmental profiles of children within the three sibling groups. Taken together, these data provided a quantifiable description of cumulative risk, cumulative protection, and neurodevelopment in these children, which I considered alongside a qualitative description using a cross-domain case study investigation. Overall, I endeavoured to illustrate the patterns of cumulative risk and protective factors as they related to neurodevelopmental outcomes in these children who were exposed to substances prenatally, using both quantitative and qualitative methods.

The objectives of this study were as follows:

Objective 1: Create comprehensive, theoretically grounded cumulative risk and protective factor scores with domains relevant to neurodevelopment in three sibling groups with prenatal substance exposure participating in early-intervention services with their mothers.

Objective 2: Describe the neurodevelopmental profiles of the children within the three sibling groups with prenatal substance exposure across the time they were receiving services at BTC.

Objective 3: Qualitatively describe the cumulative risk and protective factors, as well as the neurodevelopment, of the children within the three sibling groups with prenatal substance exposure using a cross-domain case study investigation.

Objective 4: Illustrate the patterns between cumulative risk, cumulative protective factors, and neurodevelopmental outcomes of children with prenatal substance exposure using cross-domain quantitative and qualitative investigations of the three sibling groups.

This research was embedded at Mothercraft's BTC, an early identification and prevention program for substance using mothers and their children from birth to 6 years old in Toronto, Canada. In addition to prenatal substance use, women at BTC have histories of trauma, mental health issues, interpersonal violence, and family instability, making BTC a unique context to evaluate the links between maternal histories and concurrent cumulative risk and protective factors on child neurodevelopment. The program supports the development of children with prenatal substance exposure by providing both maternal services (e.g., addiction counseling) and child services (e.g., early-intervention services), in addition to dyadic or relationship-focused services specifically designed to foster the mother-child relationship (e.g., mother-child interactional support groups, home-based dyadic developmental services). BTC's comprehensive

relationship-focused approach has been linked to improved maternal mental health and relationship capacity (Espinet, Motz, Jeong, Jenkins, & Pepler, 2016). Through a single access model, BTC operates in formal partnership with nine agencies addressing services related to child protection, addiction treatment, health, corrections and probations, and child mental health and development.

METHOD

Study Design

Throughout this study I utilized a retrospective case study design. A comprehensive chart review was conducted for two sibling dyads and one sibling quadrad. From this chart review, cumulative risk and protective factor scores were created for each child. The chart review also provided an in-depth qualitative understanding of the contexts of risk and protective factors. Developmental assessment data were used to describe each child's neurodevelopmental profile, while the full chart review provided a qualitative understanding of overall neurodevelopment. The patterns between children's histories of risk and protective factors and their overall neurodevelopment were explored using children's quantified cumulative risk and protective factor scores, as well as their overall qualitative cross-domain case studies.

Setting and Participants

This study was embedded at BTC, focussing on three families with substance exposure histories. There were two families with sibling dyads and one with a sibling quadrad, for a total of eight children aged 0 to 6 years old who had received services at BTC. The sibling dyads and quadrad that were selected participated in long-term treatment at BTC, with developmental assessments at multiple time points. The three families, herein referred to as Family A, Family B, and Family C, were selected based on their clinical progress, which the lead clinicians classified as good, fair, and poor, respectively. Clinicians assessed overall clinical progress by family, based on the families' participation in programming at BTC, child apprehensions from parental care during their involvement, and status at closing.

Data Source, Variables, and Qualitative Methods

This study utilized archival BTC data collected under a CIHR-funded, multi-year study (Espinet et al., 2016). Data were obtained from clients' charts, which include referral forms, mother and child intake forms, progress notes, medical notes, correspondence, addiction counselling notes, mother-child interactional support notes, clinical team review notes, child developmental assessment measures and reports, and service ending forms. Clients differed in their use of services and their length of involvement with BTC; therefore, available information varied slightly across participants. I first created a cumulative risk factor score. For this score, risk elements were extracted from clients' charts based on prior measures, specifically items from a cumulative risk measure utilized in prior BTC research, measures used clinically at BTC to assess maternal mental health, addiction, and parenting capacity, as well as a measure utilized in studies on adverse childhood experiences, and the Diagnostic Classification of Mental Health and Developmental Disorders of Infancy and Early Childhood, specifically Axis IV on Psychosocial Stressors (Anda et al., 2006; Mothander, 2016; Motz et al., 2011). A cumulative protective factor score was then established based on existing early-intervention components of services at BTC, clinical measures assessing maternal mental health, addiction, and parenting capacity, as well as known protective factors outlined in the literature. The cumulative risk and cumulative protective factor scores were categorized by domains, by mapping each risk and protective element onto the target theoretical model being used to conceptualize neurodevelopment in substance-exposed children undergoing intervention (Figure 1; Hosman et al., 2009). Specifically, the following domains of both risk and protective factors were assessed: mother, secondary parent, family, pregnancy, birth, child, parent-child interactions, social networks, and professional services (Hosman et al., 2009). Therefore, the scores encompassed

prenatal and postnatal factors, specifically related to maternal history, as well as the psychosocial and environmental factors experienced by the child. Overall, I determined domain-specific cumulative risk and cumulative protective factor scores, and the total cumulative risk and cumulative protective factor scores for each child.

Each risk element was coded dichotomously, with exposure = 1 and no exposure = 0. Risk assignment was accomplished by statistical criteria (e.g., upper quartile of risk exposure = 1; all others = 0) or based on *a priori* theoretical and conceptual categorization (e.g., being below the poverty line, single parenthood) and pre-existing clinical classifications (e.g., clinically significant anxiety), when appropriate. Similarly, each protective element was coded dichotomously, with exposure = 1 and no exposure = 0. Again, assignment was accomplished by statistical criteria (e.g., lower quartile of risk exposure = 1; all others = 0) or based on *a priori* theoretical and conceptual categorization (e.g., accessing early-intervention services), when appropriate. The sum of the dichotomous elements within each domain was calculated to yield domain-specific cumulative risk and cumulative protective factor scores. These scores were converted into percentages to ensure that the denominator was dependent on the number of items applicable for each child per domain, with unknown elements removed. Total cumulative risk and cumulative protective factor scores were computed by adding the scores across each domain, then converting into percentages to ensure that the denominator was based on the number of items applicable for each child. These scores were calculated for the eight children within the two sibling dyads and one sibling quadrad. Domain-specific and total cumulative risk and cumulative protective factor percentages were considered clinically significant if the percentage was above 25%. The number of clinically significant domains of risk and protection were

subtracted for each child to quantify the balance between cross-domain risk and protection, with positive numbers indicating more risk domains relative to protection domains.

Child neurodevelopmental profiles were described using existing yearly BTC developmental assessment measures that span various domains of functioning, namely social-emotional and cognitive development. Emotional and behavioral problems were assessed using the Child Behavior Checklist (CBCL), a well-established standardized parent/caregiver and teacher questionnaire (Achenbach, 2000). There are two different versions of the CBCL used for children aged 1.5 to 5 years old and 6 to 18 years old (Achenbach, 2000). Emotion regulation and behaviour were assessed using the Infant-Toddler Social Emotional Assessment (ITSEA) measure in young children aged 1 to 3 years old (Carter & Briggs-Gowan, 2005). Intellectual and cognitive functioning were assessed using the Bayley Scales of Infant and Toddler Development-Third Edition (BAYLEY-III) for children 1 to 3.5 years old, and the Wechsler Preschool and Primary Scale of Intelligence-Fourth Edition (WPPSI-IV) for children 2.5 to 7.6 years old (Bayley, 2006; Wechsler, 2012). Social-emotional development was considered clinically concerning if scores fell within the borderline clinical range or within the clinical range on the CBCL or the ITSEA. Cognitive development was considered clinically concerning if scores fell within the low average or impaired range on the BAYLEY-III or the WPPSI-IV. I classified borderline clinical range and low average scores as clinically concerning given the young age and high-risk of children in the study. When considering neurodevelopment longitudinally, the proportion of scores that were classified as clinically concerning on the social-emotional (across all respondents) and cognitive measures were reported at each time point. Proportions above 25% were designated as significantly concerning.

The cumulative risk factors, cumulative protective factors, and neurodevelopment of children in the three sibling groups exposed prenatally to substances were explored qualitatively over time in a cross-domain case study. The qualitative case study description of the children's life experiences was framed according to the same domains outlined in the target theoretical model (Figure 1; Hosman et al., 2009). Risk and protective factors were qualitatively described in each domain, and overall neurodevelopment was also described qualitatively.

The patterns between cumulative risk and protective factors, and the neurodevelopmental outcomes of children exposed prenatally to substances were illustrated by considering the qualitative cross-domain case study description of each child's life experiences alongside the respective total and domain-specific cumulative risk and protective factor percentages. This holistic consideration of risk and protective factors was then examined in relation to the longitudinal neurodevelopmental scores for each child.

In exploring both cross-domain and overall cumulative risk and protective factor percentages, I endeavored to describe whether a cross-domain consideration of cumulative risk and protective factors sheds light on the neurodevelopmental profiles of substance-exposed children, relative to a total cumulative risk and cumulative protective factor approach. In qualitatively exploring cross-domain case study descriptions of each child, in addition to quantified cross-domain cumulative risk and cumulative protective factor scores, I endeavored to describe whether a qualitative case study approach aids in understanding the impact of risk and protection on the neurodevelopmental profile of substance-exposed children. Furthermore, the impact of age at entry into the early-intervention program and proportion of lifetime in early-intervention were considered alongside the patterns reported between cumulative risk and protective factors, and child neurodevelopmental outcomes.

RESULTS

Cumulative Risk and Protective Factor Scores

In creating comprehensive, domain-specific, theoretically grounded cumulative and protective factor measures (shown in Appendix A, Tables I and II, respectively), I was able to use these scores to aid in conceptualizing the histories of risk experienced by children in the three target families, both within and across the sibling groups. Additionally, these scores highlighted the protective factors experienced by each child to help promote resilience and healthy development.

Cross-Family Comparison

The cross-domain and total cumulative risk and protective factor percentages for each child in the three sibling groups are outlined in Table 1. An overview of the total cumulative risk and protective factor percentages for each child is shown in Figure 2 to demonstrate the children with the highest and lowest cumulative risk and protection, both within and between the sibling groups. Family B had the highest total cumulative risk percentages, particularly B1 and B2 who had notably higher total percentages compared to B3 and B4. Relative to family B, family A and family C had lower total cumulative risk percentages, with stable total percentages found within and between these two sibling groups. Family B also had the highest total cumulative protection percentages, with stable total percentages within the sibling group. Relative to family B, family A had slightly lower total cumulative protection percentages; however, there was discrepancy within this sibling group, with A2 having a notably higher total percentage relative to A1. Family C had the lowest total cumulative protection percentages, with stable total percentages within the sibling group.

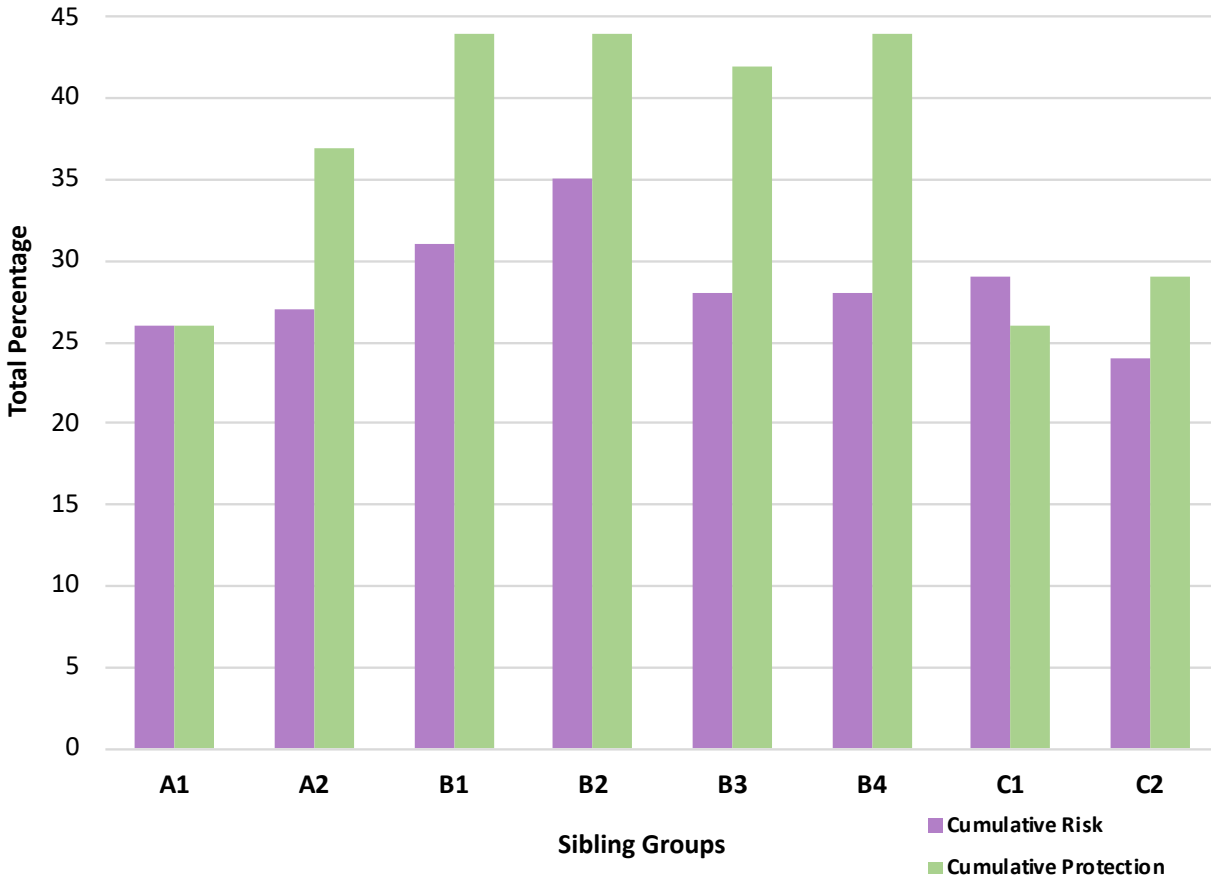
Table 1. **Cross-Family Comparison of Cumulative Risk and Protective Factor Scores**

Domain/Factor	n(%)							
	Family A		Family B				Family C	
	A1	A2	B1	B2	B3	B4	C1	C2
PARENT - MOTHER								
Cumulative Risk (n=20)	11(55)	11(55)	9(45)	9(45)	9(45)	9(45)	8(42)*	8(42)*
Cumulative Protective (n=18)	4(22)	4(22)	11(61)	11(61)	11(61)	11(61)	8(44)	8(44)
PARENT - OTHER								
Cumulative Risk (n=6)	3(50)	4(67)	3(50)	3(50)	3(50)	3(50)	3(50)	3(50)
Cumulative Protective (n=6)	0(0)	0(0)	3(50)	3(50)	3(50)	3(50)	0(0)	0(0)
FAMILY								
Cumulative Risk (n=25)	14(56)	10(40)	8(32)	8(32)	8(32)	8(32)	12(48)	11(44)
Cumulative Protective (n=7)	2(29)	2(29)	1(14)	1(14)	1(14)	1(14)	0(0)	0(0)
PRE-NATAL/PREGNANCY								
Cumulative Risk (n=27)	1(4)	10(37)	8(30)	8(30)	9(33)	9(33)	7(26)	3(11)
Cumulative Protective (n=2)	0(0)	1(50)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)
BIRTH/POST-NATAL								
Cumulative Risk (n=22)	1(5)	4(18)	8(36)	8(36)	2(9)	3(14)	0(0)*	0(0)
Cumulative Protective (n=1)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)
CHILD								
Cumulative Risk (n=31)	5(16)	1(3)	7(23)	10(32)	7(23)	5(16)	9(29)	7(23)
Cumulative Protective (n=8)	4(50)	5(63)	6(75)	6(75)	5(63)	6(75)	4(50)	7(88)
PARENT-CHILD INTERACTION								
Cumulative Risk (n=15)	3(20)	0(0)*	3(20)	6(40)	3(20)	5(33)	2(13)	3(20)
Cumulative Protective (n=15)	4(27)	7(47)*	3(20)	3(20)	3(20)	3(20)	2(13)	1(7)
SOCIAL NETWORK/ PROFESSIONAL CARE/SERVICES								
Cumulative Risk (n=3)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)

Cumulative Protective (n=5)	2(40)	2(40)	3(60)	3(60)	3(60)	3(60)	2(40)	2(40)
TOTAL								
Cumulative Risk (n=149)	38(26)	40(27)*	46(31)	52(35)	41(28)	42(28)	41(29)*	35(24)*
Cumulative Protective (n=62)	16(26)	22(37)*	27(44)	27(44)	26(42)	27(44)	16(26)	18(29)

* Adjusted denominator due to removed unknown factors

Figure 2. **Total Cumulative Risk and Protection Percentage**



Family A

Child A1

A1's completed cumulative risk and cumulative protective factor measures are shown in Appendix A, Tables III and IV, respectively. A1's total and cross-domain percentages are shown in Table 1. A1's cumulative risk scores were the highest in the maternal, other parental figure, and family domains; relative to these domains, A1's cumulative risk scores were slightly lower in the child and parent-child interaction domains. A1's cumulative risk scores were the lowest in the pre-natal/pregnancy, birth/post-natal, and social network domains. A1's cumulative protection scores were the highest in the child and social network/professional domains; relative to these domains, A1's cumulative protection scores were lower in the maternal, family, and parent-child interaction domains. A1's cumulative protection scores were the lowest in the other parental figure, prenatal/pregnancy, and birth/post-natal domains.

Child A2

A2's completed cumulative risk and cumulative protective factor measures are shown in Appendix A, Table V and VI, respectively. A2's total and cross-domain percentages are shown in Table 1. A2's cumulative risk scores were the highest in the maternal, other parental figure, and family domains; relative to these domains, A2's cumulative risk scores were slightly lower in the pre-natal/pregnancy and birth/post-natal risk domains. A2's cumulative risk scores were the lowest in the child, parent-child interaction, and social network domains. A2's cumulative protection scores were the highest in the child and pre-natal/pregnancy domains; relative to these domains, A2's cumulative protection scores were lower in the parent-child interaction, social network/professional care, maternal, and family domains. A2's cumulative protection scores were the lowest in the parental figure and birth/post-natal domains.

Family B

Child B1

B1's completed cumulative risk and cumulative protective factor measures are shown in Appendix A, Tables VII and VIII, respectively. B1's total and cross-domain percentages are shown in Table 1. B1's cumulative risk scores were the highest in the maternal, other parental figure, family, pre-natal/pregnancy, and birth/post-natal domains; relative to these domains, B1's cumulative risk scores were lower in the child and parent-child interaction domains. B1's cumulative risk scores were the lowest in the social network domain. B1's cumulative protection scores were the highest in the child, maternal, other parental figure, and social network/professional care domains; relative to these domains, B1's cumulative protective scores were lower in the family and parent-child interaction domains. B1's cumulative protection scores were the lowest in the pre-natal/pregnancy and birth/post-natal domains.

Child B2

B2's completed cumulative risk and cumulative protective factor measures are shown in Appendix A, Tables IX and X, respectively. B2's total and cross-domain percentages are shown in Table 1. B2's cumulative risk scores were the highest in the maternal, other parental figure, and parent-child interaction domains; relative to these domains, B2's cumulative risk scores were lower in the pre-natal/pregnancy, birth/post-natal, child, and family domains. B2's cumulative risk score was the lowest in the social network domain. B2's cumulative protection scores were the highest in the child, maternal, other parental figure, and social network/professional care domains; relative to these domains, B2's cumulative protection scores were lower in the family and parent-child interaction domains. B2's cumulative protection scores were the lowest in the pre-natal/pregnancy and birth/post-natal domains.

Child B3

B3's completed cumulative risk and cumulative protective factor measures are shown in Appendix A, Tables XI and XII, respectively. B3's total and cross-domain percentages are shown in Table 1. B3's cumulative risk scores were the highest in the maternal and other parental figure domains; relative to these domains, B3's cumulative risk scores were lower in the family, pre-natal/pregnancy, child, and parent-child interaction domains. B3's cumulative risk scores were the lowest in the birth/post-natal and social network domains. B3's cumulative protection scores were the highest in the maternal, other parental figure, child, and social network/professional care domains; relative to these domains, B3's cumulative protection scores were lower in the family and parent-child interaction domains. B3's cumulative protection scores were the lowest in the pre-natal/pregnancy and birth/post-natal domains.

Child B4

B4's completed cumulative risk and cumulative protective factor measures are shown in Appendix A, Tables XIII and XIV, respectively. B4's total and cross-domain percentages are shown in Table 1. B4's cumulative risk scores were the highest in the maternal and other parental figure domains; relative to these domains, B4's cumulative risk scores were lower in the family, pre-natal/pregnancy, and parent-child interaction domains. B4's cumulative risk scores were the lowest in the child, birth/post-natal and social network domains. B4's cumulative protection scores were the highest in the maternal, other parental figure, child, and social network/professional care domains; relative to these domains, B4's cumulative protection scores were lower in the family and parent-child interaction domains. B4's cumulative protection scores were the lowest in the pre-natal/pregnancy and birth/post-natal domains.

Family C

Child C1

C1's completed cumulative risk and cumulative protective factor measures are shown in Appendix A, Tables XV and XVI, respectively. C1's total and cross-domain percentages are shown in Table 1. C1's cumulative risk scores were the highest in the maternal, other parental figure, and family domains; relative to these domains, C1's cumulative risk scores were lower in the pre-natal/pregnancy, child, and parent-child interaction domains. C1's cumulative risk scores were the lowest in the birth/post-natal and social network domains. C1's cumulative protection scores were the highest in the mother, child, and social network/professional care domains; relative to these domains, C1's cumulative protection score was slightly lower in the parent-child interaction domain. C1's cumulative protection scores were the lowest in the other parental figure, family, pre-natal/pregnancy, and birth/post-natal domains.

Child C2

C2's completed cumulative risk and cumulative protective factor measures are shown in Appendix A, Tables XVII and XVIII, respectively. C2's total and cross-domain percentages are shown in Table 1. C2's cumulative risk scores were the highest in the maternal, other parental figure, and family domains; relative to these domains, C2's cumulative risk scores were lower in the child, parent-child interaction, and pre-natal/pregnancy domains. C2's cumulative risk scores were the lowest in the birth/post-natal and social network domains. C2's cumulative protection score was the highest in the child domain; relative to these domains, C2's cumulative protection scores were lower in the mother and social network/professional care domains. C2's cumulative protection scores were the lowest in the parent-child interaction, other parental figure, family, pre-natal/pregnancy, and birth/post-natal domains.

Neurodevelopmental Profiles

To quantitatively capture the neurodevelopmental profile of the children in this study, developmental assessment measures spanning various domains of functioning were examined. Social-emotional concerns (CBCL, ITSEA), in addition to cognitive functioning (BAYLEY-III, WPPSI-IV), were explored for each child in the three sibling groups across their time receiving services at BTC. Emotional and behavioural functioning was assessed on the CBCL using parent/caregiver and teacher/daycare report on the Teacher Report Form (TRF); notably, different teachers/daycare workers provided ratings at each time period. Performance was compared to the performance of other individuals of the same age using the measure-specific classification schemes shown in Table 2 for the ITSEA, CBCL, BAYLEY-III, and WPPSI-IV (Achenbach, 2000; Bayley, 2006; Carter & Briggs-Gowan, 2005; Wechsler, 2012). T-scores or percentile ranks were used to describe each child's performance relative to age-matched population norms.

Table 2. **Neurodevelopmental Assessment Measures Classification Schemes**

ITSEA Classification Scheme	
Domains	
Classification	**Range of T-Scores**
Of-Concern	≥ 63
Normal	< 63

CBCL Classification Scheme			
Syndrome Scales **DSM-Oriented Scales**		**Behavioural Concerns**	
Classification	**Range of T-scores**	**Classification**	**Range of T-scores**
Clinical	≥70	Clinical	≥64
Borderline Clinical	65 – 69	Borderline Clinical	60 – 63
Normal	<65	Normal	<60

BAYLEY-III Classification Scheme **WPPSI-IV Classification Scheme**	
Full-Scale IQ	
Domains	
Classification	**Range of Percentiles**
Very Superior	≥98th percentile
Superior	92nd – 97th percentile
High Average	76th – 91st percentile
Average	25th – 75th percentile
Low Average	9th – 24th percentile
Impaired	≤8th percentile

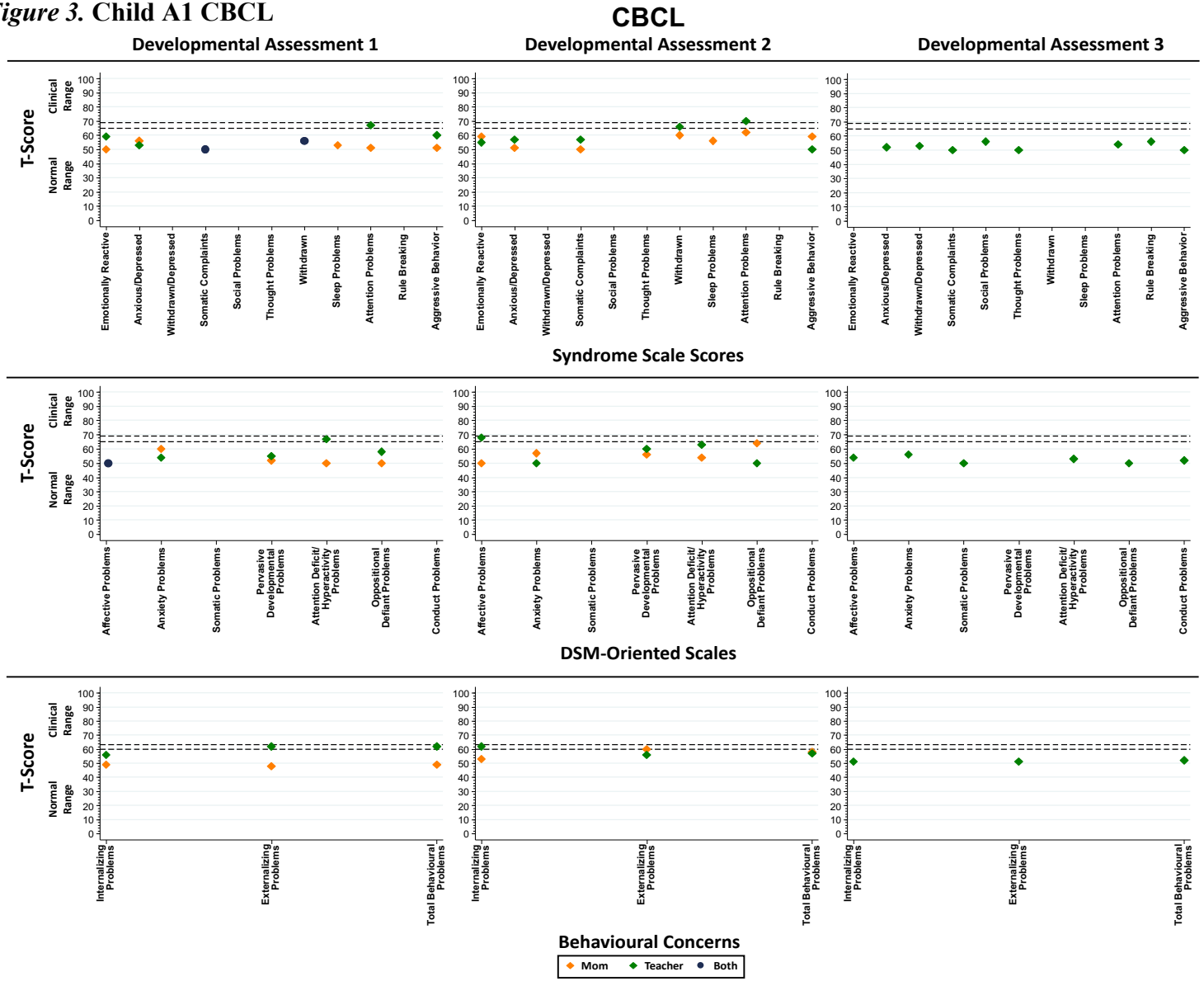
Family A

Child A1

A1 participated in three developmental assessments during his/her[1] time at BTC. The CBCL was completed by A1's mother at the first and second assessments (Achenbach, 2000). A1's teachers completed the TRF at all three assessments (Achenbach, 2000). A1's scores on the CBCL across all three assessments are shown in Figure 3, with all raters at a given time point included in the figure and designated by different colours. From the first assessment to the second assessment, A1's parental ratings demonstrated a slight increase in concerns, while A1's teachers' ratings demonstrated heightened concerns and notably more concerns in the classroom relative to at home at the first and second assessment. From the second assessment to the third assessment, although A1's parental ratings were not collected, B1's teacher's ratings demonstrated a marked decrease in concern.

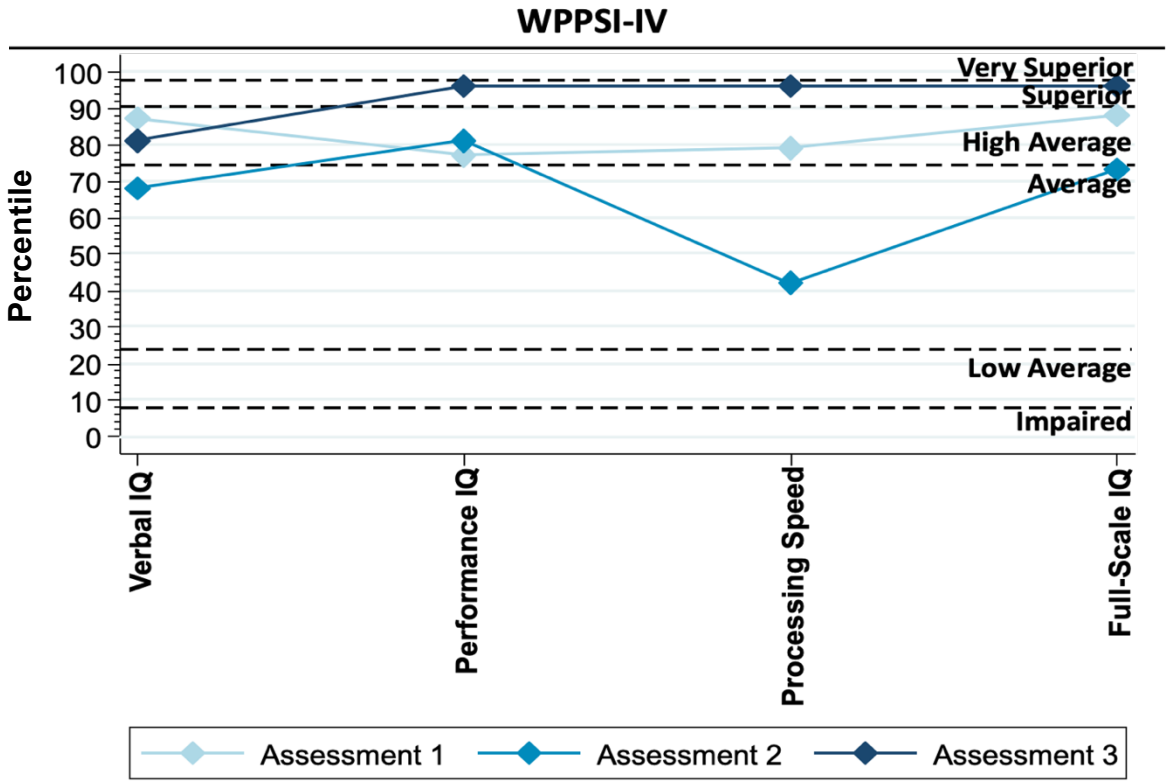
[1] The sex of the children will not be revealed to protect confidentiality

Figure 3. **Child A1 CBCL**



Cognitive testing was completed for A1 at all three assessments, with the WPPSI-IV administered at each assessment (Wechsler, 2012). A1's cognitive functioning across the three assessments is shown in Figure 4. Overall, A1 showed a slight decline in cognitive functioning between assessment one and two; however, A1 showed substantial gains in intellectual functioning by the end of involvement in the program at the third assessment, performing above age-expected norms.

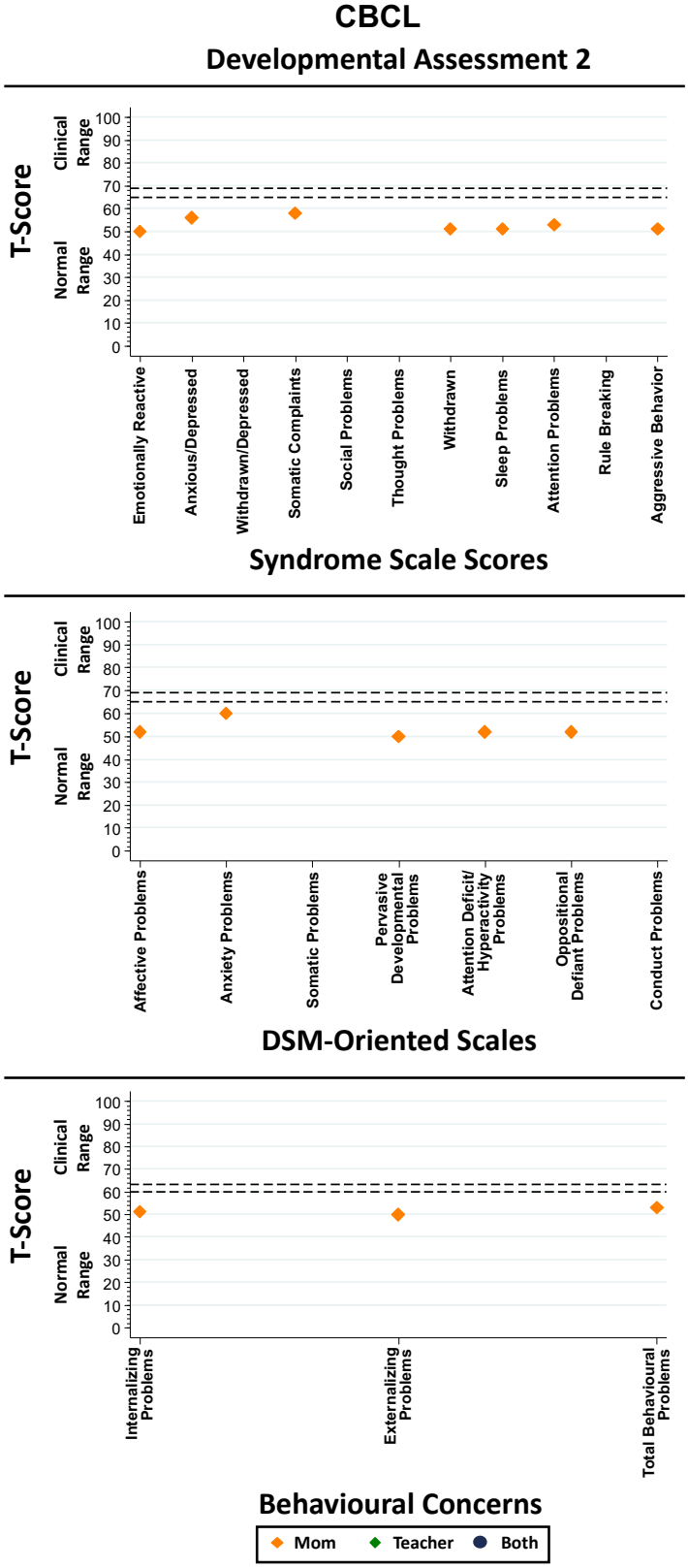
Figure 4. **Child A1 WPPSI-IV**



Child A2

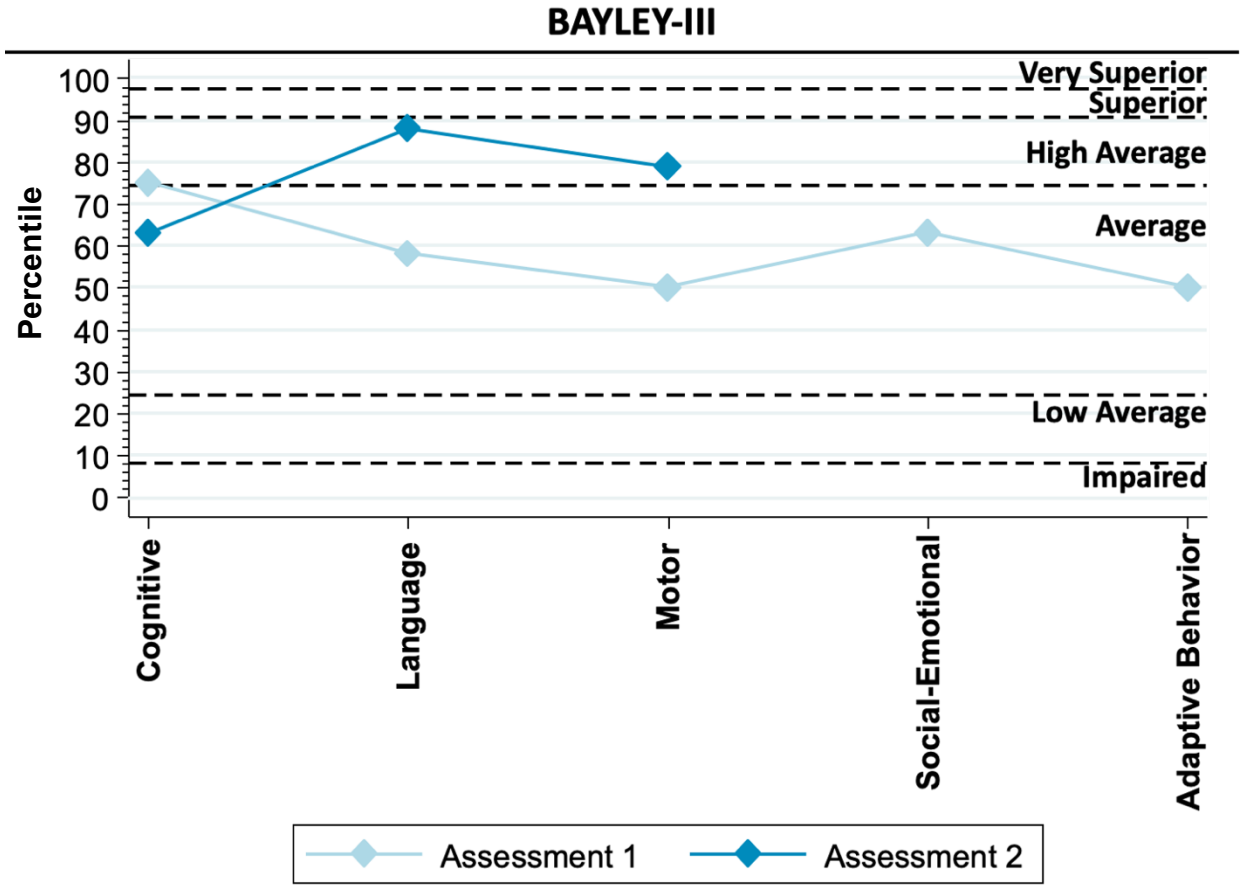
A2 had two developmental assessments during his/her time at BTC. The CBCL was administered during the second assessment only, with A2's mother's ratings (Achenbach, 2000). A2's scores on the CBCL at the second assessment are shown in Figure 5. Overall, A2's parental ratings demonstrated age-appropriate development at this time point.

Figure 5. **Child A2 CBCL**



Cognitive testing was completed for A2 at both assessments, with the BAYLEY-III administered at each assessment (Bayley, 2006). A2's cognitive functioning across the two assessments is shown in Figure 6. Overall, A2 demonstrated gains in intellectual functioning across the two assessment time points, performing consistently with age-expected norms.

Figure 6. **Child A2 BAYLEY-III**

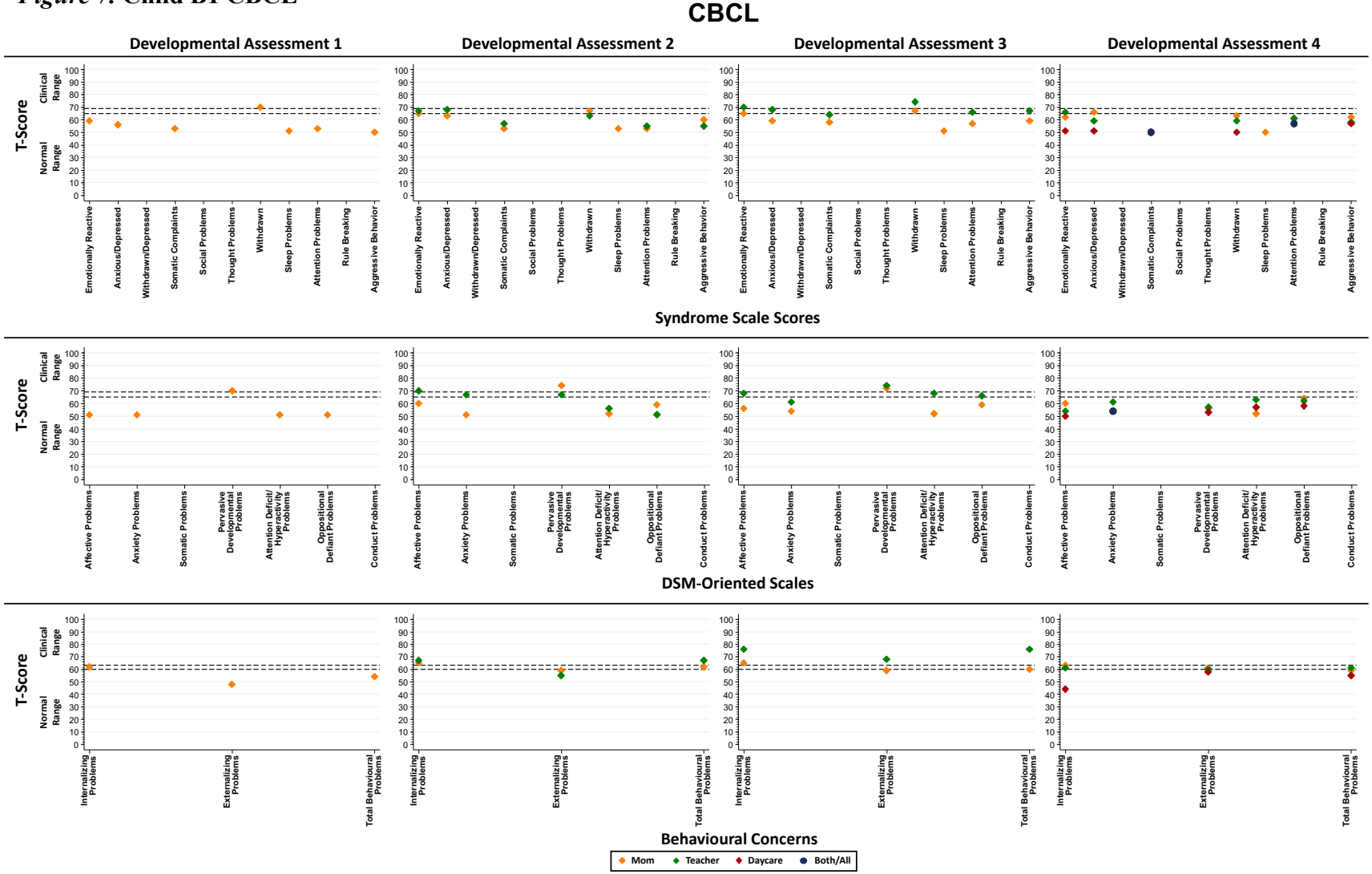


Family B

Child B1

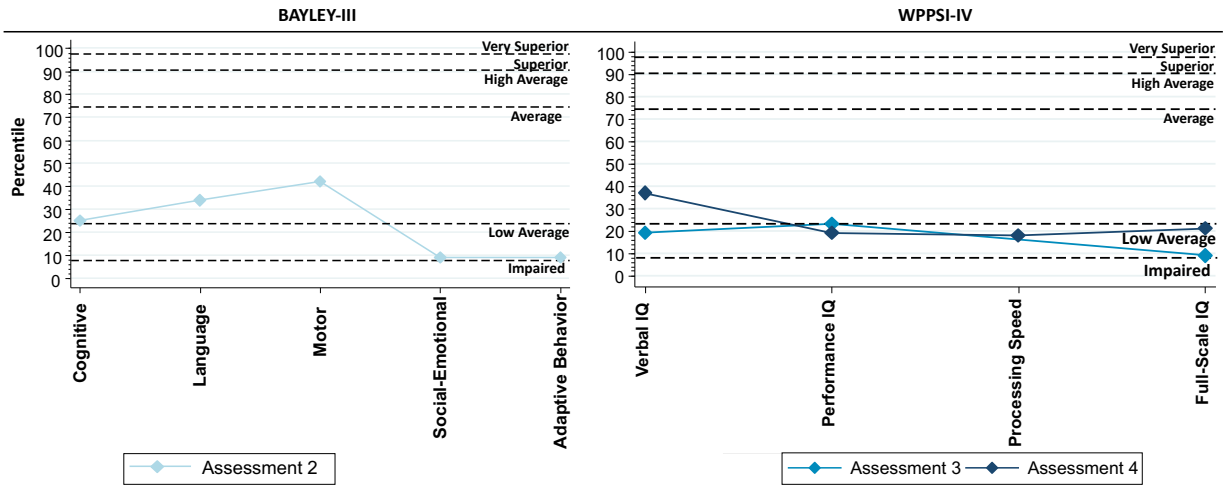
B1 participated in four developmental assessments during his/her time at BTC. The CBCL was completed by B1's mother at all four assessments (Achenbach, 2000). B1's teachers completed the TRF at the second, third, and fourth assessments; a daycare provider also completed a TRF at the fourth assessment (Achenbach, 2000). B1's scores on the CBCL across all four assessments are shown in Figure 7, with all raters at a given time point included in the figure and designated by different colours. From the first assessment to the second assessment, B1's parental ratings demonstrated heightened concerns. B1's teacher's ratings indicated more concerns in the classroom relative to at home at the second assessment specifically. From the second assessment to the third assessment, although B1's parental ratings did not change, B1 was showing markedly increased concerns in the classroom. From the third assessment to the fourth assessment, B1's parental and teacher ratings demonstrated marked decreases in concern. Notably, B1 was rated to be performing more effectively in the daycare setting relative to home or school. Overall, across B1's time at BTC, B1 was initially rated as having increasingly problematic behavioural and emotional problems; however, B1 showed notable improvements by the end of involvement in the program.

Figure 7. **Child B1 CBCL**



Cognitive testing was completed for B1 at the second, third, and fourth assessments. At the second assessment, the BAYLEY-III was administered given B1's perceived delays; the WPPSI-IV was administered for the third and fourth assessments (Bayley, 2006; Wechsler, 2012). B1's cognitive functioning across the second, third, and fourth assessments is shown in Figure 8. B1 had notably lower scores on the social-emotional and adaptive behaviour measures relative to the other domains on the BAYLEY-III at the second assessment. Overall, B1 showed an initial decline in cognitive functioning between assessment two and three. B1 showed minor improvements by the end of involvement in the program at the fourth assessment.

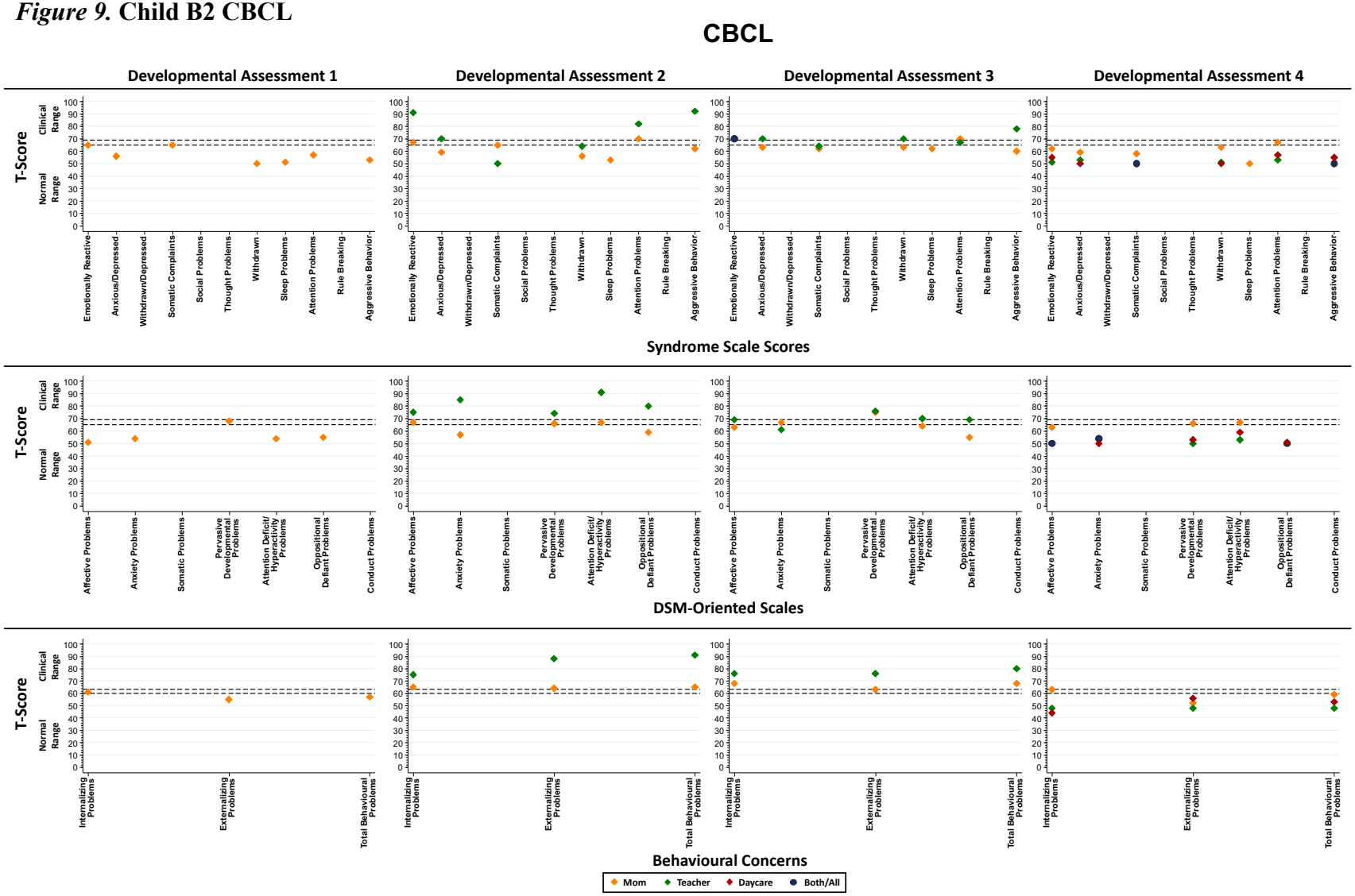
Figure 8. **Child B1 BAYLEY-III & WPPSI-IV**



Child B2

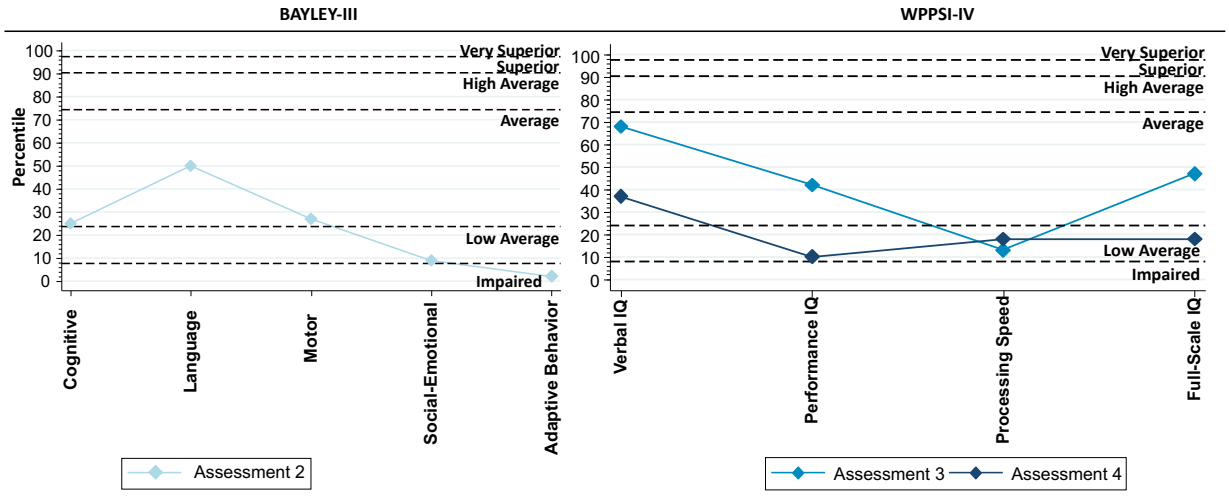
B2 participated in four developmental assessments during his/her time at BTC. The CBCL was completed by B2's mother at all four assessments (Achenbach, 2000). B2's teachers completed the TRF at the second, third, and fourth assessments; a daycare provider also completed a TRF at the fourth assessment (Achenbach, 2000). B2's scores on the CBCL across all four assessments are shown in Figure 9, with all raters at a given time point included in the figure and designated by different colours. From the first assessment to the second assessment, B2's parental ratings demonstrated heightened concerns, while B2's teacher reported very substantial concerns in the classroom relative to at home at the second assessment specifically. From the second assessment to the third assessment, B2's parental ratings demonstrated heightened concerns, and B2 demonstrated minimal improvements within the classroom. From the third to the fourth assessment, B2's parental ratings and teacher ratings demonstrated marked decreases in concern. Notably, B2 was rated to be performing more effectively in the daycare setting relative to home or school. Overall, across B2's time at BTC, B2 demonstrated an initial increase in problematic behavioural and emotional concerns; however, B2 showed notable improvements by the end of involvement in the program.

Figure 9. **Child B2 CBCL**



Cognitive testing was completed for B2 at the second, third and fourth assessments. At the second assessment, the BAYLEY-III was administered given B2's perceived delays; the WPPSI-IV was administered for the third and fourth assessments (Bayley, 2006; Wechsler, 2012). B2's cognitive functioning across the second to fourth assessments are shown in Figure 10. Overall, B2 showed an initial increase in cognitive functioning between assessment two and three. B2 showed minor declines by the end of involvement in the program at the fourth assessment; however, given the discrepancy between B2's verbal and non-verbal performance, B2's Full-Scale IQ at this time point was not considered to be a valid score.

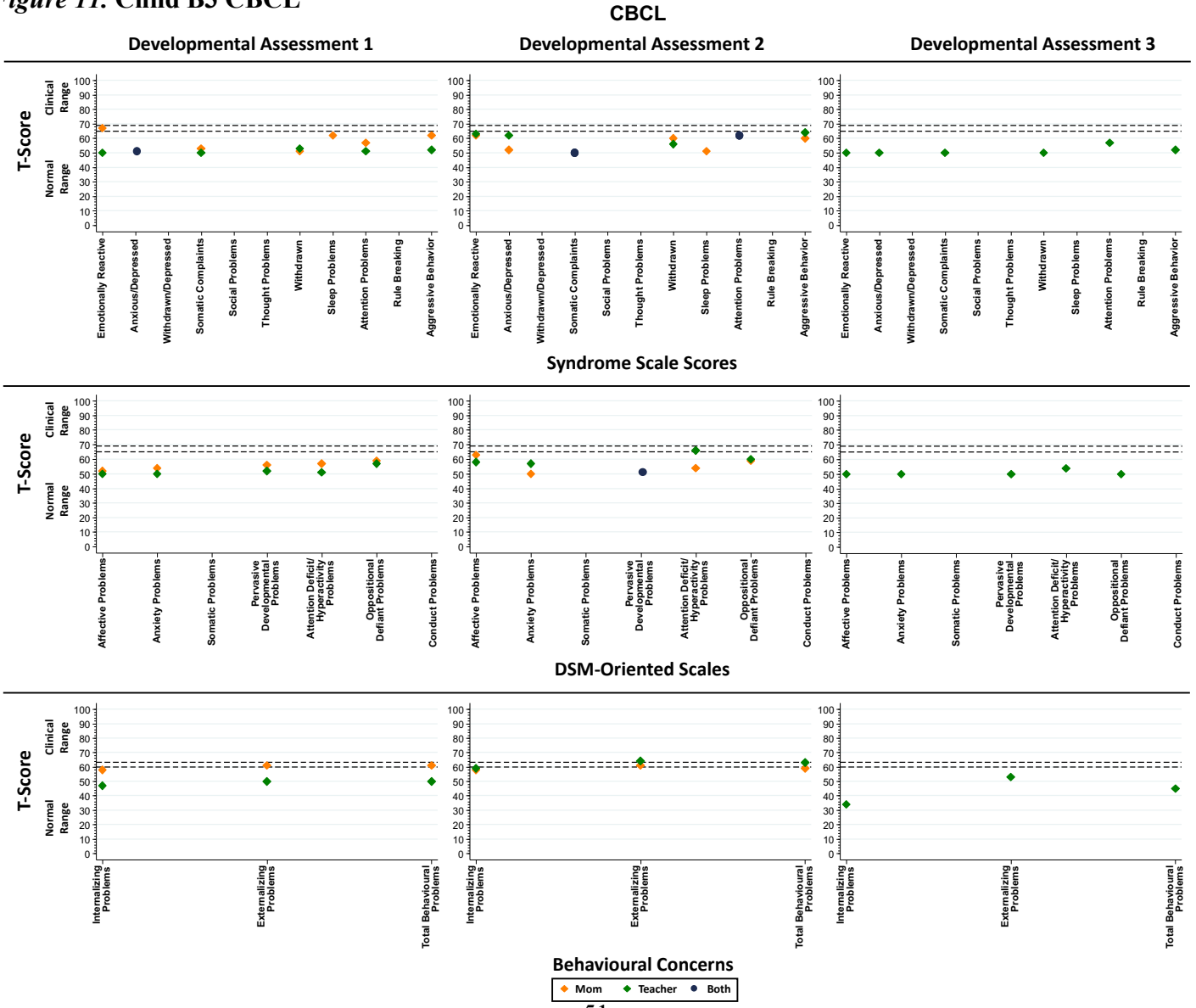
Figure 10. **Child B2 BAYLEY-III & WPPSI-IV**



Child B3

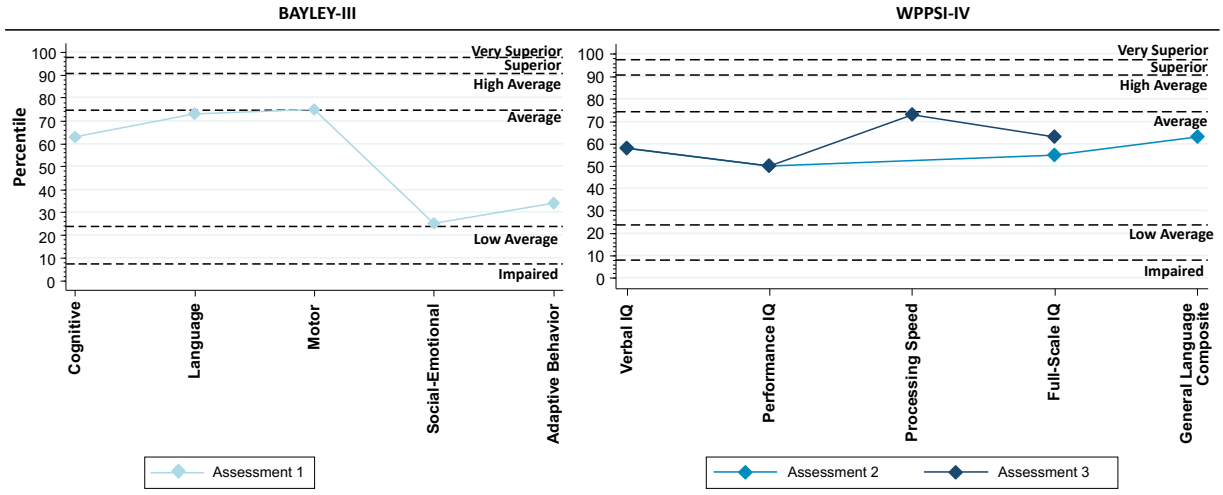
B3 participated in three developmental assessments during his/her time at BTC. The CBCL was completed by B3's mother at the first and second assessments (Achenbach, 2000). B3's teachers completed the TRF at all three assessments (Achenbach, 2000). B3's scores on the CBCL across all three assessments are shown in Figure 11, with all raters at a given time point included in the figure and designated by different colours. From the first to the second assessment, B3's parental ratings demonstrated a decrease in concerns, while B3's teachers ratings indicated an increased level of concern in the classroom. From the second assessment to the third assessment, B3's teachers reported notable improvements in B3's presentation in the classroom. Overall, across B3's time at BTC, B3 demonstrated minor increases in problematic behavioural and emotional concerns at school initially; however, showed notable improvements by the end of involvement in the program. B3's problematic behavioural and emotional concerns at home remained minimal and decreased over the time accessing services at BTC.

Figure 11. **Child B3 CBCL**



Cognitive testing was completed for B3 at all three assessments. At the first assessment, the BAYLEY-III was administered; the WPPSI-IV was administered for the second and third assessments (Bayley, 2006; Wechsler, 2012). B3's cognitive functioning across the three assessments is shown in Figure 12. Overall, B3 showed age-appropriate cognitive functioning which remained stable across all three assessments, despite having notably lower scores on the social-emotional and adaptive behaviour measures on the BAYLEY-III at the first assessment.

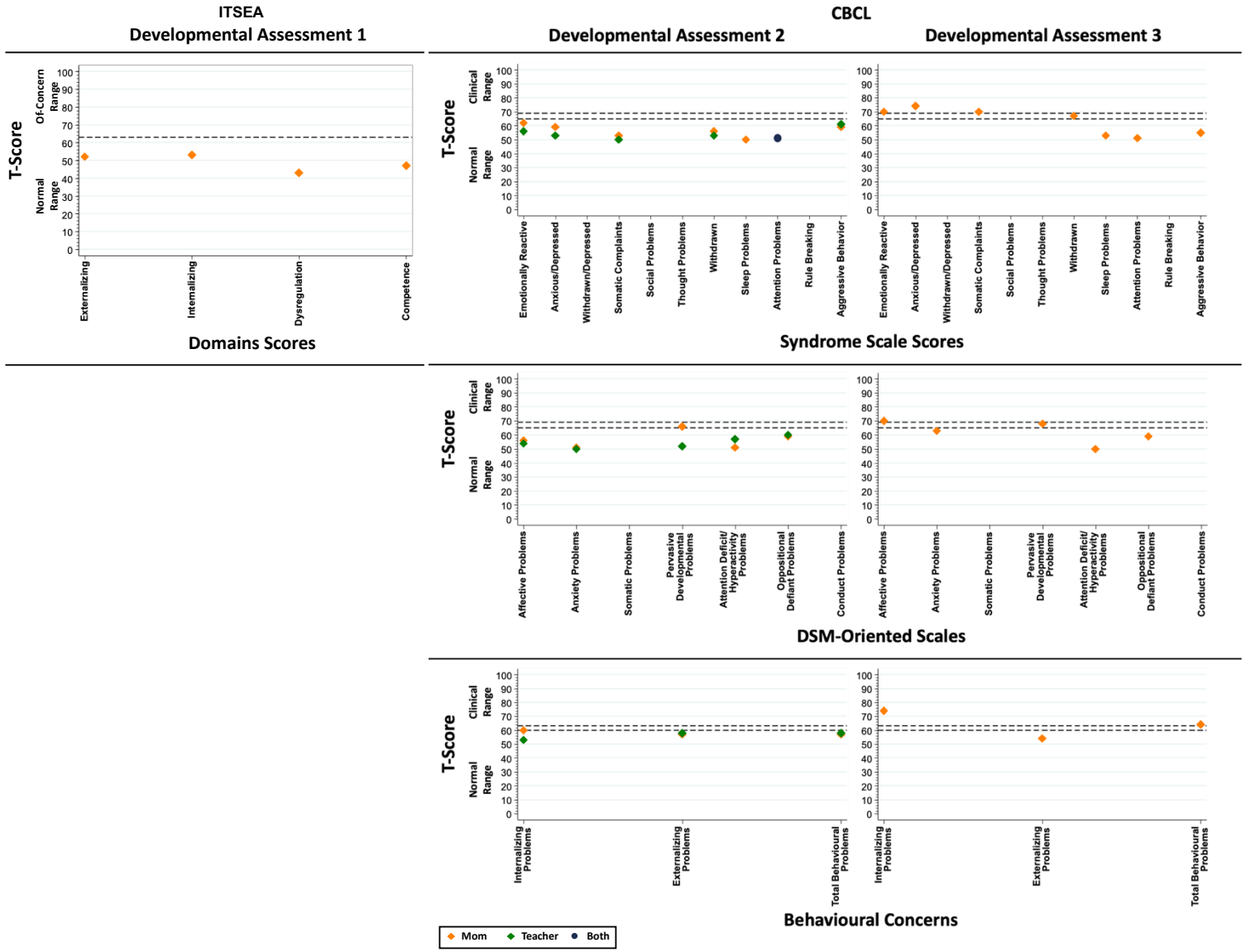
Figure 12. **Child B3 BAYLEY-III & WPPSI-IV**



Child B4

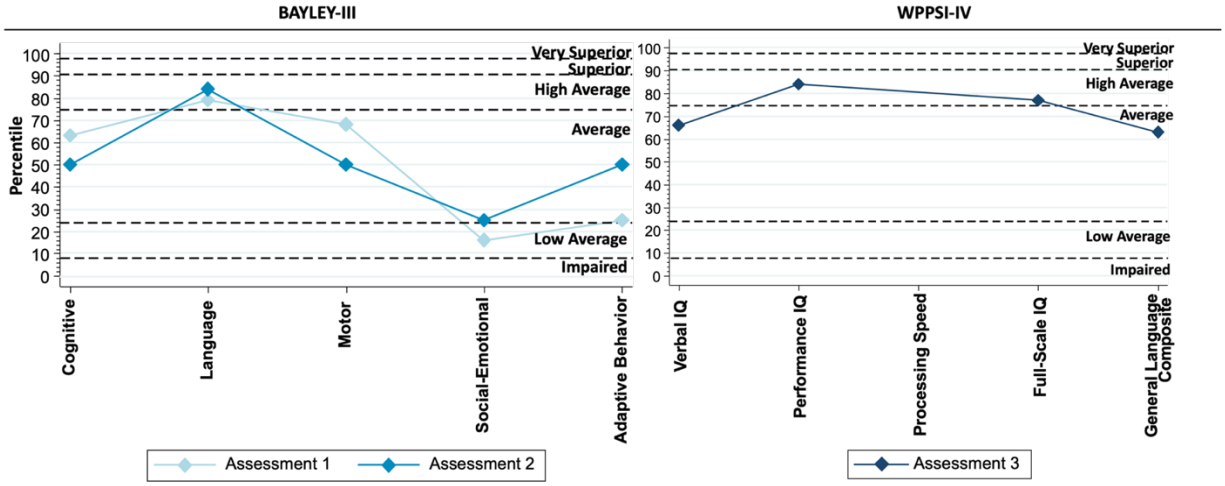
B4 participated in three developmental assessments during his/her time at BTC. The ITSEA was completed by B4's mother at the first assessment (Carter & Briggs-Gowan, 2005). The CBCL was completed by B4's mother at the second and third assessments (Achenbach, 2000). B4's teacher only completed the TRF at the second assessment (Achenbach, 2000). B4's scores on the ITSEA and the CBCL across all three assessments are shown in Figure 13, with all raters at a given time point included in the figure and designated by different colours. From the first assessment to the second assessment, B4's parental ratings demonstrated a slight increase in concerns at home, while B4's teacher's ratings at the second assessment suggested less concerns within the classroom relative to at home. From the second assessment to the third assessment, B4's parental ratings demonstrated a substantial increase in concerns at home. Overall, across B4's time at BTC, B4 demonstrated gradual increases in problematic behavioural and emotional concerns at home, while concerns at school were minimal.

Figure 13. **Child B4 ITSEA & CBCL**



Cognitive testing was completed for B4 at all three assessments. At the first and second assessments, the BAYLEY-III was administered; the WPPSI-IV was administered for the third assessment (Bayley, 2006; Wechsler, 2012). B4's cognitive functioning across the three assessments is shown in Figure 14. B4 showed age-appropriate cognitive functioning that remained stable across the first two assessments, despite having notably lower scores on the social-emotional and adaptive behaviour measures on the BAYLEY-III at these times. From the second assessment to the third assessment, B4 showed minor cognitive improvements, performing at an age-appropriate level.

Figure 14. **Child B4 BAYLEY-III & WPPSI-IV**

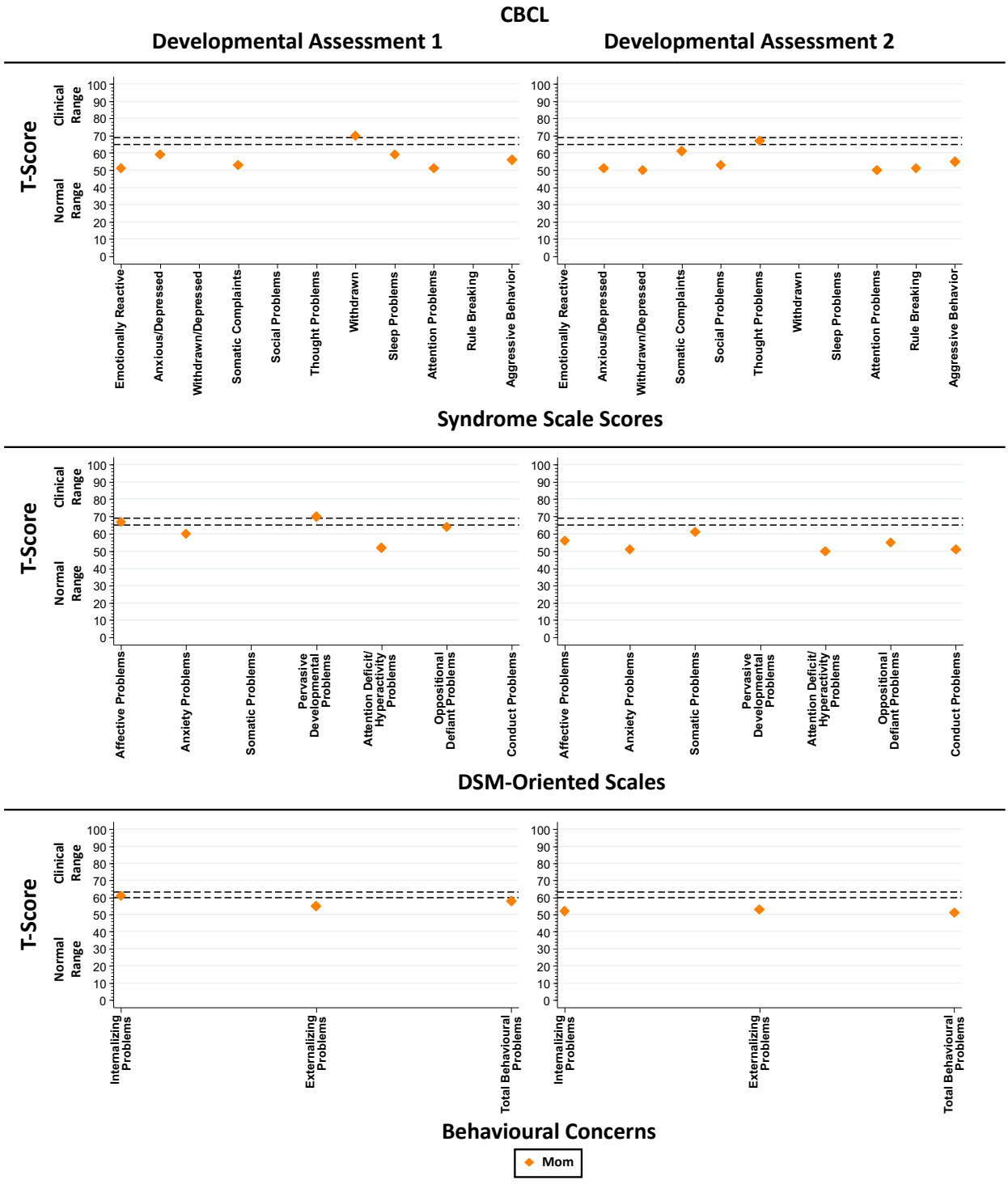


Family C

Child C1

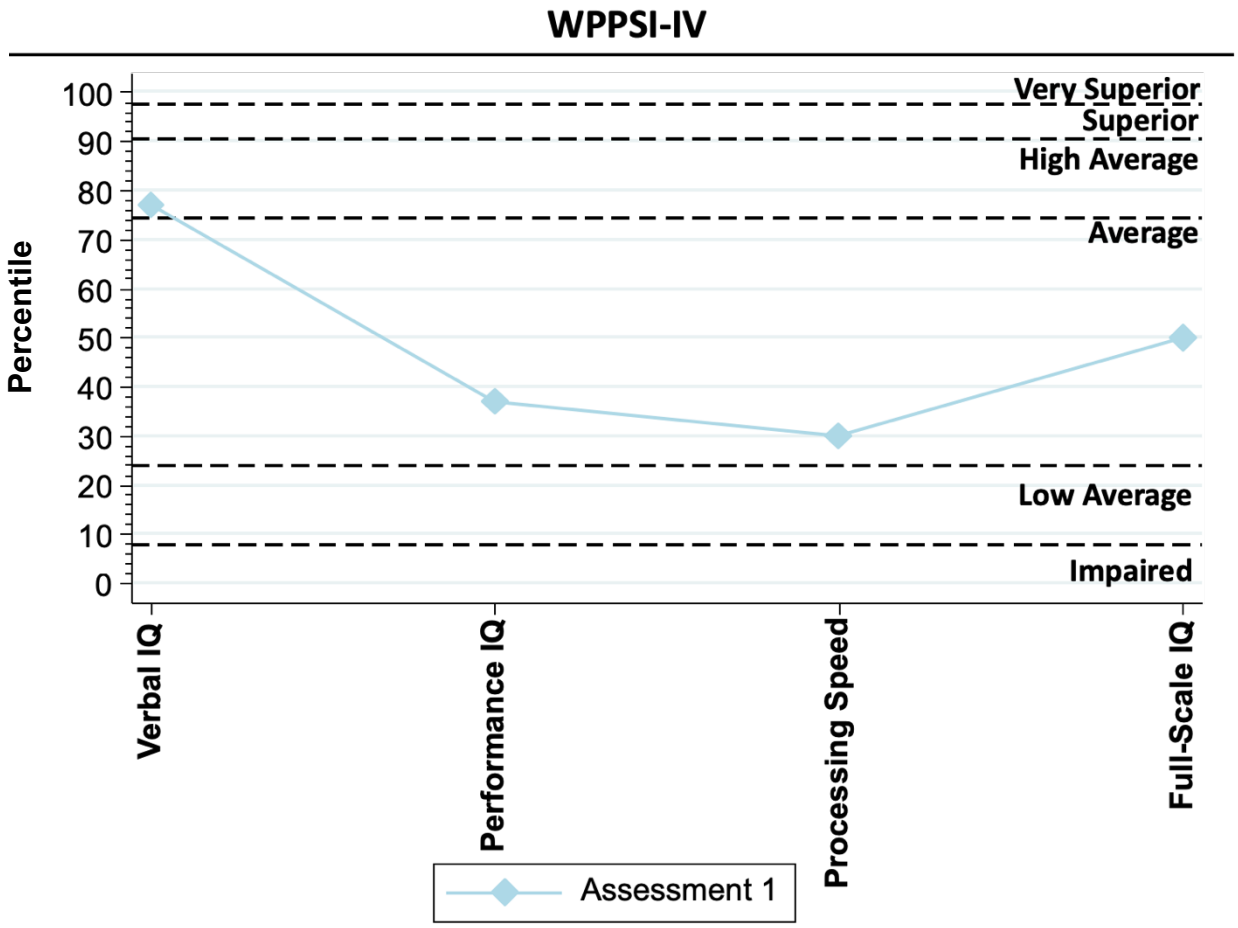
C1 participated in two developmental assessments during his/her time at BTC. The CBCL was completed by C1's mother at both assessments (Achenbach, 2000). C1's scores on the CBCL across both assessments are shown in Figure 15. Overall, across C1's time at BTC, C1 demonstrated minimal behavioural and emotional concerns at home, with C1's parental ratings showing a slight decrease in concerns between assessment one and assessment two..

Figure 15. **Child C1 CBCL**



Cognitive testing was completed for C1 at the first assessment, at which time the WPPSI-IV was administered (Wechsler, 2012). C1's cognitive functioning at assessment one is shown in Figure 16. Overall, C1's cognitive functioning was age-appropriate at this time point.

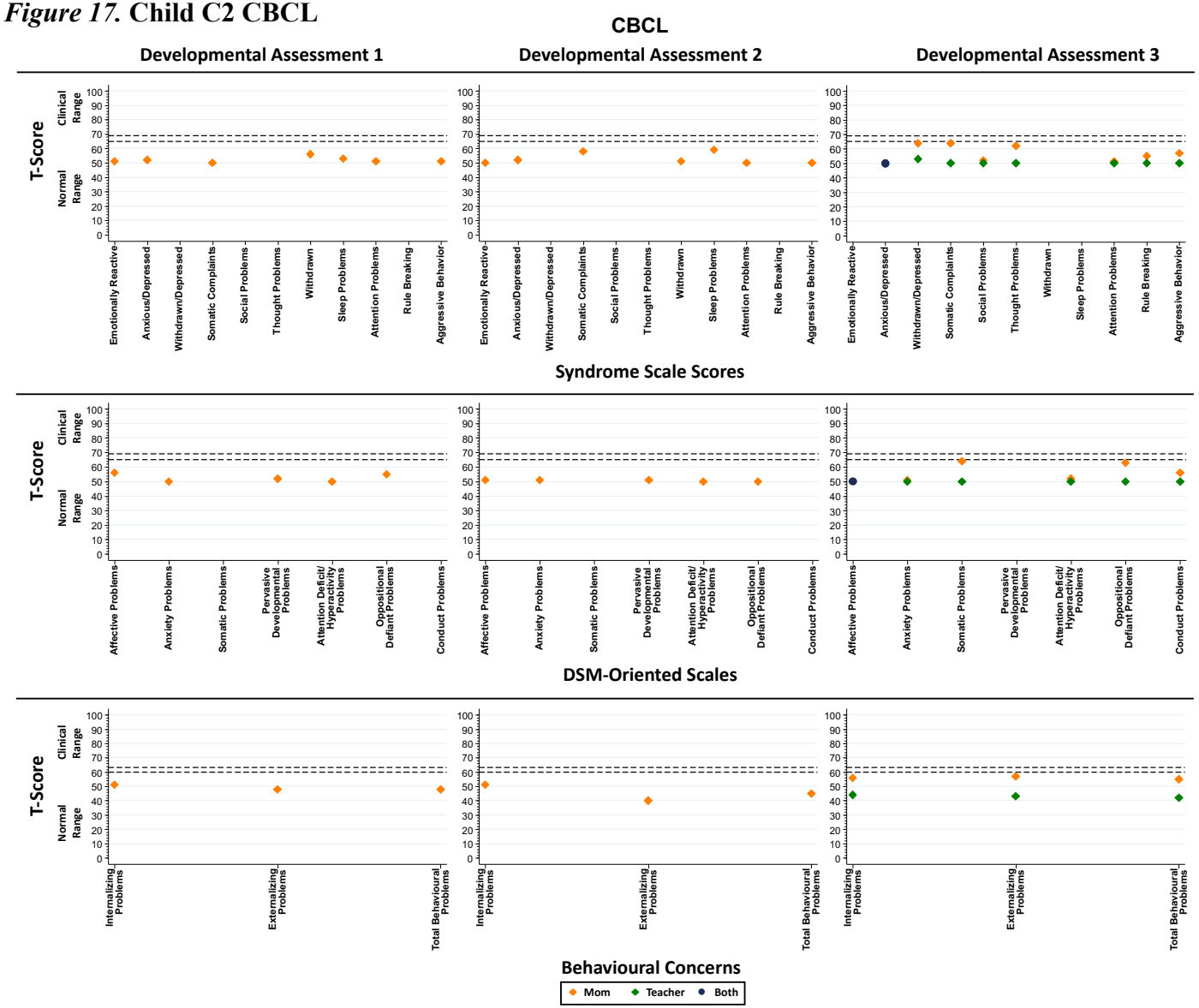
Figure 16. **Child C1 WPPSI-IV**



Child C2

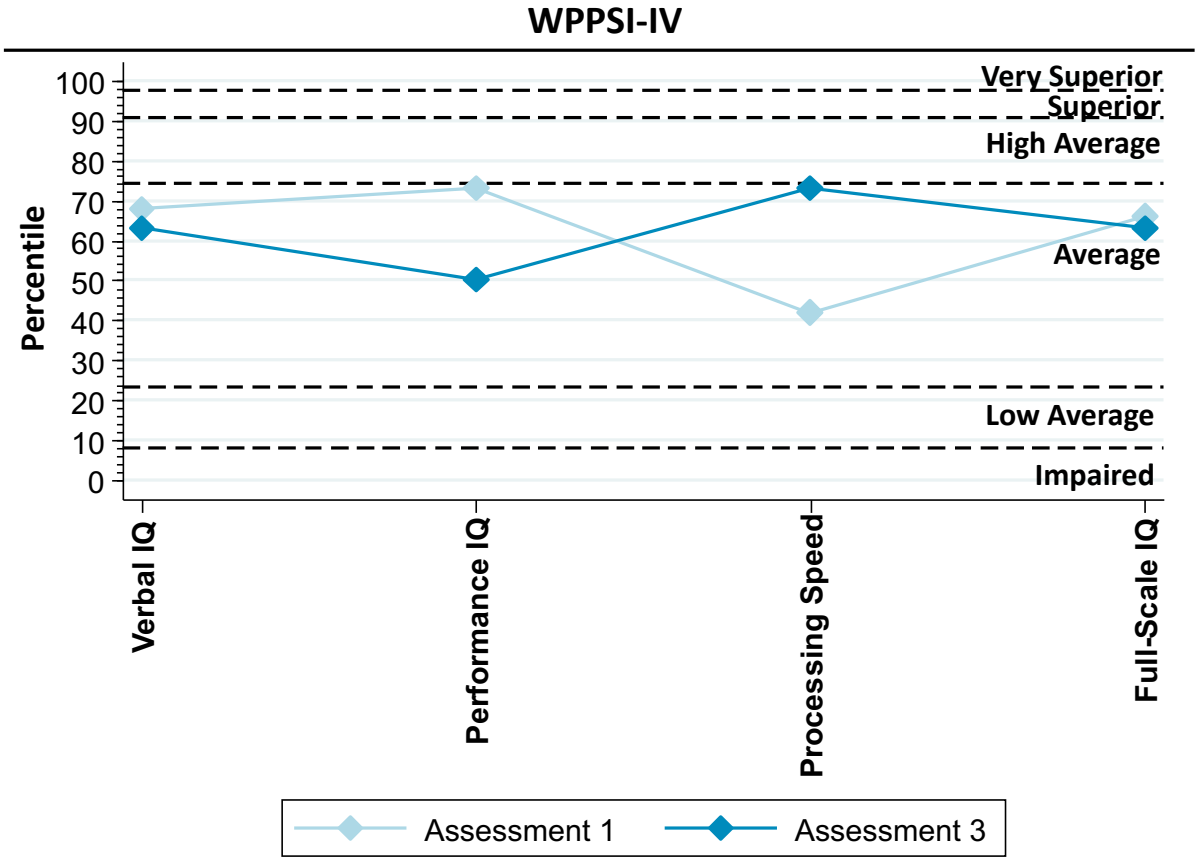
C2 participated in three developmental assessments during his/her time at BTC. The CBCL was completed by C2's mother at all three assessments (Achenbach, 2000). C2's teacher only completed the TRF at the third assessment (Achenbach, 2000). C2's scores on the CBCL across all three assessments are shown in Figure 17, with all raters at a given time point included in the figure and designated by different colours. From the first assessment to the second assessment, C2's parental ratings remained stable, showing no notable concerns. From the second to the third assessment, C2's parental ratings demonstrated a slight increase in concern, whereas C2's teacher's ratings at the third assessment indicated no notable concerns within the classroom. Overall, across involvement at BTC, C2 was rated as showing a slight increase in problematic behavioural and emotional concerns at home, although no notable concerns were reported at school. Upon qualitatively reviewing C2's clinical file, clinicians reported that C2 demonstrated neurodevelopmental concerns around deprivation, lack of safety, loss and separation, and a high attunement to the needs of others.

Figure 17. **Child C2 CBCL**



Cognitive testing was completed for C2 at the first and third assessments, at which times the WPPSI-IV was administered (Wechsler, 2012). C2's cognitive functioning at these assessments is shown in Figure 18. Overall, C2 showed age-appropriate cognitive functioning that remained relatively stable between the first and third assessments.

Figure 18. **Child C2 WPPSI-IV**



Case Study Investigations

The qualitative case study description of each child's life experiences was framed according to the same domains outlined in the theoretical model (Figure 1; Hosman et al., 2009). The theoretical model was adapted to be specific for this sample of children for the purpose of these case study investigations, shown in Figure 19. Risk and protective factors were described in each domain, and overall neurodevelopment was also described qualitatively.

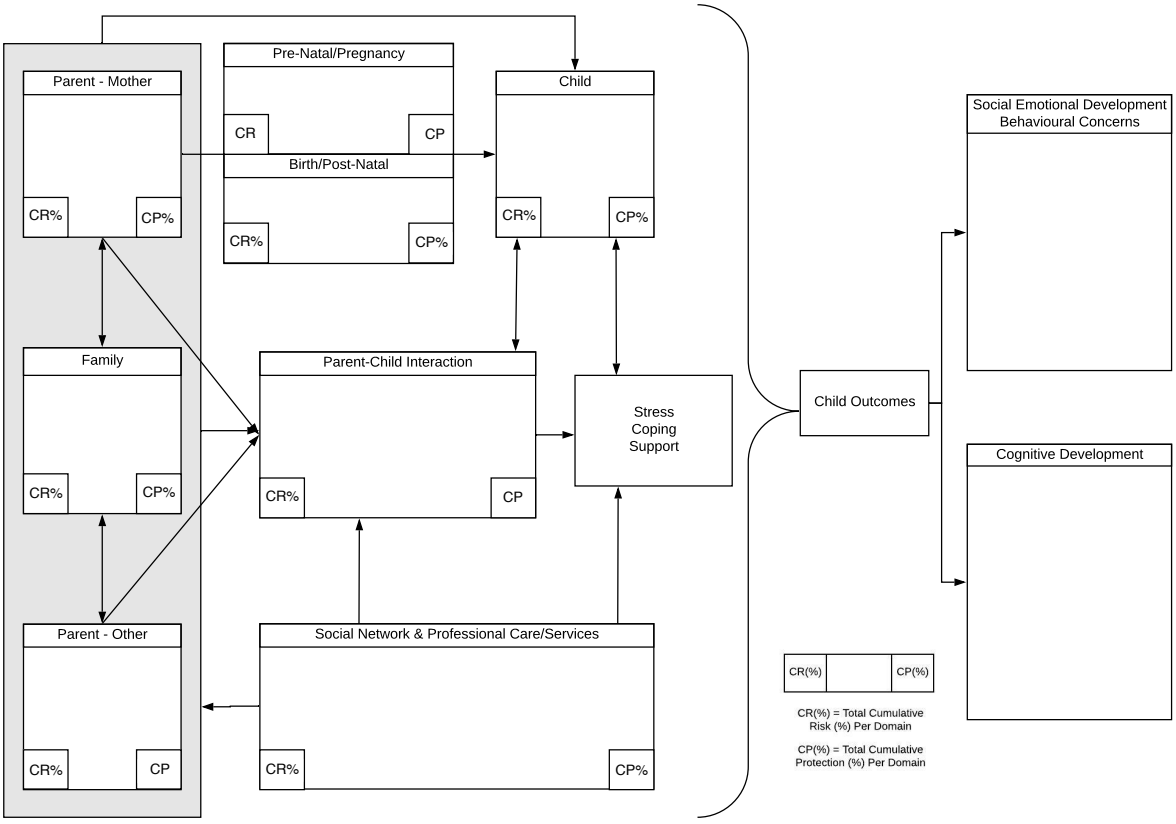


Figure 19. **Adapted Theoretical Model.** Adapted from "Prevention of Emotional Problems and Psychiatric Risks in Children of Parents with a Mental Illness in the Netherlands. I. The Scientific Basis to a Comprehensive Approach," by C. M. H. Hosman, K. T. M van Doesum, F. Santvoort, 2009, Australian e-Journal for the Advancement of Mental Health, 8(3), 250-63. Copyright 2009 by the Taylor and Francis Group. Adapted with permission.

Family A

Family A's mother was very young at the time of A1's birth and had a normal pregnancy with no prenatal substance exposure, followed by a healthy birth. For the first two years of A1's life A1 lived at home with his/her family, A1's mother and father, who had a very unhealthy relationship characterized by conflict and domestic violence. Family A's mother began using substances after the birth of A1 due to the stress and pressure within her parenting role and intimate relationship. Family A's father also used substances. At the age of two, A1 was apprehended from the home by child protective services because of parental substance misuse and placed into kinship care with the maternal grandparents for one year. In between the birth of A1 and A2, family A's mother terminated a pregnancy with twins which caused her much emotional distress and heightened her substance misuse. After the removal of A1 from the home and after the pregnancy termination, she became pregnant with A2. The relationship between family A's mother and father continued to be characterized by substance use and interpersonal violence throughout the pregnancy. After a domestic violence incident late in the pregnancy, family A's mother decided to leave the relationship and move in with her parents, who were currently caring for A1. At this time A2 was born with drug withdrawal and required post-natal interventions given that A2 had prenatal polysubstance exposure across all three trimesters. At this time, A2's mother was involved with BTC's Pregnancy Outreach Program. Across her substance use recovery at BTC, family A's mother continued to struggle with methadone misuse.

Family A's mother continued to maintain boundaries with her ex-partner after their separation, during which time he was incarcerated several times. Although family A's mother and A1 and A2 had extended family supports in the form of maternal grandparents, there was much family conflict within the home and problematic alcohol use by the grandfather. There was

also a family history of mental illness; family A's mother struggled with anxious and depressive symptoms. Given A1's time in kinship care, A1 perceived his/her grandparents to be the primary caregivers rather than A1's mother, which led to a challenging parent-child relationship between A1 and family A's mother that was characterized by struggles with limit setting, praise, and the allocation of quality time. However, A2 and his/her mother had a very close relationship and she found it easier to engage with and care for A2. A1 and A2 were both reported to have easy temperaments. A1 was diagnosed with Attention Deficit Hyperactivity Disorder – Combined Type and exhibited social-emotional and behavioural challenges at home. These problematic behaviours were not reported at school or at BTC, but were specific to the relationships between A1 and his/her caregivers. A1 demonstrated strong cognitive abilities. A2 showed no social-emotional or behavioural concerns and demonstrated average cognitive abilities. A2 had some early expressive language concerns that resolved over time. Both A1 and A2 accessed speech and language supports and psychological assessments. Their mother attended various support groups at BTC, including the Connections program that addresses interpersonal violence and childhood maltreatment, as well as the Mother Goose parenting group. Additionally, family A's mom accessed urine screens and substance use treatment.

Family B

Family B's mother had a long history of substance use, which resulted in her oldest child (not followed at BTC) from a previous relationship being apprehended early in life. Family B's mother also had an eating disorder history, in addition to a family history of mental illness. Family B's mother was in a relationship with family B's father who also used substances; they had a dysfunctional relationship characterized by blame, guilt, and differing parenting styles. The couple's first pregnancy together was with B1 and B2, identical twins who were exposed to

prenatal polysubstance use across all three trimesters. The twins were diagnosed with twin-to-twin transfusion syndrome near the end of the pregnancy which resulted in an early caesarian delivery. The twins were born prematurely and at a low birth weight, both exhibiting drug withdrawal and requiring post-natal interventions. After the birth of B1 and B2, family B's mother reported post-partum depression. The family was under extreme financial distress and moved to a shelter.

At this time, family B's mother was struggling with parenting stress. Given that her substance use with her first child many years prior happened in the context of a shelter, being in a shelter again created a sense of imprisonment with a lack of freedom that triggered her heightened substance use. At this time, she was pregnant with B3 who was also exposed to intense prenatal polysubstance use across all three trimesters. B3 was born only one year after B1 and B2 by caesarean delivery and tested positive for drug exposure at birth. B3 demonstrated very early limitations in mobility due to being bow legged. Soon after the birth of B3, family B's mother became pregnant again with B4, who was also exposed to prenatal polysubstance use across all three trimesters. B4 was born prematurely, one year after B3. B4 tested positive for drug exposure at birth and showed irregular heartbeats, thus requiring postnatal interventions.

Given the birth of four children within three years, family B was undergoing immense stress and financial strain after the birth of B4. The children were exposed to extended periods of neglect during their early years. Only six weeks after the birth of B4, all four children were apprehended from the home by child protective services at the ages of 2 years old, 1 year old, and 6 weeks old, respectively, and put into foster care where they remained together for nine months. During this time family B's mother became involved with BTC and began her recovery process. Family B's mother left the shelter, finding housing with her partner and the biological

father of all four children. Upon the children's return to their care, the family was still under immense financial stress. All four children were immediately put into full-time daycare; however, the twins, B1 and B2, experienced many daycare transitions over the next few years; B3 and B4 remained in stable placements over the same time frame. Family B's mother was very ready for change. She returned to school and work, and was committed to her recovery process at BTC. She struggled, however, to prioritize her children's social and emotional needs. Despite the unhealthy relationship between family B's mother and father, which involved threats of custody disputes and conflicting parenting styles, they remained together according to stipulations from child protective services. Family B's father took on the primary caregiving role in the children's lives as family B's mother focused on her return to school and work.

B1 and B2 had difficult temperaments and substantial speech and fine motor delays. The twins had a one-year delayed entry into kindergarten and were diagnosed with FASD, specifically Alcohol Related Neurodevelopmental Disorder. B2 was seen as the more challenging twin and family B's mother reported having a very challenging relationship with B2 relative to B1, given that B2 exhibited externalizing behaviours whereas B1was more likely to experience internalizing behaviours. B2 had selective eating problems, whereas B1 had challenges with peer relationship formation, thus relying on B2 for most social interactions. Both twins demonstrated substantial social-emotional and behavioural concerns, struggling with transitions and routines, as well as emotion regulation. They both showed low average cognitive and academic functioning. Overall, B1 and B2 showed far superior functioning in their small daycare setting with one-on-one support relative to a large classroom setting at school. B1 and B2 received speech and language as well as occupational therapy support. B1 and B2 also received psychological assessments. Although both twins required individual resource support in

daycare and specialized programs in school, these services were never made available to them despite advocacy from the parent-child therapist at BTC.

B3 and B4 had an easy temperament and overall superior emotion regulation relative to the twins. B3 had some challenges with emotional reactivity, but had average cognitive and academic abilities. B3 also had a strong relationship with his/her mother. In contrast, family B's mother had a very challenging relationship with B4, given the early apprehension that occurred which she reported caused her to be disconnected and emotionally challenged by B4. B4 was diagnosed with low upper body muscle tone in the first year. B4 also showed minimal socialization with peers and increasing social-emotional concerns with age. B4's mother reported more social-emotional concerns at home relative to the reports at school or at daycare. B4 demonstrated average cognitive and academic abilities. B3 and B4 both received occupational therapy support and psychological assessments. Their mother attended various support groups at BTC, including the Connections program that addresses interpersonal violence and childhood maltreatment, the Basic Life Skills groups, the Relapse Prevention group, and the New Mom Support group. Additionally, family B's mom accessed urine screens and substance use treatment.

Family C

Family C's mother had a family history and long personal history of pervasive mental health concerns, namely depression with related somatic symptoms and anxiety. Family C's mother had a history of maternal substance use and family C's father also used substances. Their relationship was unhealthy, characterized by a lack of support throughout family C's mother's recovery process, as well as anger and aggression when family C's father was using substances. The couple's first pregnancy together was with C1 who was exposed to prenatal polysubstance

use within the first trimester. Family C's mother also experienced pre-eclampsia near the end of the pregnancy; however, C1 had a normal birth. Two years later she became pregnant with C2 who was reportedly only exposed to nicotine within the first trimester. Family C's mother again experienced pre-eclampsia during this pregnancy and was overweight prior to the pregnancy which intensified the risks; however, C2 had a normal birth.

During their early years, C1 and C2 were exposed to significant dysfunction in the home, namely domestic violence in the parental relationship, an unsafe home environment, neglect, and parental substance use. At the age of five and three years old respectively, C1 and C2 were apprehended and placed into foster care for three months, then transitioned into kinship care with a maternal aunt for four months. During this time family C's mother became involved with BTC; however, due to her inconsistent attendance and her need for external mental health supports, her file was temporarily closed. Despite family C's mother continuing to be inconsistent in accessing mental health supports, her file was opened again at BTC several months later. Prior to the children being returned to parental care, family C's mother told her partner to leave the home given his continued substance use and the stipulations by child protective services. Upon the children's return, family C's mother was parenting independently. At this time, she was struggling to enforce limit-setting and routines in the home due to feeling guilty around the children's apprehension. C1 struggled with routines and separations. Family C's mother also had many negative conversations regarding the children's biological father in front of the children, which was a consistent problem across her involvement with BTC. Family C's father was also inconsistent with visitations with the children which impacted the children emotionally, especially C1. After a few years of child protective service involvement and mother's withdrawal from both mental health and BTC services, Family C's mother reported her substance relapse

and her reunification with her partner in the home. The children were apprehended and put up for adoption at this time.

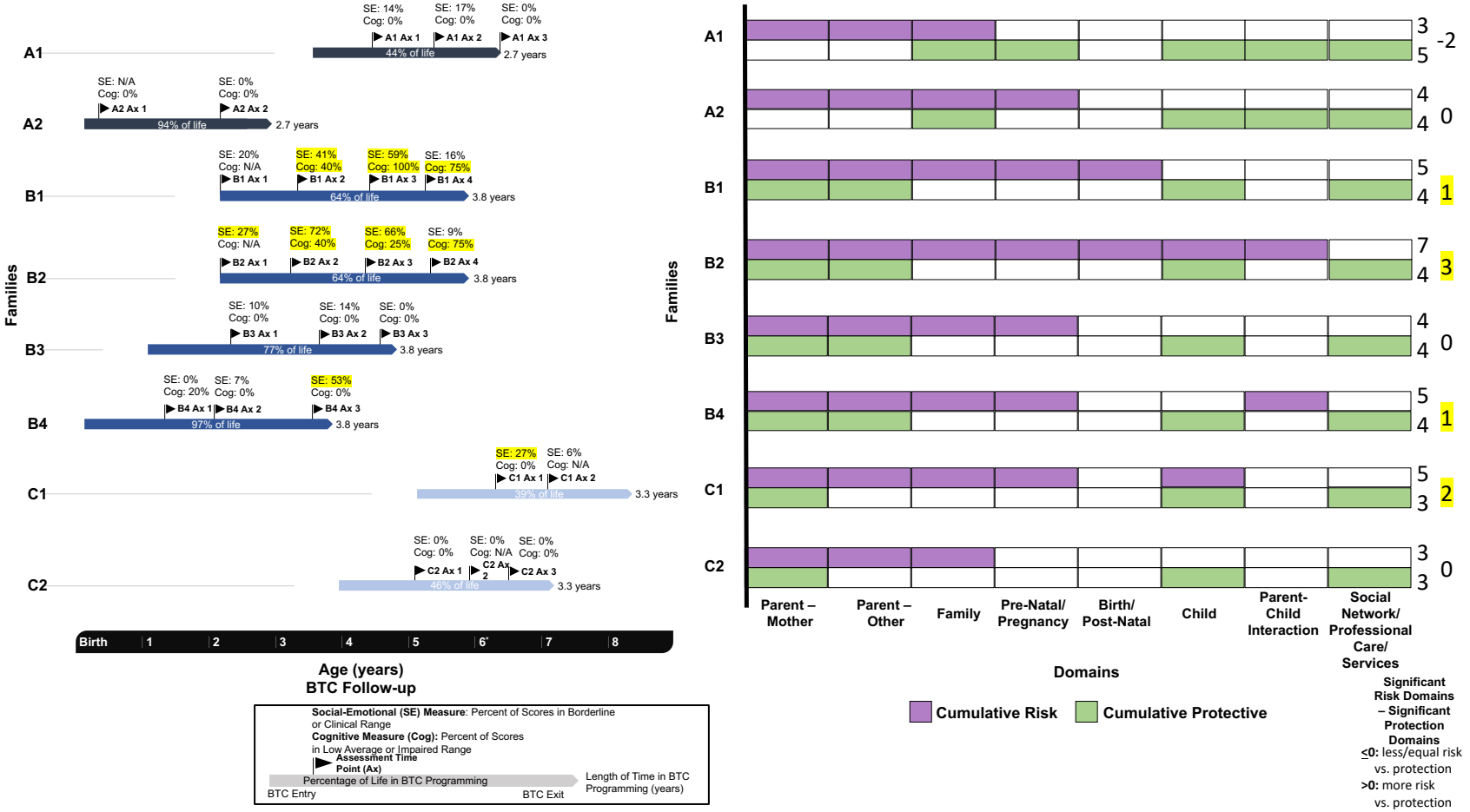
C1 demonstrated social-emotional concerns that manifested through negative externalizing behaviours. C1 showed aggressive behaviours both at home and at school and clinicians were concerned for C1's risk for mental health problems. C1 had average cognitive abilities. C2 was not reported by family C's mother or at school to be showing social-emotional or behavioural concerns; however, clinicians were concerned about C2 experiencing unreported internalizing behaviours. C2 demonstrated concerns about deprivation, a lack of safety, as well as loss and separation. C2 was seen as a compliant child who engaged in desirable behaviours to please adults. C2 lacked strong peer relationships and had some speech articulation concerns for which C2 received speech and language supports. C2 showed average cognitive and academic achievement. Overall, C2 was also thought to be at high risk for mental health concerns. C1 and C2 accessed psychological assessments and family C's mother attended the Relapse Prevention group at BTC.

Patterns Between Cumulative Risk, Cumulative Protection, and Neurodevelopment

The patterns between cumulative risk and protective factors, and the neurodevelopmental outcomes of children exposed prenatally to substances are shown in Figure 20 both between and within our three sibling groups. This figure demonstrates longitudinal neurodevelopmental data, showing the proportion of social-emotional scores that fell within the borderline clinical or clinical range, as well as the proportion of cognitive scores that fell within the low average or impaired range. If the proportion of scores in these clinically concerning ranges surpassed 25%, they were highlighted to indicate significant concern. This figure incorporated longitudinal neurodevelopmental data with information regarding which domains had clinically significant

levels of cumulative risk or cumulative protective factors (total domain percentages above 25%). The number of clinically significant domains of risk and protection were subtracted for each child to quantify the balance between risk and protection, with positive numbers (highlighted in Figure 20) indicating more clinically significant risk domains relative to protection domains. Additionally, this figure captured information on each child's age at entry into the early-intervention program and the proportion of their lifetime in early-intervention. Within each sibling group, all children were in BTC programming for the same length of time. It is vital to note, however, that the younger children entered the program at a younger age and, at the time of BTC exit, had spent a larger proportion of their life in BTC programming.

Figure 20. **Patterns Between Cumulative Risk and Protection, and Neurodevelopment**



Family A

A1 entered BTC programming around the age of 3.5 years and spent 44% of life in BTC services, compared to A2 who entered BTC programming at birth and spent 94% of life in BTC services. A1 had a higher proportion of social-emotional scores that were of clinical concern compared to A2 who had no scores that were of clinical concern. Although A1 had no cognitive scores of clinical concern, A1's social-emotional concerns increased slightly from 14% to 17% between time one and two, then decreased down to 0% by time point three, thus demonstrating improvements across A1's time at BTC. It is important to consider these findings in light of the contexts of risk and protection. A1 showed clinically significant levels of risk in three domains: maternal, other parental figure, family. Notably, A2 showed clinically significant levels of risk in the same domains, in addition to the pre-natal/pregnancy domain. A1 showed clinically significant levels of protection in four domains: family, child, parent-child interaction, social network/professional services. A2 had clinically significant levels of protection in these same domains, as well as in the pre-natal/pregnancy domain. A2 appeared to have fewer neurodevelopmental concerns compared to A1, despite a heightened level of risk. This discrepancy could have been due to the early intervention that A1 received or it could have been because A2 had clinically significant levels of protection in more domains than A1.

Family B

B1 and B2 entered BTC programming around age 2 years and spent 64% of their lives in BTC services. B3 and B4 entered the program at a younger age relative to B1 and B2, with B3 entering around age 1 year and B4 entering at birth. B3 and B4 spent 77% and 94% of life in BTC programming, respectively. B1 and B2 had a substantially higher proportion of social-emotional and cognitive scores that were of clinical concern compared to B3 and B4. B1's

proportion of clinically concerning scores in the social-emotional domains increased across time points one, two, and three, peaking at 59% and decreasing to 16% at time point four. B1 also showed a clinically concerning proportion of cognitive scores across follow-up, increasing from time points two to three to peak at 100%, then decreasing down to 75% at time point four. B2 had an even higher proportion of social-emotional scores that were clinically concerning relative to B1, which increased across time points one to two, peaking at 72% and then dropping subsequently at time points three and four to a low of 9% at the end of follow-up. B2 also showed cognitive concerns, with the proportion of scores of clinical concern decreasing from time points two to three, only to increase to a peak of 75% at time point four. These scores are consistent with B2 having demonstrated more overall neurodevelopmental concerns relative to B1.

B3 demonstrated minimal concerns across the follow-up time, showing an increase in the proportion of social-emotional scores of clinical concern from time points one to two, peaking at 14%, then dropping to 0% by time point three. B3 also had no cognitive scores in the clinical concern range. B4 showed a slow increase in the proportion of social-emotional scores that were of clinical concern, initially increasing to 7% from time points one to two, then increasing to a peak of 53% at time point three. These scores are consistent with B4 having demonstrated behaviours that were of growing concern with age. B4 initially had 20% of cognitive scores at the clinical concern level, which dropped to 0% at the two subsequent time points.

Despite being twins, it is interesting to note that B2 showed clinically significant levels of risk in seven of the eight risk domains while B1 showed clinically significant levels of risk in only five of the eight domains. B2 showed clinically significant risk in the child and parent-child interaction domains, while B1 did not. Contrastingly, B1 and B2 showed clinically significant

levels of protection in the same domains: mother, other parental figure, child, social network/professional services. The heightened level of risk in the absence of heightened protective factors may explain why B2 showed more neurodevelopmental concerns relative to B1. B3 and B4 had fewer domains of clinically significant risk relative to B1 and B2. While B3 had significant risk in 4 domains: mother, other parental figure, family, pre-natal/pregnancy, B4 showed significant risk in these domains in addition to the parent-child interaction domain. These scores were consistent with B4 having had a challenging mother-child relationship given B4's very young age at apprehension. B3 and B4 showed clinically significant levels of protection in the same domains as B1 and B2. Overall, B3 and B4 appeared to have fewer neurodevelopmental concerns relative to B1 and B2 given their lower levels of risk alongside consistent levels of protection. A notable difference among these siblings is that B3 and B4 received intervention at an earlier age relative to B1 and B2.

Family C

C1 spent 39% of life in BTC programming and C2 spent 46% of life in BTC programming. Notably, both C1 and C2 entered BTC at older ages relative to the children in the other sibling groups within this study, entering at ages 5 and 4 years, respectively. Although C1 had no cognitive scores of clinical concern, C1 had an initially high proportion of social-emotional scores that were of clinical concern, with 27% at time point one which decreased to 6% at the second time point. These scores demonstrated an improvement across C1's time at BTC. On the basis of C2's performance on the selected neurodevelopmental assessment measures, C2 was reported to have no cognitive or social-emotional scores with clinical concerns across C2's time at BTC. Notably, these results differ from the qualitative report by clinicians of C2's functioning across C2's time at BTC given that C2 demonstrated concerns around

deprivation, lack of safety, as well as loss and separation. Clinicians' notes also indicated concern for high risk of mental health challenges for both C1 and C2.

C1 showed clinically significant levels of risk in five domains: mother, other parental figure, family, pre-natal/pregnancy, child. C2 showed clinically significant levels of risk in only three of these five domains: mother, other parental figure, family. Both C1 and C2 showed clinically significant levels of protection in three domains: mother, child, social network/professional services. Overall, C1 did appear to have more neurodevelopmental concerns relative to C2, potentially due to C1's higher level of cumulative risk alongside consistent levels of cumulative protection relative to C2. These results suggest a link to the lack of early-intervention that C1 received. Similarly, although C2 was exposed to lower levels of risk, C2 also experienced neurodevelopmental concerns (reported qualitatively) which were not mitigated with early-intervention opportunities.

Cross-Family Comparison

Overall, the children in this study demonstrated improvements in neurodevelopment across their time receiving services at BTC. The results suggest that children who entered the program at a younger age and who spent a larger proportion of their life in BTC programming showed better neurodevelopment relative to those who entered the program at an older age. Similarly, children with lower levels of clinically significant cumulative risk, alongside higher levels of clinically significant cumulative protection, showed fewer neurodevelopment concerns. The results suggest an interplay between the effects of early-intervention and cumulative risk and protection on the neurodevelopment of young children exposed prenatally to substances.

The four children that had clinically significant neurodevelopmental deficits at one point during their time at BTC, namely B1, B2, B4, and C1, also experienced more significant risk

domains relative to significant protection domains. These quantitative results align with the qualitative case study descriptions of these children, suggesting that more clinically significant domains of risk relative to protection may be indicative of neurodevelopment deficits. All eight children showed clinically significant levels of risk across the mother, other parental figure, and family domains; however, their scores differed across the other domains. These common domains with significant levels of risk potentially portray the baseline level of risk present within this sample, including maternal risk factors and proximal risk factors within the home environment. The six children who had clinically significant levels of risk in the pre-natal/pregnancy domain were also exposed to substances prenatally, whereas the two children who did not show clinically significant levels of risk in this domain did not have substance exposure. These results indicate that the measure of cumulative risk was able to distinguish prenatal substance exposure histories.

Notably, the four children who had clinically significant neurodevelopmental deficits and who experienced more significant risk domains relative to significant protection domains, were also the only children who showed significant levels of risk in the birth/post-natal, child, and parent-child interaction domains. These results suggest that ongoing risk in the postnatal environment may be more indicative of neurodevelopmental deficits in this sample of children compared to maternal or family history risks, or risks within the prenatal period. However, the clinically significant levels of risk within the parent-child interaction domain across all children in this study is likely an underestimation given that many of the factors within this domain were dependent on maternal self-report at entry into BTC programming, rather than clinical reporting across each child's time at BTC. Therefore, the children that showed clinically significant levels of risk in the parent-child interaction domain likely had extreme levels of risk in this domain.

Notably, the children in family A were the only children who had clinically significant levels of protection within the family and parent-child interaction domains. These results suggest that these two domains may be an important aspect of protection, or early intervention, that contributed to family A's superior clinical progress amongst the three families.

DISCUSSION

The goal of this study was to examine the impact of cumulative risk and protective factors on the neurodevelopment of young children exposed prenatally to substances. A critical step in the study was to create cumulative risk and protective factor scores with domains relevant to neurodevelopment in substance-exposed children. This domain-specific conceptualization of risk and protective factors facilitated the consideration of both intra- and inter-domain risk and protection. I described the neurodevelopmental profile of three sibling groups. Overall, I endeavoured to illustrate the patterns linking cumulative risk, cumulative protection, and neurodevelopment in these children using quantitative and qualitative considerations. The patterns that emerged indicate the importance of considering: 1) cumulative risk and protection qualitatively; 2) cumulative rather than distinct risk and protective factors; 3) cross-domain risk and protective factors; 4) cumulative protection in addition to risk; and 5) the potential of early intervention to mitigate risk and enhance protective processes.

Cumulative Risk and Protection Qualitatively

For this study, I created comprehensive, theoretically grounded cross-domain cumulative risk and protective factor scores for each child. I also provided case study descriptions of each sibling group's context of risk and protection. With this approach, I was able to conceptualize cumulative risk and protection using both quantified scores and qualitative case study descriptions, a unique component of the present study.

A limitation in previous studies using established cumulative risk and protection measures is the lack of theoretical foundation in determining which factors to include in the metrics (Evans et al., 2013). In general, key risk factors for the outcome of interest are included in research, as well as risk factors related to proximal processes and salient mediating processes.

Additionally, the degree of stability in what constitutes as a risk or protective factor may differ across samples, with concerns for the generalizability of the operational definitions for risk and protection (Evans et al., 2013). Given the limited research on measures of cumulative risk and protection for children exposed prenatally to substances, as well as on measures of cumulative risk and protection as they relate to neurodevelopment, it was essential to take a qualitative approach in establishing the cumulative risk and protection metrics for children at BTC. The cumulative risk and protection scores were theoretically grounding using the Developmental Model of Transgenerational Transmission of Psychopathology (Hosman et al., 2009; Figure 1). A clinical and qualitative understanding of the contexts of risk and protection experienced by our three families was essential in selecting this model and in delineating the salient domains of risk and protection for children exposed prenatally to substances and accessing early intervention. The qualitative case study description of the three families was also essential in reliably identifying the individual factors to incorporate into each domain in these measures. Therefore, although recent literature has outlined the need to establish theoretically grounded cumulative risk and protection metrics, the results of this study emphasize the importance of a preliminary qualitative case study approach to selecting the theoretical model, as well as relevant domains and factors to be included in the metrics. In future research, I plan to validate the cumulative risk and protection measures with a larger sample of children at BTC.

A limitation in previous studies is that new cumulative risk and protection measures are piloted quantitatively within large target samples, thus missing the rich qualitative case study information. Creating cumulative risk and protection metrics alongside qualitative case study descriptions in this study ensured that the metrics were constructed reliably; however, this mixed-method approach also ensured that the metrics were completed reliably to yield accurate

scores for each child. The present case study approach required a full review of clients' charts to comprehensively capture their risk and protective contexts. The cumulative risk and protection measures were created so that most of the required information could be extracted from the referral, intake, and service ending forms, making it feasible to use in large-scale studies. Although the quantified cumulative scores provide an accurate portrayal of risk and protection between and within the sibling groups, the nuances that underlie these scores can only be understood when also considering the qualitative case study descriptions of the families. The qualitative consideration of cumulative risk and protection indicated that although children within a family may experience similar domains with significant risk or protection scores, the significant scores may arise for fundamentally different reasons (e.g., significant cumulative risk in the maternal domain may be due to young maternal age, long history of substance use, or pervasive mental health concerns). Furthermore, although children within a family can experience similar significant domains of risk or protection, the significant scores can differentially impact each child based on differential susceptibility (e.g., significant cumulative risk in the maternal domain may affect children differently based on their age entering BTC intervention, child mental health concerns, etc.). Correspondingly, when children within a family experience different significant domains of risk or protection, these differences can be better understood in light of each child's unique qualitative experiences.

In the present study, a consideration of quantified scores alongside qualitative information was essential for a fulsome understanding of cumulative risk and protection. The present research attempted to overcome shortcomings in the cumulative risk and protection research. These shortcomings included a lack of information on: contextual factors, risk and protective factor intensity, and the degree of risk and protective factor exposure (Evans et al.,

2013; Lima, Caughy, Nettles, & O'Campo, 2010). The present research, which has been designed to overcome these limitations, supports the need to establish cumulative risk and protection measures within a qualitative framework that is unique to the target population prior to quantitative use in larger samples. Given that the quantified cumulative risk and protection scores aligned with the qualitative case study descriptions for each family, I can conclude that the theoretically grounded cross-domain measures that have been established captured the contexts of risk and protection in this sample of high-risk children exposed prenatally to substances and accessing services at BTC.

Cumulative Rather Than Distinct Risk and Protection

The field of cumulative risk has emerged from consistent findings that children exposed to multiple risk factors are at heightened risk for poor developmental outcomes and psychological disorders, as compared to children exposed to singular risks who suffer minimal enduring consequences (Rutter, 1979; Rutter, 1981; Sameroff, 2006). Additionally, risk is typically evaluated in high-risk populations of children who often present with constellations of risk rather than isolated instances of adverse circumstances (McLoyd, 1998). Individual protective factors, in contrast to scores assessing cumulative protective factors, are weakly related to negative outcomes, suggesting that the use of a cumulative measure of protective factors is advantageous in understanding developmental outcomes (Ackerman et al., 1999).

The constellation of maternal risk factors that often accompany prenatal substance use include: mental health concerns, histories of trauma and abuse, increased exposure to parental and partner violence, negative life events, intergenerational substance use, and homelessness (Conners et al., 2004; Kettinger et al., 2000; Nair et al., 2003; Slesnick & Erdem, 2012). Additionally, multiple risk factors specific to the child, family context, parent-child relationships,

and the larger social network domains all contribute to the risks associated with prenatal substance exposure (Carta et al., 2001; LaGasse et al., 1999). When considering the effects of risk on children's neurodevelopment in this population, prenatal substance exposure is often perceived as the most salient risk factor, with little focus on protective factors. In choosing to include sibling groups in this evaluation, I was able to compare levels of cumulative risk and protection among siblings with differential prenatal exposure to substances. Within family A, A1 was not exposed prenatally to substances, while A2 did have prenatal substance exposure. Despite A2 having had prenatal substance exposure and a higher level of overall cumulative risk compared to A1, A1 showed social-emotional concerns while A2 showed no concerns. In family B, all four children had prenatal polysubstance exposure across all three trimesters, yet the children differed substantially in their cumulative risk scores and their neurodevelopment, with B1 and B2 showing more risks and deficits relative to B3 and B4. Within family C, C1 was exposed to prenatal polysubstance use within the first trimester, whereas C2 was only exposed to nicotine in the first trimester. C1 showed impaired neurodevelopment relative to C2; however, C1 was exposed to numerous other risk factors in addition to prenatal substance exposure. These results emphasize the importance of considering cumulative risks beyond the risk of prenatal substance exposure in this population, as well as the need to consider concurrent protective factors.

Families accessing services at BTC are highly vulnerable, with mothers struggling with substance use and children exposed prenatally to substances. Families A, B, and C were classified by BTC clinicians as having good, fair, and poor clinical progress, respectively, during their time at BTC. The quantified cumulative risk scores indicated that family B (28-35%), specifically B1 and B2, had the highest overall percentage of cumulative risk, while family A

(26-27%) and C (24-29%) had a slightly lower percentage of cumulative risk. The quantified cumulative protection scores indicated that family B (42-44%) had the highest overall percentage of cumulative protection, whereas families A (26-37%) and C (26-29%) had a slightly lower percentage of cumulative protection. Additional nuances were observed when cumulative risk and protection scores were examined across domains, as discussed below. Despite the challenge of capturing variability in cumulative risk and protection in these high-risk children, I was able to integrate information to capture the complex range of cumulative risk and protection in our sample. The cumulative approach taken in this study was also unique given that it captured cumulative risk and protection longitudinally across development and across involvement in intervention programming at BTC. The majority of studies on cumulative risk and protection, and the impact on child development, are cross-sectional in nature rather than longitudinal (Evans et al., 2013). To fully capture cumulative risk and protection, a longitudinal investigation that considers interventions that reduce risk exposure and enhance protective processes is necessary. In finding comparable levels of risk and protection across all children despite the variability in age, the results of this study indicate that the measures of cumulative risk and protection are not confounded by age and the potential for older children to have the highest scores due to longer lifetime exposure. Overall, given the complex histories of risk and protection for children with prenatal substance exposure, it is essential to take a longitudinal cumulative approach in conceptualizing risk and protective contexts.

Cross-Domain Cumulative Risk and Protection

In the field of cumulative risk, there has been a recent shift towards classifying singular risk factors into domains, given that risk exposure across multiple domains presents more challenging adaptive demands on children relative to intense but concentrated intra-domain risk

exposure (Ackerman et al., 1999; Brennan et al., 2003; Evans et al., 2013; Whipple et al., 2010). Limited work has taken domain-specific protective factors into consideration, despite findings that early intervention services across various domains (i.e., mother and child) can promote optimal child development (Andrews et al., 2018; Evans et al., 2013). Therefore, in this study I explored cumulative risk and protection across domains relevant to neurodevelopment in substance exposed children accessing early intervention services using a theoretical model (Hosman et al., 2009;Figure 1). In comparison to the total cumulative risk and protection scores, the cross-domain scores provided a more nuanced understanding of each child's context, also distinguishing key differences within sibling groups. The quantified cross-domain scores also aligned more accurately with each child's case study description.

A cross-domain examination of risk and protection also provided insight into baseline levels of risk in this sample of children given that all eight children showed clinically significant levels of risk across the mother, other parental figure, and family domains. In exploring the differences between clinically significant domains of cumulative risk across all children, the results of this study suggest that ongoing risk in the postnatal environment may be more indicative of neurodevelopmental delay, given that children with clinically significant neurodevelopmental deficits showed clinically significant levels of risk in the birth/post-natal, child, and parent-child interaction domains. Similarly, clinically significant levels of protection in the family and parent-child interaction domains appeared to be potentially unique aspects of protection in family A that may have contributed to the children's good clinical progress. A cross-domain examination of cumulative risk and protection alongside neurodevelopment thus enables exploration of unique domains of risk and protection in children exposed prenatally to substances.

There was considerable variability in the cross-domain cumulative risk scores within sibling groups. Although these patterns emerged in all three sibling groups, they are best demonstrated in Family B's sibling quadrad. B1 and B2 were identical twins, diagnosed with twin-to-twin transfusion syndrome, exposed to prenatal polysubstance use, born prematurely at a low birth weight via a caesarian delivery. B1 and B2 had clinically significant levels of risk in the pre-natal/pregnancy domains. B1 and B2 also exhibited drug withdrawal and required post-natal interventions. Family B's mother experienced post-partum depression and financial distress after the twins' birth, which resulted in their move to a shelter, which, in turn, triggered her heightened substance use. It is apparent why B1 and B2 also showed significant risk in the birth/post-natal domain. B2 also showed significant risk in the child and parent-child interaction domains given that B2 was perceived as the more challenging twin; family B's mother reported having a challenging relationship with B2 due to B2's externalizing behaviours. B3 and B4 were both exposed to substantial prenatal polysubstance use; additionally, B3 was born via caesarean delivery and B4 was born prematurely. Under these circumstances, it is clear why both B3 and B4 were rated as having clinically significant risk within the pre-natal/pregnancy domain. B4 also had significant risk in the parent-child interaction domain, given that family B's mother reported having a challenging relationship with B4 due to B4's very early apprehension by child protection services and the subsequent impact on the bonding process.

Although there was variability in the cross-domain cumulative risk scores within sibling groups, more stable patterns emerged in the cross-domain cumulative protection scores within sibling groups. Again, these patterns emerged in all three sibling groups; however, they are best demonstrated in Family B's sibling quadrad. B1, B2, B3 and B4 had identical profiles of cross-domain cumulative protection, with clinically significant scores within the mother, other parental

figure, child, and social network/professional services domains. All four children were rated as having comparable levels of cumulative protection despite variable levels of risk, which shed light on the discrepancies in their neurodevelopmental outcomes.

Our cross-domain quantification of cumulative risk and protection captured each child's context of risk and protection in a manner that was consistent with their qualitative case study description. Our results also indicated notable domains of risk and protection in the perinatal environment and their potential impact on the neurodevelopment of children exposed prenatally to substances. The cross-domain quantification depicted the variability present in cumulative risk scores within sibling groups, while depicting the stable cumulative protection scores present within sibling groups. Further, a cross-domain conceptualization of risk and protection demonstrated how varying levels of risk within sibling groups, alongside consistent levels of protection, resulted in differing neurodevelopmental outcomes, as further discussed below.

Cumulative Protection in Addition to Risk

Given findings that cumulative protective processes can attenuate the negative effects of cumulative risk, I also examined cross-domain cumulative protective factors within this study (Ackerman et al., 1999; Ostaszewski & Zimmerman, 2006; Spencer, 2005). Having more clinically significant domains of risk relative to clinically significant domains of protection was associated with clinically significant neurodevelopmental deficits. Therefore, these results have emphasized the importance of the balance between the number of clinically significant domains of risk and protection; however, it is also important to consider the balance between overall cumulative risk and protection. The results indicate that heightened levels of cumulative risk, in the absence of heightened levels of cumulative protection, can result in hindered neurodevelopment and notable differences within sibling groups. Although family B was

classified as having the highest overall cumulative risk scores, family B was also classified as having the highest overall cumulative protection scores. This balance between risk and protection may have contributed to family B being classified as having fair, rather than poor, clinical progress despite being the highest risk family. Although families A and C showed lower levels of cumulative risk alongside lower levels of cumulative protection, they differed substantially in their clinical progress, classified as good and poor progress, respectively. These results indicate that clinical progress is impacted by more than just the balance between cumulative risk and protection, otherwise family A and C would be expected to show superior clinical progress relative to the high-risk family B. Overall, comparisons between sibling groups indicated that the balance between cross-domain and total levels of cumulative risk and protection can impact clinical progress; however, additional factors (e.g., early intervention as discussed below) may also have an effect.

Early Intervention

In exploring cumulative risk and protection, as well as neurodevelopment, in sibling groups I hoped to capture intra- and inter-family variability. The results of this study have demonstrated that neurodevelopment and clinical progress are dependent on the balance between levels of cumulative risk and protection; however, in exploring the variability within and between sibling groups, there also appears to be an effect of early intervention. Family B had the highest level of cumulative risk, with B1 and B2 showing higher levels of risk relative to B3 and B4. Although family B had the highest level of cumulative risk overall, this high risk was balanced by them also having the highest level of cumulative protection. Despite the notable differences in risk between B1 and B2 relative to B3 and B4, all four children had clinically significant protection in the same domains. Clinicians classified family B as having made “fair”

clinical progress during their time at BTC, likely due to the overall balance between high levels of risk alongside high levels of protection. B1 and B2 showed notable deficits in their neurodevelopment relative to B3 and B4, which is consistent with B1 and B2's higher levels of risk alongside consistent levels of protection. It is vital to note that B1 and B2 entered intervention services at an older age (i.e., age ~ 2 years) relative to B3 (i.e., age ~ 1 year) and B4 (i.e., birth), suggesting that B3 and B4's superior neurodevelopment may have been due to receiving early intervention, in addition to experiencing less cumulative risk compared to B1 and B2.

Although families A and C showed comparably lower levels of both risk and protection relative to family B, they differed substantially in their clinical progress, classified by clinicians as "good" and "poor", respectively. A1 had fewer clinically significant cumulative risk domains and more clinically significant protection domains relative to A2; however, A1 showed social-emotional concerns while A2 showed no concerns. These differences might lead to an expectation of heightened neurodevelopment for A1 compared to A2, rather than the observed neurodevelopmental concerns in A1. It is again important to note that A1 entered intervention services at an older age (i.e., age ~3.5) relative to A2 (i.e., birth), suggesting that A2's lack of neurodevelopmental concerns, despite higher levels of risk and less protection compared to A1, may have been due to A2 accessing early intervention. Similarly, C1 had more clinically significant cumulative risk domains relative to C2; however, C1 and C2 had the same clinically significant domains of protection. C1 showed deficits in neurodevelopment, namely social-emotional concerns, aligning with C1's higher levels of risk relative to C2 alongside comparable levels of protection. Nonetheless, upon qualitatively reviewing C2's clinical file, clinicians reported that C2 demonstrated neurodevelopmental concerns around deprivation, lack of safety,

loss and separation, and a high attunement to the needs of others, despite the assessment data failing to portray these concerns. It is important to note that C1 entered intervention services at an older age (i.e., age ~5) relative to C2 (i.e., age ~4); however, C2 entered services at an older age relative to the other children in this study who ranged in age from birth to 3.5 years at entry to BTC. Therefore, although C2 demonstrated fewer neurodevelopmental concerns relative to C1, this may have been due to C2 accessing intervention at an earlier age than C1. Both C1 and C2's neurodevelopmental concerns may have been due in part to their late entry into BTC programming. Additionally, C1 and C2's older age at entry into intervention may explain the discrepancy between the clinical progress of family A (i.e., good), relative to family C (i.e., poor), despite comparable levels of cumulative risk and protection.

Overall, these results may suggest the importance of early intervention for this high-risk population of children exposed prenatally to substances. It is important to note that this potential effect of early intervention is specific to BTC's early intervention program that focusses on child development, maternal mental health and addiction, as well as the mother-child relationship. The results indicate that it is crucial for early intervention to begin generally within the first three years of life in order to have a strong impact on neurodevelopment; however, there appear to be additional benefits to neurodevelopment the earlier a child begins intervention. The results revealed neurodevelopmental differences between children who entered programming with as little as a one year age difference at entry (e.g., age 1 year versus age 2 years). These results shift the typical conceptualization of early intervention that focusses individually on the child towards a relational perspective in which the mother-child relationship is addressed alongside child development and maternal mental health and addiction. The results also highlight the importance of early intervention commencing as soon as possible postnatally. The importance of early

intervention has been highlighted by research showing the early implementation of intervention is most effective as it capitalizes on brain plasticity. To date, however, there are very few studies on the effects of early intervention with young children exposed prenatally to substances (Lester, Boukydis, & Twomey, 2000). The related literature on early intervention with young disadvantaged children has revealed improvements in language and cognitive abilities, with decreased behavioural concerns (Martin, Ramey, & Ramey, 1990; Warr-Leeper, 2001). Early intervention has also been shown to prevent cognitive and language delays, as well as behavioural problems, in young children exposed prenatally to cocaine, with sustainable improvements over time (Bono et al., 2005).

Overall, the results of this study have emphasized the impact that contexts of risk and protection can have on the neurodevelopment of children exposed prenatally to substances; however, there also appears to be an effect of early intervention. Given the vulnerability of children exposed prenatally to substances, it is optimistic to begin considering the impact of mother, child, and mother-child relational interventions after birth. Overall, these high-risk children must be considering alongside contextual factors, recognizing and addressing key risk factors while celebrating and instituting protective processes through early intervention.

LIMITATIONS AND FUTURE DIRECTIONS

The families at BTC are expected to have moderate to high levels of cumulative risk given their histories of trauma and mental health concerns. BTC gathers rich contextual information for clinical and research purposes, providing information regarding neurodevelopment in substance-exposed children accessing early intervention services. Further, studying protective factors typically has to occur within contexts of risk. This study involved young, at-risk children; however, data were only available on these children until the age of 6 years, when service at BTC ends. Therefore, limited information was available on children's outcomes at later stages of development. Since clinicians made child-specific choices as to the measures used for yearly developmental assessments, not all participants received the same measures. Each assessment measure has specific versions appropriate for different age ranges, further impeding uniformity as different versions of the same assessment measure were administered to children of different ages. Therefore, measures were not completely comparable across children. Cognitive development was assessed using pre-school aged testing measures, which are less predictive of future cognitive functioning relative to school-age testing measures. Testing pre-school aged children may have also been limited by lack of effort, task maintenance, or comprehension. Social-emotional development was assessed using caregiver and teacher/daycare provider reports, which may have varied in accuracy depending on the respondents' understanding of young children's development and age-appropriate expectations. The mothers in this study may have rated their children's development in a positive light as they tried to represent themselves and their children in a positive light, given that they were in the context of treatment.

Furthermore, it is difficult to gather accurate data on substance use and other risk exposure during pregnancy due to mothers' fear of stigmatization, incarceration, compulsory treatment, or loss of custody (Phillips, Thomas, Cox, & Ricciardelli, 2007; Roberts & Nuru-Jeter, 2010). These social and legal pressures may have impacted women's willingness to disclose substance use and other risk factors, hindering the process of screening and assessment (Phillips et al., 2007; Roberts & Nuru-Jeter, 2010). Although the BTC clinicians are highly skilled at getting to know a woman and her life history; the mothers' self-reported cumulative risk exposure as assessed from file notes may have been underestimated. Generalizability is also a limitation of note as BTC serves a unique clinical population, limiting the generalizability to other clinical and typically developing populations. Specifically, given mothers' and children's participation in early intervention services through BTC, all participants had exposure to protective early intervention factors that other families struggling with prenatal substance exposure may not. With the small sample size, the case study approach further impedes generalizability to the wider population.

In future research, the reliability and validity of the measures of cumulative risk and protection established in the present study need to be evaluated quantitatively in a larger sample of children exposed prenatally to substances and receiving early intervention services at BTC or a similar program. Although data from this study indicate that early intervention impacts the relationship between cumulative risk, cumulative protection, and neurodevelopment, there is a critical gap in research on the effects of early intervention for young children with prenatal polysubstance exposure. I am looking forward to continuing this line of research by exploring the neurodevelopment improvements in substance exposed children accessing early intervention services at BTC. With a larger sample, I will be able to conduct both qualitative and quantitative

analyses to better understand the unique impact of early intervention and how it can combat contexts of risk alongside other forms of protection.

IMPLICATIONS AND CONCLUSIONS

Within this study I established cumulative risk and cumulative protective factor scores with domains relevant to neurodevelopment in substance-exposed sibling groups accessing early intervention services at BTC. This domain-specific conceptualization of risk and protective factors facilitated the consideration of intra- and inter-domain risk and protection both within and between sibling groups. I also described the neurodevelopmental profile of the three sibling groups across their time at BTC. The quantitative and qualitative results revealed patterns within cumulative risk, cumulative protection, and neurodevelopmental profiles of the children. The present research highlights the importance of a qualitative, cumulative, and cross-domain consideration of both risk and protective processes. It also highlights the potential impact of early intervention on the neurodevelopment of children exposed to substances prenatally. Studies have consistently shown dire neurodevelopmental consequences from prenatal substance exposure (Bandstra et al., 2010; Black et al., 1993). The present research has practice and policy implications for early intervention support for vulnerable women who use substances and their young children. The measures of cumulative risk and protection established in this study will inform future quantitative research validating these measures in larger samples of children at BTC or other similar programs. Overall, this study provides evidence and direction for future research that can enhance understanding of the risk and protective profiles of children exposed prenatally to substances, when they are able to access services such as BTC. Specifically, the present research enhances understanding of how risk and protection processes interact to impact neurodevelopment. This research has started to identify the domains of risk that may pose the greatest harm to neurodevelopment; conversely it has begun to identify the domains of protective

experiences that may pose the greatest benefit to neurodevelopment for children exposed to substances in utero.

Most notably, these findings indicate the impact that early intervention can have on the relationship between cumulative risk and protection, and neurodevelopment. In better understanding profiles of risk and protection, alongside the impact of early intervention, these findings and future work can begin to inform evidence-based early interventions that: 1) target children identified as being at high risk for poor neurodevelopmental outcomes, 2) are targeted towards the full range of risk factors with which children must contend, 3) incorporate the most effective protective factors into practice, and 4) provide individualized interventions for children that target vulnerable domains of neurodevelopment. Overall, this research contributes to enhancing the clinical services for this highly vulnerable population of children exposed prenatally to substances. Providing individualized, client-centered, and relationship-based early intervention can be an important step to improve these children's neurodevelopment and reduce the social and economic costs for society.

REFERENCES

Achenbach, T. M. (2000). Child Behavior Checklist. In *Encyclopedia of psychology, Vol. 2.* (pp. 69–70). https://doi.org/10.1037/10517-028

Ackerman, B. P., Schoff, K., Levinson, K., Youngstrom, E., & Izard, C. E. (1999). The relations between cluster indexes of risk and promotion and the problem behaviors of 6- and 7-year-old children from economically disadvantaged families. *Developmental Psychology*, *35*(6), 1355–1366. https://doi.org/10.1037/0012-1649.35.6.1355

Anda, R. F., Felitti, V. J., Bremner, J. D., Walker, J. D., Whitfield, C., Perry, B. D., … Giles, W. H. (2006). The enduring effects of abuse and related adverse experiences in childhood: A convergence of evidence from neurobiology and epidemiology. *European Archives of Psychiatry and Clinical Neuroscience*, *256*(3), 174–186. https://doi.org/10.1007/s00406-005-0624-4

Andrews, N. C. Z., Motz, M., Pepler, D. J., Jeong, J. J., & Khoury, J. (2018). Engaging mothers with substance use issues and their children in early intervention: Understanding use of service and outcomes. *Child Abuse and Neglect*, *83*, 10–20. https://doi.org/10.1016/j.chiabu.2018.06.011

Appleyard, K., Egeland, B., van Dulmen, M. H. M., & Sroufe, L. A. (2005). When more is not better: The role of cumulative risk in child behavior outcomes. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *46*(3), 235–245. https://doi.org/10.1111/j.1469-7610.2004.00351.x

Bailey, B. N., Delaney-Black, V., Covington, C. Y., Ager, J., Janisse, J., Hannigan, J. H., & Sokol, R. J. (2004). Prenatal exposure to binge drinking and cognitive and behavioral outcomes at age 7 years. *American Journal of Obstetrics and Gynecology*, *191*(3), 1037–

1043. https://doi.org/10.1016/j.ajog.2004.05.048

Bandstra, E. S., Morrow, C. E., Mansoor, E., & Accornero, V. H. (2010). Prenatal drug exposure: Infant and toddler outcomes. *Journal of Addictive Diseases*, *29*(2), 245–258. https://doi.org/10.1080/10550881003684871

Bayley, N. (2006). Bayley Scales of Infant and Toddler Development– Third Edition. San Antonio, TX: Harcourt Assessment. *Journal of Psychoeducational Assessment*, (25), 180–190. https://doi.org/10.1177/0734282906297199

Black, M., Schuler, M., & Nair, P. (1993). Prenatal drug exposure: Neurodevelopmental outcome and parenting environment. *Journal of Pediatric Psychology*, *18*(5), 605–620. https://doi.org/10.1093/jpepsy/18.5.605

Bono, K. E., Bolzani Dinehart, L. H., Claussen, A. H., Scott, K. G., Mundy, P. C., & Katz, L. F. (2005). Early intervention with children prenatally exposed to cocaine: Expansion with multiple cohorts. *Journal of Early Intervention*, *27*(4), 268–284. https://doi.org/10.1177/105381510502700406

Brennan, P. A., Hall, J., Bor, W., Najman, J. M., & Williams, G. (2003). Integrating Biological and Social Processes in Relation to Early-Onset Persistent Aggression in Boys and Girls. *Developmental Psychology*, *39*(2), 309–323. https://doi.org/10.1037/0012-1649.39.2.309

Bronfenbrenner, U, & Morris, P. A. (1998). The ecology of developmental processes. In W. Damon & R. M. Lerner (Eds.), *Handbook of Child Psychology, Vol. 1: Theoretical models of human development* (5th ed., pp. 993–1023). New York, NY: Wiley.

Bronfenbrenner, Urie. (1979). Contexts of child rearing: Problems and prospects. *American Psychologist*, *34*(10), 844–850. https://doi.org/10.1037/0003-066X.34.10.844

Bronfenbrenner, Urie, & Evans, G. W. (2001). Developmental Science in the 21st Century:

Emerging Questions, Theoretical Models, Research Designs and Empirical Findings. *Social Development*, *9*(1), 115–125. https://doi.org/10.1111/1467-9507.00114

Carta, J., Atwater, J. B., Greenwood, C. R., McConnell, S. R., McEvoy, M. A., & Williams, R. (2001). Effects of Cumulative Prenatal Substance Exposure and Environmental Risks on Children's Developmental Trajectories. *Journal of Clinical Child and Adolescent Psychology*, *30*(3), 327–337. https://doi.org/10.1207/S15374424JCCP3003_5

Carter, A. S., & Briggs-Gowan, M. J. (2005). *Infant-Toddler Social & Emotional Assessment*. (P. Corporation, Ed.), *Bulverde Road*. San Antonio, TX. Retrieved from TX 78259-3701

Conners, N. A., Bradley, R. H., Mansell, L. W., Liu, J. Y., Roberts, T. J., Burgdorf, K., & Herrell, J. M. (2004). Children of Mothers with Serious Substance Abuse Problems: An Accumulation of Risks. *American Journal of Drug and Alcohol Abuse*, *30*(1), 85–100. https://doi.org/10.1081/ADA-120029867

Crosnoe, R., Leventhal, T., Wirth, R. J., Pierce, K. M., & Pianta, R. C. (2010). Family socioeconomic status and consistent environmental stimulation in early childhood. *Child Development*, *81*(3), 972–987. https://doi.org/10.1111/j.1467-8624.2010.01446.x

Espinet, S. D., Motz, M., Jeong, J. J., Jenkins, J. M., & Pepler, D. (2016). 'Breaking the Cycle' of maternal substance use through relationships: A comparison of integrated approaches. *Addiction Research and Theory*, *24*(5), 375–388. https://doi.org/10.3109/16066359.2016.1140148

Evans, G. W. (2004). The Environment of Childhood Poverty. *American Psychologist*, *59*(2), 77–92. https://doi.org/10.1037/0003-066X.59.2.77

Evans, G. W., Li, D., & Whipple, S. S. (2013). Cumulative risk and child development. *Psychological Bulletin*, *139*(6), 1342–1396. https://doi.org/10.1037/a0031808

Fried, P. A., Watkinson, B., & Gray, R. (1992). A follow-up study of attentional behavior in 6-year-old children exposed prenatally to marihuana, cigarettes, and alcohol. *Neurotoxicology and Teratology*, *14*(5), 299–311. https://doi.org/10.1016/0892-0362(92)90036-A

Furstenberg, F. F., Cook, T. D., Eccles, J., Elder, G. H., & Sameroff, A. (1999). *Managing to make it: Urban families and adolescent success*. Chicago, IL: University of Chicago Press.

Goodman, S. H., & Gotlib, I. H. (1999). Risk for psychopathology in the children of depressed mothers: a developmental model for understanding mechanisms of transmission. *Psychological Review*, *106*(3), 458–490. https://doi.org/10.1037/0033-295X.106.3.458

Gutman, L. M., Sameroff, A. J., & Cole, R. (2003). Academic Growth Curve Trajectories from 1st Grade to 12th Grade: Effects of Multiple Social Risk Factors and Preschool Child Factors. *Developmental Psychology*, *39*(4), 777–790. https://doi.org/10.1037/0012-1649.39.4.777

Hooper, S. R., Burchinal, M., Roberts, J. E., Zeisel, S. A., & Neebe, E. C. (1998). Social and family risk factors for infant development at one year: An application of the cumulative risk model. *Journal of Applied Developmental Psychology*, *19*(1), 85–96. https://doi.org/10.1016/S0193-3973(99)80029-X

Hosman, C. M. H., van Doesum, K. T. M., & van Santvoort, F. (2009). Prevention of emotional problems and psychiatric risks in children of parents with a mental illness in the Netherlands: I. The scientific basis to a comprehnsive approach. *Australian E-Journal for the Advancement of Mental Health*, *8*(3), 264–276. https://doi.org/10.5172/jamh.8.3.264

Huizink, A. C. (2015). Prenatal maternal substance use and offspring outcomes: Overview of recent findings and possible interventions. *Special Issue: Prenatal Adversity: Impact and Potential Interventions*, *20*(2), 90–101. https://doi.org/http://dx.doi.org/10.1027/1016-

9040/a000197

Hunt, R. W., Tzioumi, D., Collins, E., & Jeffery, H. E. (2008). Adverse neurodevelopmental outcome of infants exposed to opiate in-utero. *Early Human Development*, *84*(1), 29–35. https://doi.org/10.1016/j.earlhumdev.2007.01.013

Jacobson, S. W., Jacobson, J. L., Sokol, R. J., Chiodo, L. M., & Corobana, R. (2004). Maternal age, alcohol abuse history, and quality of parenting as moderators of the effects of prenatal alcohol exposure on 7.5-year intellectual function. *Alcoholism: Clinical and Experimental Research*, *28*(11). https://doi.org/10.1097/01.ALC.0000145691.81233.FA

Kettinger, L. A., Nair, P., & Schuler, M. E. (2000). Exposure to environmental risk factors and parenting attitudes among substance-abusing women. *American Journal of Drug and Alcohol Abuse*, *26*(1), 1–11. https://doi.org/10.1081/ADA-100100586

Koren, G., Nulman, I., Rovet, J., Greenbaum, R., Loebstein, M., & Einarson, T. (1998). Long-term neurodevelopmental risks in children exposed in utero to cocaine the toronto adoption study. *Annals of the New York Academy of Sciences*, *846*(1). https://doi.org/10.1111/j.1749-6632.1998.tb09747.x

Kraemer, H. C., Lowe, K. K., & Kupfer, D. J. (2005). *To your health*. New York, NY: Oxford University Press.

LaGasse, L. L., Seifer, R., & Lester, B. M. (1999). Interpreting research on prenatal substance exposure in the context of multiple confounding factors. *Clinics in Perinatology*, *26*(1), 39–54. https://doi.org/10.1016/S0095-5108(18)30071-X

Lamela, D., & Figueiredo, B. (2015). A cumulative risk model of child physical maltreatment potential: Findings from a community-based study. *Journal of Interpersonal Violence*, *33*(8), 1287–1305. https://doi.org/10.1177/0886260515615142

Leech, S. L., Richardson, G. A., Goldschmidt, L., & Day, N. L. (1999). Prenatal substance exposure: Effects on attention and impulsivity of 6-year-olds. *Neurotoxicology and Teratology*, *21*(2), 109–118. https://doi.org/10.1016/S0892-0362(98)00042-7

Lester, B. M., Boukydis, C. F. Z., & Twomey, J. E. (2000). Maternal substance abuse and child outcome. In *Handbook of Infant Mental Health*. New York, NY, US: The Guilford Press.

Lester, B. M., Tronick, E. Z., LaGasse, L., Seifer, R., Bauer, C. R., Shankaran, S., … Maza, P. L. (2002). The Maternal Lifestyle Study: Effects of Substance Exposure During Pregnancy on Neurodevelopmental Outcome in 1-Month-Old Infants. *Pediatrics*, *110*(6), 1182–1192. https://doi.org/10.1542/peds.110.6.1182

Lima, J., Caughy, M., Nettles, S. M., & O'Campo, P. J. (2010). Effects of cumulative risk on behavioral and psychological well-being in first grade: Moderation by neighborhood context. *Social Science and Medicine*, *71*(8), 1447–1454. https://doi.org/10.1016/j.socscimed.2010.06.022

Madigan, S., Wade, M., Plamondon, A., Maguire, J. L., & Jenkins, J. M. (2017). Maternal Adverse Childhood Experience and Infant Health: Biomedical and Psychosocial Risks as Intermediary Mechanisms. *Journal of Pediatrics*, *187*, 282–289. https://doi.org/10.1016/j.jpeds.2017.04.052

Martin, S. L., Ramey, G. T., & Ramey, S. (1990). The prevention of intellectual impairment in children of impoverished families: Findings of a randomized trial of educational day care. *American Journal of Public Health*, *80*, 844–847. https://doi.org/10.2105/AJPH.80.7.844

Mayes, L. C., Grillon, C., Granger, R., & Schottenfeld, R. (1998). Regulation of arousal and attention in preschool children exposed to cocaine prenatally. *Annals of the New York Academy of Sciences*, *846*(1). https://doi.org/10.1111/j.1749-6632.1998.tb09731.x

McLoyd, V. C. (1998). Socioeconomic Disadvantage and Child Development. *American Psychologist*, *53*(2), 185–204. https://doi.org/10.1037/0003-066X.53.2.185

McQueen, K. A., Murphy-Oikonen, J., & Desaulniers, L. (2015). Maternal Substance Use and Neonatal Abstinence Syndrome: A Descriptive Study. *Maternal and Child Health Journal*, *19*(8), 1756–1765. https://doi.org/10.1007/s10995-015-1689-y

Moe, V. (2002). Foster-placed and adopted children exposed in utero to opiates and other substances: Prediction and outcome at four and a half years. *Journal of Developmental and Behavioral Pediatrics*, *23*(5), 330–339. https://doi.org/10.1097/00004703-200210000-00006

Mothander, P. R. (2016). Diagnostic Classification of Mental Health and Developmental Disorders of Infancy and Early Childhood (DC: 0–3): Implementation considerations and clinical remarks. *Infant Mental Health Journal*, *37*(5), 523–524. https://doi.org/http://dx.doi.org/10.1002/imhj.21593

Motz, M., Espinet, S. D., Jeong, J. J., Major, D., Racine, N., Chamberlin, J., & Pepler, D. J. (2011). The role of the mother-child relationship in developmental outcomes of infants and young children with and without prenatal alcohol exposure. *Journal of Population Therapeutics and Clinical Pharmacology*, *18*(3), 544–563.

Mrug, S., Loosier, P. S., & Windle, M. (2008). Violence Exposure Across Multiple Contexts: Individual and Joint Effects on Adjustment. *American Journal of Orthopsychiatry*, *78*(1), 70–84. https://doi.org/10.1037/0002-9432.78.1.70

Nair, P., Schuler, M. E., Black, M. M., Kettinger, L., & Harrington, D. (2003). Cumulative environmental risk in substance abusing women: Early intervention, parenting stress, child abuse potential and child development. *Child Abuse & Neglect*, *27*(9), 997–1017.

https://doi.org/10.1016/S0145-2134(03)00169-8

Nulman, I., Rovet, J., Greenbaum, R., Loebstein, M., Wolpin, J., Pace-Asciak, P., & Koren, G. (2001). Neurodevelopment of adopted children exposed in utero to cocaine: The Toronto Adoption Study. *Clinical and Investigative Medicine*, *24*(3), 129–137.

Ostaszewski, K., & Zimmerman, M. A. (2006). The effects of cumulative risks and promotive factors on urban adolescent alcohol and other drug use: A longitudinal study of resiliency. *American Journal of Community Psychology*, *38*(3–4), 237–249. https://doi.org/10.1007/s10464-006-9076-x

Phillips, D., Thomas, K., Cox, H., & Ricciardelli, L. (2007). Factors that influence women's disclosures of substance use during pregnancy: A qualitative study of ten midwives and ten pregnant women. *Journal of Drug Issues*, *37*(2), 357–375. https://doi.org/http://dx.doi.org/10.1108/17506200710779521

Pollard, J. A., Hawkins, J. D., & Arthur, M. W. (1999). Risk and protection: Are both necessary to understand diverse behavioral outcomes in adolescence? *Social Work Research*, *23*(3), 145–158. https://doi.org/10.1093/swr/23.3.145

Rauer, A. J., Karney, B. R., Garvan, C. W., & Hou, W. (2008). Relationship risks in context: A cumulative risk approach to understanding relationship satisfaction. *Journal of Marriage and Family*, *70*(5), 1122–1135. https://doi.org/10.1111/j.1741-3737.2008.00554.x

Roberts, S. C. M., & Nuru-Jeter, A. (2010). Women's Perspectives on Screening for Alcohol and Drug Use in Prenatal Care. *Women's Health Issues*, *20*(3), 193–200. https://doi.org/10.1016/j.whi.2010.02.003

Runyan, D. K., Hunter, W. M., Socolar, R. R. S., Amaya-Jackson, L., English, D., Landsverk, J., … Mathew, R. M. (1998). Children Who Prosper in Unfavorable Environments: The

Relationship to Social Capital. *Pediatrics*, *101*(1). https://doi.org/10.1542/peds.101.1.12

Rutter, M. (1979). Protective factors in children's responses to stress and disadvantage. *Annals of the Academy of Medicine Singapore*, *8*(3), 324–338.

Rutter, Michael. (1981). Stress, coping and development: some issues and some questions. *Journal of Child Psychology and Psychiatry*, *22*(4), 323–356. https://doi.org/10.1111/j.1469-7610.1981.tb00560.x

Sameroff, A. (2006). Identifying risk and protective factors for healthy child development. In Clarke-Stewart. A. & J. Dunn (Eds.), *Families Count: Effects on Child and Adolescent Development* (pp. 53–76). Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511616259.004

Sameroff, A.J., Bartko, W. T., Baldwin, A., Baldwin, C., & Seifer, R. (1998). Family and social influences on the development of child competence. In M. Lewis & C. Feiring (Eds.), *Families, risk, and competence* (pp. 161–183). Mahwah, NJ: Erlbaum.

Sameroff, A J, Seifer, R., & McDonough, S. C. (2004). Contextual contributors to the assessment of infant mental health. In R. Del Carmen-Wiggins & A. Carter (Eds.), *Handbook of Infant, Toddler, and Preschool Mental Health Assessment* (pp. 61–76). New York: Oxford University Press.

Sameroff, Arnold J., & Rosenblum, K. L. (2006). Psychosocial constraints on the development of resilience. *Annals of the New York Academy of Sciences*, *1094*(1). https://doi.org/10.1196/annals.1376.010

Singer, L. T., Arendt, R., Minnes, S., Farkas, K., Salvator, A., Lester Kirchner, H., & Kliegman, R. (2002). Cognitive and motor outcomes of cocaine-exposed infants. *Journal of the American Medical Association*, *287*(15), 1952–1960.

https://doi.org/10.1001/jama.287.15.1952

Singer, L. T., Minnes, S., Short, E., Arendt, R., Farkas, K., Lewis, B., … Kirchner, H. L. (2004). Cognitive outcomes of preschool children with prenatal cocaine exposure. *JAMA*, *291*(20), 2448–2456. https://doi.org/10.1001/jama.291.20.2448

Singer, L, Arendt, R., Farkas, K., Minnes, S., Huang, J., & Yamashita, T. (1997). Relationship of prenatal cocaine exposure and maternal postpartum psychological distress to child developmental outcome. *Development and Psychopathology*, *9*(3), 473–489.

Singer, Lynn, Arendt, R., Minnes, S., Salvator, A., Siegel, A. C., & Lewis, B. (2001). Developing language skills of cocaine exposed infants. *Pediatrics*, *107*(5), 1057–1064.

Slesnick, N., & Erdem, G. (2012). Intervention for homeless, substance abusing mothers: Findings from a non-randomized pilot. *Behavioral Medicine*, *38*(2), 36–48. https://doi.org/10.1080/08964289.2012.657724

Slinning, K. (2004). Foster placed children prenatally exposed to poly-substances: Attention-related problems at ages 2 and 4 1/2. *European Child and Adolescent Psychiatry*, *13*(1), 19–27. https://doi.org/10.1007/s00787-004-0350-x

Spencer, M. B. (2005). Crafting identities and accessing opportunities post-Brown. *The American Psychologist*, *60*(8), 821–830. https://doi.org/10.1037/0003-066X.60.8.821

van Baar, a L., Soepatmi, S., Gunning, W. B., & Akkerhuis, G. W. (1994). Development after prenatal exposure to cocaine, heroin and methadone. *Acta Paediatrica (Oslo, Norway : 1992). Supplement*, *404*, 40–46. https://doi.org/10.1111/j.1651-2227.1994.tb13383.x

Velleman, R., & Templeton, L. J. (2007). Impact of parents substance misuse on children: an update. *BJPscyh Advances*, *13*(1), 79–89. https://doi.org/10.1192/apt.bp.114.014449

Wakschlag, L. S., & Hans, S. L. (2002). Maternal smoking during pregnancy and conduct

problems in high-risk youth: A developmental framework. *Development and Psychopathology*, *14*(2), 351–369. https://doi.org/10.1017/S0954579402002092

Warr-Leeper, G. A. (2001). A review of early intervention programs and effectiveness research for environmentally disadvantaged children. *Journal of Speech-Language Pathology & Audiology*, *25*(2), 89–102.

Wechsler, D. (2012). *Wechsler Preschool and Primary Scale of Intelligence (4th ed.)*. Bloomington, MN: Pearson.

Whipple, S. S., Evans, G. W., Barry, R. L., & Maxwell, L. E. (2010). An ecological perspective on cumulative school and neighborhood risk factors related to achievement. *Journal of Applied Developmental Psychology*, *31*(6), 422–427. https://doi.org/10.1016/j.appdev.2010.07.002

Williams, J. F., & Smith, V. C. (2015). Fetal Alcohol Spectrum Disorders. *Pediatrics*, *136*(5), e1395-406. https://doi.org/10.1542/peds.2015-3113

Williams, J. H. G., & Ross, L. (2007). Consequences of prenatal toxin exposure for mental health in children and adolescents: A systematic review. *European Child and Adolescent Psychiatry*, *16*(4), 243–253. https://doi.org/10.1007/s00787-006-0596-6

APPENDICES

Appendix A: Tables

Table I: Cumulative Risk Factor Score

DOMAIN	SCORING		
PARENT - MOTHER			
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	(0) no	unknown	(+1) yes
Family history of mental illness	(0) no	unknown	(+1) yes
Chronic medical illness	(0) no	unknown	(+1) yes
Maternal level of education: has not completed high school	(0) no	unknown	(+1) yes
Conviction history	(0) no	unknown	(+1) yes
Mother has history of child abuse/neglect	(0) no	unknown	(+1) yes
Mother has history of interpersonal violence/trauma	(0) no	unknown	(+1) yes
Maternal anxiety symptoms (clinical level – BAI)	(0) no	unknown	(+1) yes
Mother endorses depressive symptoms (clinical level – CESD-D)	(0) no	unknown	(+1) yes
Teenage parent	(0) no	unknown	(+1) yes
More than 3 births	(0) no	unknown	(+1) yes
Has tried to quit substance use ever	(0) no	unknown	(+1) yes
Reports having had withdrawal symptoms when trying to stop substance use	(0) no	unknown	(+1) yes
Low perceived social support – Family (PSS)	(0) no	unknown	(+1) yes
Low perceived social support – Friends (PSS)	(0) no	unknown	(+1) yes
Is not comfortable with closeness and intimacy (RAAS)	(0) no	unknown	(+1) yes
Does not feel she can depend on others (RAAS)	(0) no	unknown	(+1) yes
Worries about being rejected or unloved (RAAS)	(0) no	unknown	(+1) yes
Low confidence regarding ability to cope with relapse crisis situations (old DTCQ)	(0) no	unknown	(+1) yes
History of self-harm behaviours or suicide attempt	(0) no	unknown	(+1) yes
PARENT - OTHER			
Secondary parent is absent from child's life	(0) no	unknown	(+1) yes
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	(0) no	unknown	(+1) yes
Substance use	(0) no	unknown	(+1) yes
Has tried to quit substance use ever	(0) no	unknown	(+1) yes
Conviction history	(0) no	unknown	(+1) yes
Difficult/dysfunctional or abusive relationship with mother of child	(0) no	unknown	(+1) yes
FAMILY			
Maternal pregnancy/Birth of a sibling	(0) no	unknown	(+1) yes
New child adopted	(0) no	unknown	(+1) yes
More than one child in the home	(0) no	unknown	(+1) yes
Medical illness of parent or caregiver	(0) no	unknown	(+1) yes

Death of parent or important person	(0) no	unknown	(+1) yes
Other trauma to significant person in the child's life	(0) no	unknown	(+1) yes
Mother is engaged in a domestically violent relationship/Domestic violence	(0) no	unknown	(+1) yes
Has a primary relationship with substance user	(0) no	unknown	(+1) yes
Parent or caregiver traumatic divorce or separation	(0) no	unknown	(+1) yes
Custody dispute	(0) no	unknown	(+1) yes
New romantic relationship	(0) no	unknown	(+1) yes
New adult in household (e.g., romantic partner)	(0) no	unknown	(+1) yes
Parent or caregiver remarriage	(0) no	unknown	(+1) yes
Substance use by household member (non-parental)	(0) no	unknown	(+1) yes
Parental substance use relapse	(0) no	unknown	(+1) yes
Child protective services involvement	(0) no	unknown	(+1) yes
Removal of non-index child from home	(0) no	unknown	(+1) yes
Child put up for adoption	(0) no	unknown	(+1) yes
Parental unemployment or job instability	(0) no	unknown	(+1) yes
Poverty or near poverty (less than $10,000)	(0) no	unknown	(+1) yes
Head of household has no more than a semiskilled occupation	(0) no	unknown	(+1) yes
Inadequate, unsafe or overcrowded housing or homelessness	(0) no	unknown	(+1) yes
Multiple housing moves (2+)	(0) no	unknown	(+1) yes
Parental arrest	(0) no	unknown	(+1) yes
Parental incarceration (or return from incarceration)	(0) no	unknown	(+1) yes
PRE-NATAL/PREGNANCY			
Domestic violence	(0) no	unknown	(+1) yes
Alcohol use	(0) no	unknown	(+1) yes
Cannabis use	(0) no	unknown	(+1) yes
Crack/cocaine use	(0) no	unknown	(+1) yes
Heroin use	(0) no	unknown	(+1) yes
Methadone use	(0) no	unknown	(+1) yes
Other opiates use	(0) no	unknown	(+1) yes
Nicotine use	(0) no	unknown	(+1) yes
Prescription drug use	(0) no	unknown	(+1) yes
Other drug use (eg., amphetamines, hallucinogens, barbiturates/sleeping pills, sedatives/hyponotics/tranquilizers, inhalants	(0) no	unknown	(+1) yes
Poly-substance exposure versus single substance exposure during pregnancy	(0) no	unknown	(+1) yes
Continuous exposure over all three trimesters during pregnancy	(0) no	unknown	(+1) yes
Transiency	(0) no	unknown	(+1) yes
Low maternal weight gain	(0) no	unknown	(+1) yes
High blood pressure/ pre-eclampsia	(0) no	unknown	(+1) yes
Mother overweight pre-pregnancy	(0) no	unknown	(+1) yes

Poor pre-natal nutrition	(0) no	unknown	(+1) yes
Mom >35 years	(0) no	unknown	(+1) yes
Teenage pregnancy	(0) no	unknown	(+1) yes
Minimal prenatal care	(0) no	unknown	(+1) yes
History of miscarriages or terminations	(0) no	unknown	(+1) yes
Diabetes during pregnancy	(0) no	unknown	(+1) yes
Infections/STD	(0) no	unknown	(+1) yes
Anemia	(0) no	unknown	(+1) yes
Placenta Previa	(0) no	unknown	(+1) yes
Multiple fetuses	(0) no	unknown	(+1) yes
Vaginal bleeding (2^{nd} or 3^{rd} trimester)	(0) no	unknown	(+1) yes
BIRTH/POST-NATAL			
Mom >35 years	(0) no	unknown	(+1) yes
Teenage pregnancy	(0) no	unknown	(+1) yes
Caesarean delivery	(0) no	unknown	(+1) yes
Premature delivery	(0) no	unknown	(+1) yes
Birth complications	(0) no	unknown	(+1) yes
Post-partum depression	(0) no	unknown	(+1) yes
Apprehension at birth	(0) no	unknown	(+1) yes
Post-natal Medical Diagnoses:			
Fetal Alcohol Spectrum Disorder	(0) no	unknown	(+1) yes
Drug withdrawal	(0) no	unknown	(+1) yes
Genetic disorder	(0) no	unknown	(+1) yes
Seizure/tremors	(0) no	unknown	(+1) yes
Heart complications	(0) no	unknown	(+1) yes
Birth injuries	(0) no	unknown	(+1) yes
Birth defects	(0) no	unknown	(+1) yes
Breathing difficulty	(0) no	unknown	(+1) yes
Low birth weight	(0) no	unknown	(+1) yes
Meconium in placenta	(0) no	unknown	(+1) yes
Post-natal Interventions:			
Incubator	(0) no	unknown	(+1) yes
Tube feeding	(0) no	unknown	(+1) yes
Apnea monitor	(0) no	unknown	(+1) yes
Respirator (required ventilation)	(0) no	unknown	(+1) yes
Medication requires	(0) no	unknown	(+1) yes
CHILD			
Hospitalization of child	(0) no	unknown	(+1) yes
Child medical illness	(0) no	unknown	(+1) yes
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	(0) no	unknown	(+1) yes
Presence of FASD diagnosis	(0) no	unknown	(+1) yes
Child in foster care or kin care/Change in primary caregiver	(0) no	unknown	(+1) yes
Child neglect (physical, emotional)	(0) no	unknown	(+1) yes

Child abuse (physical, sexual, emotional)	(0) no	unknown	(+1) yes
Child reunification with parent after separation	(0) no	unknown	(+1) yes
Multiple changes in childcare provider	(0) no	unknown	(+1) yes
Stress surrounding child starting daycare/entered school system	(0) no	unknown	(+1) yes
Challenging temperament style	(0) no	unknown	(+1) yes
Psychosocial & Health Concerns at Intake:			
Chronic colds	(0) no	unknown	(+1) yes
Chronic respiratory problems	(0) no	unknown	(+1) yes
Chronic ear infections	(0) no	unknown	(+1) yes
Heart problems	(0) no	unknown	(+1) yes
Gastroenteritis	(0) no	unknown	(+1) yes
Limitation in mobility	(0) no	unknown	(+1) yes
Seizures	(0) no	unknown	(+1) yes
Psychological/emotional problem	(0) no	unknown	(+1) yes
Developmental delays/delays to meet developmental milestones	(0) no	unknown	(+1) yes
Injuries	(0) no	unknown	(+1) yes
Eating problems	(0) no	unknown	(+1) yes
Slow weight gain	(0) no	unknown	(+1) yes
Behind in immunization	(0) no	unknown	(+1) yes
Visual impairment	(0) no	unknown	(+1) yes
Hearing impairment	(0) no	unknown	(+1) yes
Speech impairment	(0) no	unknown	(+1) yes
Cognitive impairment	(0) no	unknown	(+1) yes
Frequent injuries	(0) no	unknown	(+1) yes
Behavioural problems	(0) no	unknown	(+1) yes
Asthma	(0) no	unknown	(+1) yes
PARENT-CHILD INTERACTION			
Low parental efficacy (BaP)	(0) no	unknown	(+1) yes
Low parental satisfaction (BaP)	(0) no	unknown	(+1) yes
High defensive responding (PSI)	(0) no	unknown	(+1) yes
High parental distress (PSI)	(0) no	unknown	(+1) yes
High parent-child dysfunctional interactions (PSI)	(0) no	unknown	(+1) yes
Mother's perception of having a difficult child (PSI)	(0) no	unknown	(+1) yes
Clinical level of stress in parenting role (PSI)	(0) no	unknown	(+1) yes
High parental expectations (AAPI)	(0) no	unknown	(+1) yes
Low parental empathy (AAPI)	(0) no	unknown	(+1) yes
Reversed familial/parent-child roles (AAPI)	(0) no	unknown	(+1) yes
High hostile ineffective parenting (NLSCY)	(0) no	unknown	(+1) yes
High inconsistent parenting (NLSCY)	(0) no	unknown	(+1) yes
Low positive parenting (NLSCY)	(0) no	unknown	(+1) yes
Reporting challenging relationship with child	(0) no	unknown	(+1) yes

Child apprehension within first three years of life	(0) no	unknown	(+1) yes
SOCIAL NETWORK			
Disadvantaged minority ethnic background	(0) no	unknown	(+1) yes
Immigrant status	(0) no	unknown	(+1) yes
Acculturation or language conflicts	(0) no	unknown	(+1) yes

Table II: Cumulative Protective Factor Score

DOMAIN	SCORING		
PARENT - MOTHER			
Attends Basic Life Skills group at BTC	(0) no	unknown	(+1) yes
Attends Emotional Awareness Life Skills group at BTC	(0) no	unknown	(+1) yes
Attends Connections group at BTC	(0) no	unknown	(+1) yes
Attends Relapse Prevention group at BTC	(0) no	unknown	(+1) yes
Attends Recovery Group at BTC	(0) no	unknown	(+1) yes
Attends Mindfulness group at BTC	(0) no	unknown	(+1) yes
In recovery for substance use	(0) no	unknown	(+1) yes
Attending substance use treatment	(0) no	unknown	(+1) yes
Accessing addiction support	(0) no	unknown	(+1) yes
Accessing urine screens	(0) no	unknown	(+1) yes
Accessing mental health support/therapy/trauma counselling	(0) no	unknown	(+1) yes
High Perceived Social Support – Family (PSS)	(0) no	unknown	(+1) yes
High Perceived Social Support – Friends (PSS)	(0) no	unknown	(+1) yes
Is comfortable with closeness and intimacy (RAAS)	(0) no	unknown	(+1) yes
Feels she can depend on others (RAAS)	(0) no	unknown	(+1) yes
Does not worry about being rejected or unloved (RAAS)	(0) no	unknown	(+1) yes
High confidence regarding ability to cope with relapse crisis situations (old DTCQ)	(0) no	unknown	(+1) yes
Maternal level of education: has completed post-secondary education	(0) no	unknown	(+1) yes
PARENT - OTHER			
No substance use history	(0) no	unknown	(+1) yes
If substance use history, in recovery for substance use	(0) no	unknown	(+1) yes
Parent attending substance use treatment	(0) no	unknown	(+1) yes
Accessing addiction support	(0) no	unknown	(+1) yes
Accessing mental health support/therapy/trauma counselling	(0) no	unknown	(+1) yes
Presence of positive secondary parental figure to child	(0) no	unknown	(+1) yes
FAMILY			
Partner supportive of maternal substance use treatment services	(0) no	unknown	(+1) yes
Family supportive of maternal substance use treatment services	(0) no	unknown	(+1) yes
Presence of extended familial supports	(0) no	unknown	(+1) yes
High SES	(0) no	unknown	(+1) yes
Accessing couples therapy services	(0) no	unknown	(+1) yes
Accessing family therapy services	(0) no	unknown	(+1) yes
Family cohesion	(0) no	unknown	(+1) yes
PRE-NATAL/PREGNANCY			
Early-intervention through BTC Pregnancy Outreach Program	(0) no	unknown	(+1) yes
Attends BTC Pregnancy Outreach Program Prenatal Relapse Prevention group	(0) no	unknown	(+1) yes

BIRTH/POST-NATAL			
Neonatal follow-up	(0) no	unknown	(+1) yes
CHILD			
Easy temperament	(0) no	unknown	(+1) yes
Child was/is in daycare	(0) no	unknown	(+1) yes
Child involved in extra-curricular activities	(0) no	unknown	(+1) yes
Child has positive teacher relationships at school/daycare	(0) no	unknown	(+1) yes
Received occupational therapy	(0) no	unknown	(+1) yes
Received speech/language therapy	(0) no	unknown	(+1) yes
Received psychological assessment	(0) no	unknown	(+1) yes
Child protective services involvement	(0) no	unknown	(+1) yes
PARENT-CHILD INTERACTION			
High parental efficacy (BaP)	(0) no	unknown	(+1) yes
High parental satisfaction (BaP)	(0) no	unknown	(+1) yes
Low parental distress (PSI)	(0) no	unknown	(+1) yes
Low parent-child dysfunctional interactions (PSI)	(0) no	unknown	(+1) yes
Mother's perception of having an easy child (PSI)	(0) no	unknown	(+1) yes
Low level of stress in parenting role (PSI)	(0) no	unknown	(+1) yes
Low parental expectations (AAPI)	(0) no	unknown	(+1) yes
High parental empathy (AAPI)	(0) no	unknown	(+1) yes
Intact familial/parent-child roles (AAPI)	(0) no	unknown	(+1) yes
Low hostile ineffective parenting (NLSCY)	(0) no	unknown	(+1) yes
Low inconsistent parenting (NLSCY)	(0) no	unknown	(+1) yes
High positive parenting (NLSCY)	(0) no	unknown	(+1) yes
Attended New Mom Support group at BTC	(0) no	unknown	(+1) yes
Attends Mother Goose group at BTC	(0) no	unknown	(+1) yes
Attends Learning Through Play group at BTC	(0) no	unknown	(+1) yes
SOCIAL NETWORK/PROFESSIONAL CARE/SERVICES			
Non-family adult support network	(0) no	unknown	(+1) yes
Public health services	(0) no	unknown	(+1) yes
High risk nurse services	(0) no	unknown	(+1) yes
Physician	(0) no	unknown	(+1) yes
Financial Allowances (e.g., ODSP, OCCS, Ontario Works)	(0) no	unknown	(+1) yes

Table III: Cumulative Risk Factor Score – A1

DOMAIN	SCORING		
PARENT - MOTHER			
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	**(0) no**	unknown	(+1) yes
Family history of mental illness	(0) no	unknown	**(+1) yes**
Chronic medical illness	**(0) no**	unknown	(+1) yes
Maternal level of education: has not completed high school	**(0) no**	unknown	(+1) yes
Conviction history	**(0) no**	unknown	(+1) yes
Mother has history of child abuse/neglect	(0) no	unknown	**(+1) yes**
Mother has history of interpersonal violence/trauma	(0) no	unknown	**(+1) yes**
Maternal anxiety symptoms (clinical level – BAI)	(0) no	unknown	**(+1) yes**
Mother endorses depressive symptoms (clinical level – CESD-D)	(0) no	unknown	**(+1) yes**
Teenage parent	(0) no	unknown	**(+1) yes**
More than 3 births	**(0) no**	unknown	(+1) yes
Has tried to quit substance use ever	(0) no	unknown	**(+1) yes**
Reports having had withdrawal symptoms when trying to stop substance use	(0) no	unknown	**(+1) yes**
Low perceived social support – Family (PSS)	**(0) no**	unknown	(+1) yes
Low perceived social support – Friends (PSS)	(0) no	unknown	**(+1) yes**
Is not comfortable with closeness and intimacy (RAAS)	(0) no	unknown	**(+1) yes**
Does not feel she can depend on others (RAAS)	(0) no	unknown	**(+1) yes**
Worries about being rejected or unloved (RAAS)	**(0) no**	unknown	(+1) yes
Low confidence regarding ability to cope with relapse crisis situations (old DTCQ)	**(0) no**	unknown	(+1) yes
History of self-harm behaviours or suicide attempt	**(0) no**	unknown	(+1) yes
PARENT - OTHER			
Secondary parent is absent from child's life	**(0) no**	unknown	(+1) yes
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	**(0) no**	unknown	(+1) yes
Substance use	(0) no	unknown	**(+1) yes**
Has tried to quit substance use ever	**(0) no**	unknown	(+1) yes
Conviction history	(0) no	unknown	**(+1) yes**
Difficult/dysfunctional or abusive relationship with mother of child	(0) no	unknown	**(+1) yes**
FAMILY			
Maternal pregnancy/Birth of a sibling	(0) no	unknown	**(+1) yes**
New child adopted	**(0) no**	unknown	(+1) yes
More than one child in the home	(0) no	unknown	**(+1) yes**
Medical illness of parent or caregiver	**(0) no**	unknown	(+1) yes
Death of parent or important person	**(0) no**	unknown	(+1) yes
Other trauma to significant person in the child's life	**(0) no**	unknown	(+1) yes
Mother is engaged in a domestically violent relationship/Domestic violence	(0) no	unknown	**(+1) yes**

Has a primary relationship with substance user	(0) no	unknown	**(+1) yes**
Parent or caregiver traumatic divorce or separation	(0) no	unknown	**(+1) yes**
Custody dispute	**(0) no**	unknown	(+1) yes
New romantic relationship	(0) no	unknown	**(+1) yes**
New adult in household (e.g., romantic partner)	**(0) no**	unknown	(+1) yes
Parent or caregiver remarriage	**(0) no**	unknown	(+1) yes
Substance use by household member (non-parental)	(0) no	unknown	**(+1) yes**
Parental substance use relapse	(0) no	unknown	**(+1) yes**
Child protective services involvement	(0) no	unknown	**(+1) yes**
Removal of non-index child from home	**(0) no**	unknown	(+1) yes
Child put up for adoption	**(0) no**	unknown	(+1) yes
Parental unemployment or job instability	(0) no	unknown	**(+1) yes**
Poverty or near poverty (less than $10,000)	(0) no	unknown	**(+1) yes**
Head of household has no more than a semiskilled occupation	(0) no	unknown	**(+1) yes**
Inadequate, unsafe or overcrowded housing or homelessness	**(0) no**	unknown	(+1) yes
Multiple housing moves (2+)	**(0) no**	unknown	(+1) yes
Parental arrest	(0) no	unknown	**(+1) yes**
Parental incarceration (or return from incarceration)	(0) no	unknown	**(+1) yes**
PRE-NATAL/PREGNANCY			
Domestic violence	**(0) no**	unknown	(+1) yes
Alcohol use	**(0) no**	unknown	(+1) yes
Cannabis use	**(0) no**	unknown	(+1) yes
Crack/cocaine use	**(0) no**	unknown	(+1) yes
Heroin use	**(0) no**	unknown	(+1) yes
Methadone use	**(0) no**	unknown	(+1) yes
Other opiates use	**(0) no**	unknown	(+1) yes
Nicotine use	**(0) no**	unknown	(+1) yes
Prescription drug use	**(0) no**	unknown	(+1) yes
Other drug use (eg., amphetamines, hallucinogens, barbiturates/sleeping pills, sedatives/hyponotics/tranquilizers, inhalants	**(0) no**	unknown	(+1) yes
Poly-substance exposure versus single substance exposure during pregnancy	**(0) no**	unknown	(+1) yes
Continuous exposure over all three trimesters during pregnancy	**(0) no**	unknown	(+1) yes
Transiency	**(0) no**	unknown	(+1) yes
Low maternal weight gain	**(0) no**	unknown	(+1) yes
High blood pressure/ pre-eclampsia	**(0) no**	unknown	(+1) yes
Mother overweight pre-pregnancy	**(0) no**	unknown	(+1) yes
Poor pre-natal nutrition	**(0) no**	unknown	(+1) yes
Mom >35 years	**(0) no**	unknown	(+1) yes
Teenage pregnancy	(0) no	unknown	**(+1) yes**
Minimal prenatal care	**(0) no**	unknown	(+1) yes

History of miscarriages or terminations	**(0) no**	unknown	(+1) yes
Diabetes during pregnancy	**(0) no**	unknown	(+1) yes
Infections/STD	**(0) no**	unknown	(+1) yes
Anemia	**(0) no**	unknown	(+1) yes
Placenta Previa	**(0) no**	unknown	(+1) yes
Multiple fetuses	**(0) no**	unknown	(+1) yes
Vaginal bleeding (2nd or 3rd trimester)	**(0) no**	unknown	(+1) yes
BIRTH/POST-NATAL			
Mom >35 years	**(0) no**	unknown	(+1) yes
Teenage pregnancy	(0) no	unknown	**(+1) yes**
Caesarean delivery	**(0) no**	unknown	(+1) yes
Premature delivery	**(0) no**	unknown	(+1) yes
Birth complications	**(0) no**	unknown	(+1) yes
Post-partum depression	**(0) no**	unknown	(+1) yes
Apprehension at birth	**(0) no**	unknown	(+1) yes
Post-natal Medical Diagnoses:			
Fetal Alcohol Spectrum Disorder	**(0) no**	unknown	(+1) yes
Drug withdrawal	**(0) no**	unknown	(+1) yes
Genetic disorder	**(0) no**	unknown	(+1) yes
Seizure/tremors	**(0) no**	unknown	(+1) yes
Heart complications	**(0) no**	unknown	(+1) yes
Birth injuries	**(0) no**	unknown	(+1) yes
Birth defects	**(0) no**	unknown	(+1) yes
Breathing difficulty	**(0) no**	unknown	(+1) yes
Low birth weight	**(0) no**	unknown	(+1) yes
Meconium in placenta	**(0) no**	unknown	(+1) yes
Post-natal Interventions:			
Incubator	**(0) no**	unknown	(+1) yes
Tube feeding	**(0) no**	unknown	(+1) yes
Apnea monitor	**(0) no**	unknown	(+1) yes
Respirator (required ventilation)	**(0) no**	unknown	(+1) yes
Medication requires	**(0) no**	unknown	(+1) yes
CHILD			
Hospitalization of child	**(0) no**	unknown	(+1) yes
Child medical illness	**(0) no**	unknown	(+1) yes
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	(0) no	unknown	**(+1) yes**
Presence of FASD diagnosis	**(0) no**	unknown	(+1) yes
Child in foster care or kin care/Change in primary caregiver	(0) no	unknown	**(+1) yes**
Child neglect (physical, emotional)	**(0) no**	unknown	(+1) yes
Child abuse (physical, sexual, emotional)	**(0) no**	unknown	(+1) yes
Child reunification with parent after separation	(0) no	unknown	**(+1) yes**
Multiple changes in childcare provider	**(0) no**	unknown	(+1) yes

Stress surrounding child starting daycare/entered school system	(0) no	unknown	**(+1) yes**
Challenging temperament style	**(0) no**	unknown	(+1) yes
Psychosocial & Health Concerns at Intake:			
Chronic colds	**(0) no**	unknown	(+1) yes
Chronic respiratory problems	**(0) no**	unknown	(+1) yes
Chronic ear infections	**(0) no**	unknown	(+1) yes
Heart problems	**(0) no**	unknown	(+1) yes
Gastroenteritis	**(0) no**	unknown	(+1) yes
Limitation in mobility	**(0) no**	unknown	(+1) yes
Seizures	**(0) no**	unknown	(+1) yes
Psychological/emotional problem	**(0) no**	unknown	(+1) yes
Developmental delays/delays to meet developmental milestones	**(0) no**	unknown	(+1) yes
Injuries	**(0) no**	unknown	(+1) yes
Eating problems	**(0) no**	unknown	(+1) yes
Slow weight gain	**(0) no**	unknown	(+1) yes
Behind in immunization	**(0) no**	unknown	(+1) yes
Visual impairment	**(0) no**	unknown	(+1) yes
Hearing impairment	**(0) no**	unknown	(+1) yes
Speech impairment	**(0) no**	unknown	(+1) yes
Cognitive impairment	**(0) no**	unknown	(+1) yes
Frequent injuries	**(0) no**	unknown	(+1) yes
Behavioural problems	(0) no	unknown	**(+1) yes**
Asthma	**(0) no**	unknown	(+1) yes
PARENT-CHILD INTERACTION			
Low parental efficacy (BaP)	**(0) no**	unknown	(+1) yes
Low parental satisfaction (BaP)	**(0) no**	unknown	(+1) yes
High defensive responding (PSI)	**(0) no**	unknown	(+1) yes
High parental distress (PSI)	(0) no	unknown	**(+1) yes**
High parent-child dysfunctional interactions (PSI)	**(0) no**	unknown	(+1) yes
Mother's perception of having a difficult child (PSI)	**(0) no**	unknown	(+1) yes
Clinical level of stress in parenting role (PSI)	**(0) no**	unknown	(+1) yes
High parental expectations (AAPI)	**(0) no**	unknown	(+1) yes
Low parental empathy (AAPI)	**(0) no**	unknown	(+1) yes
Reversed familial/parent-child roles (AAPI)	**(0) no**	unknown	(+1) yes
High hostile ineffective parenting (NLSCY)	**(0) no**	unknown	(+1) yes
High inconsistent parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Low positive parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Reporting challenging relationship with child	(0) no	unknown	**(+1) yes**
Child apprehension within first three years of life	(0) no	unknown	**(+1) yes**
SOCIAL NETWORK			
Disadvantaged minority ethnic background	**(0) no**	unknown	(+1) yes

Immigrant status	**(0) no**	unknown	(+1) yes
Acculturation or language conflicts	**(0) no**	unknown	(+1) yes

Table IV: Cumulative Protective Factor Score – A1			
DOMAIN	**SCORING**		
PARENT - MOTHER			
Attends Basic Life Skills group at BTC	**(0) no**	unknown	(+1) yes
Attends Emotional Awareness Life Skills group at BTC	**(0) no**	unknown	(+1) yes
Attends Connections group at BTC	(0) no	unknown	**(+1) yes**
Attends Relapse Prevention group at BTC	**(0) no**	unknown	(+1) yes
Attends Recovery Group at BTC	**(0) no**	unknown	(+1) yes
Attends Mindfulness group at BTC	**(0) no**	unknown	(+1) yes
In recovery for substance use	(0) no	unknown	**(+1) yes**
Attending substance use treatment	(0) no	unknown	**(+1) yes**
Accessing addiction support	**(0) no**	unknown	(+1) yes
Accessing urine screens	(0) no	unknown	**(+1) yes**
Accessing mental health support/therapy/trauma counselling	**(0) no**	unknown	(+1) yes
High Perceived Social Support – Family (PSS)	**(0) no**	unknown	(+1) yes
High Perceived Social Support – Friends (PSS)	**(0) no**	unknown	(+1) yes
Is comfortable with closeness and intimacy (RAAS)	**(0) no**	unknown	(+1) yes
Feels she can depend on others (RAAS)	**(0) no**	unknown	(+1) yes
Does not worry about being rejected or unloved (RAAS)	**(0) no**	unknown	(+1) yes
High confidence regarding ability to cope with relapse crisis situations (old DTCQ)	**(0) no**	unknown	(+1) yes
Maternal level of education: has completed post-secondary education	**(0) no**	unknown	(+1) yes
PARENT - OTHER			
No substance use history	**(0) no**	unknown	(+1) yes
If substance use history, in recovery for substance use	**(0) no**	unknown	(+1) yes
Parent attending substance use treatment	**(0) no**	unknown	(+1) yes
Accessing addiction support	**(0) no**	unknown	(+1) yes
Accessing mental health support/therapy/trauma counselling	**(0) no**	unknown	(+1) yes
Presence of positive secondary parental figure to child	**(0) no**	unknown	(+1) yes
FAMILY			
Partner supportive of maternal substance use treatment services	**(0) no**	unknown	(+1) yes
Family supportive of maternal substance use treatment services	(0) no	unknown	**(+1) yes**
Presence of extended familial supports	(0) no	unknown	**(+1) yes**
High SES	**(0) no**	unknown	(+1) yes
Accessing couples therapy services	**(0) no**	unknown	(+1) yes
Accessing family therapy services	**(0) no**	unknown	(+1) yes
Family cohesion	**(0) no**	unknown	(+1) yes
PRE-NATAL/PREGNANCY			
Early-intervention through BTC Pregnancy Outreach Program	**(0) no**	unknown	(+1) yes

Attends BTC Pregnancy Outreach Program Prenatal Relapse Prevention group	**(0) no**	unknown	(+1) yes
BIRTH/POST-NATAL			
Neonatal follow-up	**(0) no**	unknown	(+1) yes
CHILD			
Easy temperament	(0) no	unknown	**(+1) yes**
Child was/is in daycare	(0) no	unknown	**(+1) yes**
Child involved in extra-curricular activities	**(0) no**	unknown	(+1) yes
Child has positive teacher relationships at school/daycare	**(0) no**	unknown	(+1) yes
Received occupational therapy	**(0) no**	unknown	(+1) yes
Received speech/language therapy	**(0) no**	unknown	(+1) yes
Received psychological assessment	(0) no	unknown	**(+1) yes**
Child protective services involvement	(0) no	unknown	**(+1) yes**
PARENT-CHILD INTERACTION			
High parental efficacy (BaP)	**(0) no**	unknown	(+1) yes
High parental satisfaction (BaP)	**(0) no**	unknown	(+1) yes
Low parental distress (PSI)	**(0) no**	unknown	(+1) yes
Low parent-child dysfunctional interactions (PSI)	**(0) no**	unknown	(+1) yes
Mother's perception of having an easy child (PSI)	**(0) no**	unknown	(+1) yes
Low level of stress in parenting role (PSI)	**(0) no**	unknown	(+1) yes
Low parental expectations (AAPI)	(0) no	unknown	**(+1) yes**
High parental empathy (AAPI)	(0) no	unknown	**(+1) yes**
Intact familial/parent-child roles (AAPI)	(0) no	unknown	**(+1) yes**
Low hostile ineffective parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Low inconsistent parenting (NLSCY)	**(0) no**	unknown	(+1) yes
High positive parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Attended New Mom Support group at BTC	**(0) no**	unknown	(+1) yes
Attends Mother Goose group at BTC	(0) no	unknown	**(+1) yes**
Attends Learning Through Play group at BTC	**(0) no**	unknown	(+1) yes
SOCIAL NETWORK/PROFESSIONAL CARE/SERVICES			
Non-family adult support network	**(0) no**	unknown	(+1) yes
Public health services	**(0) no**	unknown	(+1) yes
High risk nurse services	**(0) no**	unknown	(+1) yes
Physician	(0) no	unknown	**(+1) yes**
Financial Allowances (e.g., ODSP, OCCS, Ontario Works)	(0) no	unknown	**(+1) yes**

Table V: Cumulative Risk Factor Score – A2

DOMAIN	SCORING		
PARENT - MOTHER			
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	**(0) no**	unknown	(+1) yes
Family history of mental illness	(0) no	unknown	**(+1) yes**
Chronic medical illness	**(0) no**	unknown	(+1) yes
Maternal level of education: has not completed high school	**(0) no**	unknown	(+1) yes
Conviction history	**(0) no**	unknown	(+1) yes
Mother has history of child abuse/neglect	(0) no	unknown	**(+1) yes**
Mother has history of interpersonal violence/trauma	(0) no	unknown	**(+1) yes**
Maternal anxiety symptoms (clinical level – BAI)	(0) no	unknown	**(+1) yes**
Mother endorses depressive symptoms (clinical level – CESD-D)	(0) no	unknown	**(+1) yes**
Teenage parent	(0) no	unknown	**(+1) yes**
More than 3 births	**(0) no**	unknown	(+1) yes
Has tried to quit substance use ever	(0) no	unknown	**(+1) yes**
Reports having had withdrawal symptoms when trying to stop substance use	(0) no	unknown	**(+1) yes**
Low perceived social support – Family (PSS)	**(0) no**	unknown	(+1) yes
Low perceived social support – Friends (PSS)	(0) no	unknown	**(+1) yes**
Is not comfortable with closeness and intimacy (RAAS)	(0) no	unknown	**(+1) yes**
Does not feel she can depend on others (RAAS)	(0) no	unknown	**(+1) yes**
Worries about being rejected or unloved (RAAS)	**(0) no**	unknown	(+1) yes
Low confidence regarding ability to cope with relapse crisis situations (old DTCQ)	**(0) no**	unknown	(+1) yes
History of self-harm behaviours	**(0) no**	unknown	(+1) yes
PARENT - OTHER			
Secondary parent is absent from child's life	(0) no	unknown	**(+1) yes**
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	**(0) no**	unknown	(+1) yes
Substance use	(0) no	unknown	**(+1) yes**
Has tried to quit substance use ever	**(0) no**	unknown	(+1) yes
Conviction history	(0) no	unknown	**(+1) yes**
Difficult/dysfunctional or abusive relationship with mother of child	(0) no	unknown	**(+1) yes**
FAMILY			
Maternal pregnancy/Birth of a sibling	**(0) no**	unknown	(+1) yes
New child adopted	**(0) no**	unknown	(+1) yes
More than one child in the home	(0) no	unknown	**(+1) yes**
Medical illness of parent or caregiver	**(0) no**	unknown	(+1) yes
Death of parent or important person	**(0) no**	unknown	(+1) yes
Other trauma to significant person in the child's life	**(0) no**	unknown	(+1) yes
Mother is engaged in a domestically violent relationship/Domestic violence	**(0) no**	unknown	(+1) yes

Has a primary relationship with substance user	**(0) no**	unknown	(+1) yes
Parent or caregiver traumatic divorce or separation	(0) no	unknown	**(+1) yes**
Custody dispute	**(0) no**	unknown	(+1) yes
New romantic relationship	(0) no	unknown	**(+1) yes**
New adult in household (e.g., romantic partner)	**(0) no**	unknown	(+1) yes
Parent or caregiver remarriage	**(0) no**	unknown	(+1) yes
Substance use by household member (non-parental)	(0) no	unknown	**(+1) yes**
Parental substance use relapse	(0) no	unknown	**(+1) yes**
Child protective services involvement	**(0) no**	unknown	(+1) yes
Removal of non-index child from home	**(0) no**	unknown	(+1) yes
Child put up for adoption	**(0) no**	unknown	(+1) yes
Parental unemployment or job instability	(0) no	unknown	**(+1) yes**
Poverty or near poverty (less than $10,000)	(0) no	unknown	**(+1) yes**
Head of household has no more than a semiskilled occupation	(0) no	unknown	**(+1) yes**
Inadequate, unsafe or overcrowded housing or homelessness	**(0) no**	unknown	(+1) yes
Multiple housing moves (2+)	**(0) no**	unknown	(+1) yes
Parental arrest	(0) no	unknown	**(+1) yes**
Parental incarceration (or return from incarceration)	(0) no	unknown	**(+1) yes**
PRE-NATAL/PREGNANCY			
Domestic violence	(0) no	unknown	**(+1) yes**
Alcohol use	**(0) no**	unknown	(+1) yes
Cannabis use	**(0) no**	unknown	(+1) yes
Crack/cocaine use	(0) no	unknown	**(+1) yes**
Heroin use	**(0) no**	unknown	(+1) yes
Methadone use	(0) no	unknown	**(+1) yes**
Other opiates use	(0) no	unknown	**(+1) yes**
Nicotine use	**(0) no**	unknown	(+1) yes
Prescription drug use	(0) no	unknown	**(+1) yes**
Other drug use (eg., amphetamines, hallucinogens, barbiturates/sleeping pills, sedatives/hyponotics/tranquilizers, inhalants	**(0) no**	unknown	(+1) yes
Poly-substance exposure versus single substance exposure during pregnancy	(0) no	unknown	**(+1) yes**
Continuous exposure over all three trimesters during pregnancy	(0) no	unknown	**(+1) yes**
Transiency	**(0) no**	unknown	(+1) yes
Low maternal weight gain	**(0) no**	unknown	(+1) yes
High blood pressure/ pre-eclampsia	**(0) no**	unknown	(+1) yes
Mother overweight pre-pregnancy	**(0) no**	unknown	(+1) yes
Poor pre-natal nutrition	(0) no	unknown	**(+1) yes**
Mom >35 years	**(0) no**	unknown	(+1) yes
Teenage pregnancy	(0) no	unknown	**(+1) yes**
Minimal prenatal care	**(0) no**	unknown	(+1) yes

History of miscarriages or terminations	(0) no	unknown	**(+1) yes**
Diabetes during pregnancy	**(0) no**	unknown	(+1) yes
Infections/STD	**(0) no**	unknown	(+1) yes
Anemia	**(0) no**	unknown	(+1) yes
Placenta Previa	**(0) no**	unknown	(+1) yes
Multiple fetuses	**(0) no**	unknown	(+1) yes
Vaginal bleeding (2nd or 3rd trimester)	**(0) no**	unknown	(+1) yes
BIRTH/POST-NATAL			
Mom >35 years	**(0) no**	unknown	(+1) yes
Teenage pregnancy	(0) no	unknown	**(+1) yes**
Caesarean delivery	**(0) no**	unknown	(+1) yes
Premature delivery	**(0) no**	unknown	(+1) yes
Birth complications	**(0) no**	unknown	(+1) yes
Post-partum depression	**(0) no**	unknown	(+1) yes
Apprehension at birth	**(0) no**	unknown	(+1) yes
Post-natal Medical Diagnoses:			
Fetal Alcohol Spectrum Disorder	**(0) no**	unknown	(+1) yes
Drug withdrawal	(0) no	unknown	**(+1) yes**
Genetic disorder	**(0) no**	unknown	(+1) yes
Seizure/tremors	**(0) no**	unknown	(+1) yes
Heart complications	**(0) no**	unknown	(+1) yes
Birth injuries	**(0) no**	unknown	(+1) yes
Birth defects	**(0) no**	unknown	(+1) yes
Breathing difficulty	**(0) no**	unknown	(+1) yes
Low birth weight	**(0) no**	unknown	(+1) yes
Meconium in placenta	**(0) no**	unknown	(+1) yes
Post-natal Interventions:			
Incubator	(0) no	unknown	**(+1) yes**
Tube feeding	**(0) no**	unknown	(+1) yes
Apnea monitor	(0) no	unknown	**(+1) yes**
Respirator (required ventilation)	**(0) no**	unknown	(+1) yes
Medication requires	**(0) no**	unknown	(+1) yes
CHILD			
Hospitalization of child	**(0) no**	unknown	(+1) yes
Child medical illness	**(0) no**	unknown	(+1) yes
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	**(0) no**	unknown	(+1) yes
Presence of FASD diagnosis	**(0) no**	unknown	(+1) yes
Child in foster care or kin care/Change in primary caregiver	**(0) no**	unknown	(+1) yes
Child neglect (physical, emotional)	**(0) no**	unknown	(+1) yes
Child abuse (physical, sexual, emotional)	**(0) no**	unknown	(+1) yes
Child reunification with parent after separation	**(0) no**	unknown	(+1) yes
Multiple changes in childcare provider	**(0) no**	unknown	(+1) yes

Stress surrounding child starting daycare/entered school system	**(0) no**	unknown	(+1) yes
Challenging temperament style	**(0) no**	unknown	(+1) yes
Psychosocial & Health Concerns at Intake:			
Chronic colds	(0) no	unknown	**(+1) yes**
Chronic respiratory problems	**(0) no**	unknown	(+1) yes
Chronic ear infections	**(0) no**	unknown	(+1) yes
Heart problems	**(0) no**	unknown	(+1) yes
Gastroenteritis	**(0) no**	unknown	(+1) yes
Limitation in mobility	**(0) no**	unknown	(+1) yes
Seizures	**(0) no**	unknown	(+1) yes
Psychological/emotional problem	**(0) no**	unknown	(+1) yes
Developmental delays/delays to meet developmental milestones	**(0) no**	unknown	(+1) yes
Injuries	**(0) no**	unknown	(+1) yes
Eating problems	**(0) no**	unknown	(+1) yes
Slow weight gain	**(0) no**	unknown	(+1) yes
Behind in immunization	**(0) no**	unknown	(+1) yes
Visual impairment	**(0) no**	unknown	(+1) yes
Hearing impairment	**(0) no**	unknown	(+1) yes
Speech impairment	**(0) no**	unknown	(+1) yes
Cognitive impairment	**(0) no**	unknown	(+1) yes
Frequent injuries	**(0) no**	unknown	(+1) yes
Behavioural problems	**(0) no**	unknown	(+1) yes
Asthma	**(0) no**	unknown	(+1) yes
PARENT-CHILD INTERACTION			
Low parental efficacy (BaP)	**(0) no**	unknown	(+1) yes
Low parental satisfaction (BaP)	**(0) no**	unknown	(+1) yes
High defensive responding (PSI)	**(0) no**	unknown	(+1) yes
High parental distress (PSI)	**(0) no**	unknown	(+1) yes
High parent-child dysfunctional interactions (PSI)	**(0) no**	unknown	(+1) yes
Mother's perception of having a difficult child (PSI)	**(0) no**	unknown	(+1) yes
Clinical level of stress in parenting role (PSI)	**(0) no**	unknown	(+1) yes
High parental expectations (AAPI)	**(0) no**	unknown	(+1) yes
Low parental empathy (AAPI)	**(0) no**	unknown	(+1) yes
Reversed familial/parent-child roles (AAPI)	**(0) no**	unknown	(+1) yes
High hostile ineffective parenting (NLSCY)	(0) no	**unknown**	(+1) yes
High inconsistent parenting (NLSCY)	(0) no	**unknown**	(+1) yes
Low positive parenting (NLSCY)	(0) no	**unknown**	(+1) yes
Reporting challenging relationship with child	**(0) no**	unknown	(+1) yes
Child apprehension within first three years of life	**(0) no**	unknown	(+1) yes
SOCIAL NETWORK			
Disadvantaged minority ethnic background	**(0) no**	unknown	(+1) yes

Immigrant status	**(0) no**	unknown	(+1) yes
Acculturation or language conflicts	**(0) no**	unknown	(+1) yes

Table VI: Cumulative Protective Factor Score – A2

DOMAIN	SCORING		
PARENT - MOTHER			
Attends Basic Life Skills group at BTC	**(0) no**	unknown	(+1) yes
Attends Emotional Awareness Life Skills group at BTC	**(0) no**	unknown	(+1) yes
Attends Connections group at BTC	(0) no	unknown	**(+1) yes**
Attends Relapse Prevention group at BTC	**(0) no**	unknown	(+1) yes
Attends Recovery Group at BTC	**(0) no**	unknown	(+1) yes
Attends Mindfulness group at BTC	**(0) no**	unknown	(+1) yes
In recovery for substance use	(0) no	unknown	**(+1) yes**
Attending substance use treatment	(0) no	unknown	**(+1) yes**
Accessing addiction support	**(0) no**	unknown	(+1) yes
Accessing urine screens	(0) no	unknown	**(+1) yes**
Accessing mental health support/therapy/trauma counselling	**(0) no**	unknown	(+1) yes
High Perceived Social Support – Family (PSS)	**(0) no**	unknown	(+1) yes
High Perceived Social Support – Friends (PSS)	**(0) no**	unknown	(+1) yes
Is comfortable with closeness and intimacy (RAAS)	**(0) no**	unknown	(+1) yes
Feels she can depend on others (RAAS)	**(0) no**	unknown	(+1) yes
Does not worry about being rejected or unloved (RAAS)	**(0) no**	unknown	(+1) yes
High confidence regarding ability to cope with relapse crisis situations (old DTCQ)	**(0) no**	unknown	(+1) yes
Maternal level of education: has completed post-secondary education	**(0) no**	unknown	(+1) yes
PARENT - OTHER			
No substance use history	**(0) no**	unknown	(+1) yes
If substance use history, in recovery for substance use	**(0) no**	unknown	(+1) yes
Parent attending substance use treatment	**(0) no**	unknown	(+1) yes
Accessing addiction support	**(0) no**	unknown	(+1) yes
Accessing mental health support/therapy/trauma counselling	**(0) no**	unknown	(+1) yes
Presence of positive secondary parental figure to child	**(0) no**	unknown	(+1) yes
FAMILY			
Partner supportive of maternal substance use treatment services	**(0) no**	unknown	(+1) yes
Family supportive of maternal substance use treatment services	(0) no	unknown	**(+1) yes**
Presence of extended familial supports	(0) no	unknown	**(+1) yes**
High SES	**(0) no**	unknown	(+1) yes
Accessing couples therapy services	**(0) no**	unknown	(+1) yes
Accessing family therapy services	**(0) no**	unknown	(+1) yes
Family cohesion	**(0) no**	unknown	(+1) yes
PRE-NATAL/PREGNANCY			
Early-intervention through BTC Pregnancy Outreach Program	(0) no	unknown	**(+1) yes**

Attends BTC Pregnancy Outreach Program Prenatal Relapse Prevention group	**(0) no**	unknown	(+1) yes
BIRTH/POST-NATAL			
Neonatal follow-up	**(0) no**	unknown	(+1) yes
CHILD			
Easy temperament	(0) no	unknown	**(+1) yes**
Child was/is in daycare	(0) no	unknown	**(+1) yes**
Child involved in extra-curricular activities	**(0) no**	unknown	(+1) yes
Child has positive teacher relationships at school/daycare	**(0) no**	unknown	(+1) yes
Received occupational therapy	**(0) no**	unknown	(+1) yes
Received speech/language therapy	(0) no	unknown	**(+1) yes**
Received psychological assessment	(0) no	unknown	**(+1) yes**
Child protective services involvement	(0) no	unknown	**(+1) yes**
PARENT-CHILD INTERACTION			
High parental efficacy (BaP)	(0) no	unknown	**(+1) yes**
High parental satisfaction (BaP)	**(0) no**	unknown	(+1) yes
Low parental distress (PSI)	**(0) no**	unknown	(+1) yes
Low parent-child dysfunctional interactions (PSI)	**(0) no**	unknown	(+1) yes
Mother's perception of having an easy child (PSI)	(0) no	unknown	**(+1) yes**
Low level of stress in parenting role (PSI)	(0) no	unknown	**(+1) yes**
Low parental expectations (AAPI)	(0) no	unknown	**(+1) yes**
High parental empathy (AAPI)	(0) no	unknown	**(+1) yes**
Intact familial/parent-child roles (AAPI)	(0) no	unknown	**(+1) yes**
Low hostile ineffective parenting (NLSCY)	(0) no	**unknown**	(+1) yes
Low inconsistent parenting (NLSCY)	(0) no	**unknown**	(+1) yes
High positive parenting (NLSCY)	(0) no	**unknown**	(+1) yes
Attended New Mom Support group at BTC	**(0) no**	unknown	(+1) yes
Attends Mother Goose group at BTC	(0) no	unknown	**(+1) yes**
Attends Learning Through Play group at BTC	**(0) no**	unknown	(+1) yes
SOCIAL NETWORK/PROFESSIONAL CARE/SERVICES			
Non-family adult support network	**(0) no**	unknown	(+1) yes
Public health services	**(0) no**	unknown	(+1) yes
High risk nurse services	**(0) no**	unknown	(+1) yes
Physician	(0) no	unknown	**(+1) yes**
Financial Allowances (e.g., ODSP, OCCS, Ontario Works)	(0) no	unknown	**(+1) yes**

Table VII: Cumulative Risk Factor Score – B1			
DOMAIN	**SCORING**		
PARENT - MOTHER			
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	(0) no	unknown	**(+1) yes**
Family history of mental illness	(0) no	unknown	**(+1) yes**
Chronic medical illness	**(0) no**	unknown	(+1) yes
Maternal level of education: has not completed high school	**(0) no**	unknown	(+1) yes
Conviction history	**(0) no**	unknown	(+1) yes
Mother has history of child abuse/neglect	(0) no	unknown	**(+1) yes**
Mother has history of interpersonal violence/trauma	**(0) no**	unknown	(+1) yes
Maternal anxiety symptoms (clinical level – BAI)	**(0) no**	unknown	(+1) yes
Mother endorses depressive symptoms (clinical level – CESD-D)	(0) no	unknown	**(+1) yes**
Teenage parent	**(0) no**	unknown	(+1) yes
More than 3 births	(0) no	unknown	**(+1) yes**
Has tried to quit substance use ever	(0) no	unknown	**(+1) yes**
Reports having had withdrawal symptoms when trying to stop substance use	(0) no	unknown	**(+1) yes**
Low perceived social support – Family (PSS)	**(0) no**	unknown	(+1) yes
Low perceived social support – Friends (PSS)	**(0) no**	unknown	(+1) yes
Is not comfortable with closeness and intimacy (RAAS)	(0) no	unknown	**(+1) yes**
Does not feel she can depend on others (RAAS)	(0) no	unknown	**(+1) yes**
Worries about being rejected or unloved (RAAS)	**(0) no**	unknown	(+1) yes
Low confidence regarding ability to cope with relapse crisis situations (old DTCQ)	**(0) no**	unknown	(+1) yes
History of self-harm behaviours or suicide attempt	**(0) no**	unknown	(+1) yes
PARENT - OTHER			
Secondary parent is absent from child's life	**(0) no**	unknown	(+1) yes
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	**(0) no**	unknown	(+1) yes
Substance use	(0) no	unknown	**(+1) yes**
Has tried to quit substance use ever	(0) no	unknown	**(+1) yes**
Conviction history	**(0) no**	unknown	(+1) yes
Difficult/dysfunctional or abusive relationship with mother of child	(0) no	unknown	**(+1) yes**
FAMILY			
Maternal pregnancy/Birth of a sibling	(0) no	unknown	**(+1) yes**
New child adopted	**(0) no**	unknown	(+1) yes
More than one child in the home	(0) no	unknown	**(+1) yes**
Medical illness of parent or caregiver	**(0) no**	unknown	(+1) yes
Death of parent or important person	**(0) no**	unknown	(+1) yes
Other trauma to significant person in the child's life	**(0) no**	unknown	(+1) yes
Mother is engaged in a domestically violent relationship/Domestic violence	**(0) no**	unknown	(+1) yes

Has a primary relationship with substance user	(0) no	unknown	**(+1) yes**
Parent or caregiver traumatic divorce or separation	**(0) no**	unknown	(+1) yes
Custody dispute	**(0) no**	unknown	(+1) yes
New romantic relationship	**(0) no**	unknown	(+1) yes
New adult in household (e.g., romantic partner)	**(0) no**	unknown	(+1) yes
Parent or caregiver remarriage	**(0) no**	unknown	(+1) yes
Substance use by household member (non-parental)	**(0) no**	unknown	(+1) yes
Parental substance use relapse	**(0) no**	unknown	(+1) yes
Child protective services involvement	(0) no	unknown	**(+1) yes**
Removal of non-index child from home	**(0) no**	unknown	(+1) yes
Child put up for adoption	**(0) no**	unknown	(+1) yes
Parental unemployment or job instability	(0) no	unknown	**(+1) yes**
Poverty or near poverty (less than $10,000)	(0) no	unknown	**(+1) yes**
Head of household has no more than a semiskilled occupation	(0) no	unknown	**(+1) yes**
Inadequate, unsafe or overcrowded housing or homelessness	(0) no	unknown	**(+1) yes**
Multiple housing moves (2+)	**(0) no**	unknown	(+1) yes
Parental arrest	**(0) no**	unknown	(+1) yes
Parental incarceration (or return from incarceration)	**(0) no**	unknown	(+1) yes
PRE-NATAL/PREGNANCY			
Domestic violence	**(0) no**	unknown	(+1) yes
Alcohol use	(0) no	unknown	**(+1) yes**
Cannabis use	**(0) no**	unknown	(+1) yes
Crack/cocaine use	**(0) no**	unknown	(+1) yes
Heroin use	**(0) no**	unknown	(+1) yes
Methadone use	(0) no	unknown	**(+1) yes**
Other opiates use	**(0) no**	unknown	(+1) yes
Nicotine use	(0) no	unknown	**(+1) yes**
Prescription drug use	**(0) no**	unknown	(+1) yes
Other drug use (eg., amphetamines, hallucinogens, barbiturates/sleeping pills, sedatives/hyponotics/tranquilizers, inhalants	**(0) no**	unknown	(+1) yes
Poly-substance exposure versus single substance exposure during pregnancy	(0) no	unknown	**(+1) yes**
Continuous exposure over all three trimesters during pregnancy	(0) no	unknown	**(+1) yes**
Transiency	**(0) no**	unknown	(+1) yes
Low maternal weight gain	**(0) no**	unknown	(+1) yes
High blood pressure/ pre-eclampsia	**(0) no**	unknown	(+1) yes
Mother overweight pre-pregnancy	**(0) no**	unknown	(+1) yes
Poor pre-natal nutrition	**(0) no**	unknown	(+1) yes
Mom >35 years	**(0) no**	unknown	(+1) yes
Teenage pregnancy	**(0) no**	unknown	(+1) yes
Minimal prenatal care	**(0) no**	unknown	(+1) yes

History of miscarriages or terminations	(0) no	unknown	**(+1) yes**
Diabetes during pregnancy	**(0) no**	unknown	(+1) yes
Infections/STD	(0) no	unknown	**(+1) yes**
Anemia	**(0) no**	unknown	(+1) yes
Placenta Previa	**(0) no**	unknown	(+1) yes
Multiple fetuses	(0) no	unknown	**(+1) yes**
Vaginal bleeding (2nd or 3rd trimester)	**(0) no**	unknown	(+1) yes
BIRTH/POST-NATAL			
Mom >35 years	**(0) no**	unknown	(+1) yes
Teenage pregnancy	**(0) no**	unknown	(+1) yes
Caesarean delivery	(0) no	unknown	**(+1) yes**
Premature delivery	(0) no	unknown	**(+1) yes**
Birth complications	**(0) no**	unknown	(+1) yes
Post-partum depression	(0) no	unknown	**(+1) yes**
Apprehension at birth	**(0) no**	unknown	(+1) yes
Post-natal Medical Diagnoses:			
Fetal Alcohol Spectrum Disorder	**(0) no**	unknown	(+1) yes
Drug withdrawal	(0) no	unknown	**(+1) yes**
Genetic disorder	**(0) no**	unknown	(+1) yes
Seizure/tremors	**(0) no**	unknown	(+1) yes
Heart complications	**(0) no**	unknown	(+1) yes
Birth injuries	**(0) no**	unknown	(+1) yes
Birth defects	**(0) no**	unknown	(+1) yes
Breathing difficulty	**(0) no**	unknown	(+1) yes
Low birth weight	(0) no	unknown	**(+1) yes**
Meconium in placenta	**(0) no**	unknown	(+1) yes
Post-natal Interventions:			
Incubator	(0) no	unknown	**(+1) yes**
Tube feeding	(0) no	unknown	**(+1) yes**
Apnea monitor	(0) no	unknown	**(+1) yes**
Respirator (required ventilation)	**(0) no**	unknown	(+1) yes
Medication requires	**(0) no**	unknown	(+1) yes
CHILD			
Hospitalization of child	**(0) no**	unknown	(+1) yes
Child medical illness	**(0) no**	unknown	(+1) yes
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	**(0) no**	unknown	(+1) yes
Presence of FASD diagnosis	(0) no	unknown	**(+1) yes**
Child in foster care or kin care/Change in primary caregiver	(0) no	unknown	**(+1) yes**
Child neglect (physical, emotional)	(0) no	unknown	**(+1) yes**
Child abuse (physical, sexual, emotional)	**(0) no**	unknown	(+1) yes
Child reunification with parent after separation	(0) no	unknown	**(+1) yes**
Multiple changes in childcare provider	(0) no	unknown	**(+1) yes**

Stress surrounding child starting daycare/entered school system	(0) no	unknown	**(+1) yes**
Challenging temperament style	**(0) no**	unknown	(+1) yes
Psychosocial & Health Concerns at Intake:			
Chronic colds	**(0) no**	unknown	(+1) yes
Chronic respiratory problems	**(0) no**	unknown	(+1) yes
Chronic ear infections	**(0) no**	unknown	(+1) yes
Heart problems	**(0) no**	unknown	(+1) yes
Gastroenteritis	**(0) no**	unknown	(+1) yes
Limitation in mobility	**(0) no**	unknown	(+1) yes
Seizures	**(0) no**	unknown	(+1) yes
Psychological/emotional problem	**(0) no**	unknown	(+1) yes
Developmental delays/delays to meet developmental milestones	**(0) no**	unknown	(+1) yes
Injuries	**(0) no**	unknown	(+1) yes
Eating problems	**(0) no**	unknown	(+1) yes
Slow weight gain	**(0) no**	unknown	(+1) yes
Behind in immunization	**(0) no**	unknown	(+1) yes
Visual impairment	**(0) no**	unknown	(+1) yes
Hearing impairment	**(0) no**	unknown	(+1) yes
Speech impairment	(0) no	unknown	**(+1) yes**
Cognitive impairment	**(0) no**	unknown	(+1) yes
Frequent injuries	**(0) no**	unknown	(+1) yes
Behavioural problems	**(0) no**	unknown	(+1) yes
Asthma	**(0) no**	unknown	(+1) yes
PARENT-CHILD INTERACTION			
Low parental efficacy (BaP)	**(0) no**	unknown	(+1) yes
Low parental satisfaction (BaP)	**(0) no**	unknown	(+1) yes
High defensive responding (PSI)	**(0) no**	unknown	(+1) yes
High parental distress (PSI)	**(0) no**	unknown	(+1) yes
High parent-child dysfunctional interactions (PSI)	(0) no	unknown	**(+1) yes**
Mother's perception of having a difficult child (PSI)	**(0) no**	unknown	(+1) yes
Clinical level of stress in parenting role (PSI)	**(0) no**	unknown	(+1) yes
High parental expectations (AAPI)	**(0) no**	unknown	(+1) yes
Low parental empathy (AAPI)	(0) no	unknown	**(+1) yes**
Reversed familial/parent-child roles (AAPI)	**(0) no**	unknown	(+1) yes
High hostile ineffective parenting (NLSCY)	**(0) no**	unknown	(+1) yes
High inconsistent parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Low positive parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Reporting challenging relationship with child	**(0) no**	unknown	(+1) yes
Child apprehension within first three years of life	(0) no	unknown	**(+1) yes**
SOCIAL NETWORK			
Disadvantaged minority ethnic background	**(0) no**	unknown	(+1) yes

Immigrant status	**(0) no**	unknown	(+1) yes
Acculturation or language conflicts	**(0) no**	unknown	(+1) yes

Table VIII: Cumulative Protective Factor Score – B1			
DOMAIN	**SCORING**		
PARENT - MOTHER			
Attends Basic Life Skills group at BTC	(0) no	unknown	**(+1) yes**
Attends Emotional Awareness Life Skills group at BTC	**(0) no**	unknown	(+1) yes
Attends Connections group at BTC	(0) no	unknown	**(+1) yes**
Attends Relapse Prevention group at BTC	(0) no	unknown	**(+1) yes**
Attends Recovery Group at BTC	**(0) no**	unknown	(+1) yes
Attends Mindfulness group at BTC	**(0) no**	unknown	(+1) yes
In recovery for substance use	(0) no	unknown	**(+1) yes**
Attending substance use treatment	(0) no	unknown	**(+1) yes**
Accessing addiction support	(0) no	unknown	**(+1) yes**
Accessing urine screens	(0) no	unknown	**(+1) yes**
Accessing mental health support/therapy/trauma counselling	**(0) no**	unknown	(+1) yes
High perceived social support – Family (PSS)	**(0) no**	unknown	(+1) yes
High perceived social support – Friends (PSS)	(0) no	unknown	**(+1) yes**
Is comfortable with closeness and intimacy (RAAS)	**(0) no**	unknown	(+1) yes
Feels she can depend on others (RAAS)	**(0) no**	unknown	(+1) yes
Does not worry about being rejected or unloved (RAAS)	(0) no	unknown	**(+1) yes**
High confidence regarding ability to cope with relapse crisis situations (old DTCQ)	(0) no	unknown	**(+1) yes**
Maternal level of education: has completed post-secondary education	(0) no	unknown	**(+1) yes**
PARENT - OTHER			
No substance use history	**(0) no**	unknown	(+1) yes
If substance use history, in recovery for substance use	(0) no	unknown	**(+1) yes**
Parent attending substance use treatment	**(0) no**	unknown	(+1) yes
Accessing addiction support	(0) no	unknown	**(+1) yes**
Accessing mental health support/therapy/trauma counselling	**(0) no**	unknown	(+1) yes
Presence of positive secondary parental figure to child	(0) no	unknown	**(+1) yes**
FAMILY			
Partner supportive of maternal substance use treatment services	(0) no	unknown	(+1) **yes**
Family supportive of maternal substance use treatment services	**(0) no**	unknown	(+1) yes
Presence of extended familial supports	**(0) no**	unknown	(+1) yes
High SES	**(0) no**	unknown	(+1) yes
Accessing couples therapy services	**(0) no**	unknown	(+1) yes
Accessing family therapy services	**(0) no**	unknown	(+1) yes
Family cohesion	**(0) no**	unknown	(+1) yes
PRE-NATAL/PREGNANCY			
Early-intervention through BTC Pregnancy Outreach Program	**(0) no**	unknown	(+1) yes
Attends BTC Pregnancy Outreach Program Prenatal Relapse Prevention group	**(0) no**	unknown	(+1) yes

BIRTH/POST-NATAL			
Neonatal follow-up	**(0) no**	unknown	(+1) yes
CHILD			
Easy temperament	**(0) no**	unknown	(+1) yes
Child was/is in daycare	(0) no	unknown	**(+1) yes**
Child involved in extra-curricular activities	**(0) no**	unknown	(+1) yes
Child has positive teacher relationships at school/daycare	(0) no	unknown	**(+1) yes**
Received occupational therapy	(0) no	unknown	**(+1) yes**
Received speech/language therapy	(0) no	unknown	**(+1) yes**
Received psychological assessment	(0) no	unknown	**(+1) yes**
Child protective services involvement	(0) no	unknown	**(+1) yes**
PARENT-CHILD INTERACTION			
High parental efficacy (BaP)	**(0) no**	unknown	(+1) yes
High parental satisfaction (BaP)	**(0) no**	unknown	(+1) yes
Low parental distress (PSI)	**(0) no**	unknown	(+1) yes
Low parent-child dysfunctional interactions (PSI)	**(0) no**	unknown	(+1) yes
Mother's perception of having an easy child (PSI)	**(0) no**	unknown	(+1) yes
Low level of stress in parenting role (PSI)	**(0) no**	unknown	(+1) yes
Low parental expectations (AAPI)	(0) no	unknown	**(+1) yes**
High parental empathy (AAPI)	**(0) no**	unknown	(+1) yes
Intact familial/parent-child roles (AAPI)	**(0) no**	unknown	(+1) yes
Low hostile ineffective parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Low inconsistent parenting (NLSCY)	(0) no	unknown	**(+1) yes**
High positive parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Attended New Mom Support group at BTC	(0) no	unknown	**(+1) yes**
Attends Mother Goose group at BTC	**(0) no**	unknown	(+1) yes
Attends Learning Through Play group at BTC	**(0) no**	unknown	(+1) yes
SOCIAL NETWORK/PROFESSIONAL CARE/SERVICES			
Non-family adult support network	(0) no	unknown	**(+1) yes**
Public health services	**(0) no**	unknown	(+1) yes
High risk nurse services	**(0) no**	unknown	(+1) yes
Physician	(0) no	unknown	**(+1) yes**
Financial Allowances (e.g., ODSP, OCCS, Ontario Works)	(0) no	unknown	**(+1) yes**

Table IX: Cumulative Risk Factor Score – B2

DOMAIN	SCORING		
PARENT - MOTHER			
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	(0) no	unknown	**(+1) yes**
Family history of mental illness	(0) no	unknown	**(+1) yes**
Chronic medical illness	**(0) no**	unknown	(+1) yes
Maternal level of education: has not completed high school	**(0) no**	unknown	(+1) yes
Conviction history	**(0) no**	unknown	(+1) yes
Mother has history of child abuse/neglect	(0) no	unknown	**(+1) yes**
Mother has history of interpersonal violence/trauma	**(0) no**	unknown	(+1) yes
Maternal anxiety symptoms (clinical level – BAI)	**(0) no**	unknown	(+1) yes
Mother endorses depressive symptoms (clinical level – CESD-D)	(0) no	unknown	**(+1) yes**
Teenage parent	**(0) no**	unknown	(+1) yes
More than 3 births	(0) no	unknown	**(+1) yes**
Has tried to quit substance use ever	(0) no	unknown	**(+1) yes**
Reports having had withdrawal symptoms when trying to stop substance use	(0) no	unknown	**(+1) yes**
Low perceived social support – Family (PSS)	**(0) no**	unknown	(+1) yes
Low perceived social support – Friends (PSS)	**(0) no**	unknown	(+1) yes
Is not comfortable with closeness and intimacy (RAAS)	(0) no	unknown	**(+1) yes**
Does not feel she can depend on others (RAAS)	(0) no	unknown	**(+1) yes**
Worries about being rejected or unloved (RAAS)	**(0) no**	unknown	(+1) yes
Low confidence regarding ability to cope with relapse crisis situations (old DTCQ)	**(0) no**	unknown	(+1) yes
History of self-harm behaviours or suicide attempt	**(0) no**	unknown	(+1) yes
PARENT - OTHER			
Secondary parent is absent from child's life	**(0) no**	unknown	(+1) yes
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	**(0) no**	unknown	(+1) yes
Substance use	(0) no	unknown	**(+1) yes**
Has tried to quit substance use ever	(0) no	unknown	**(+1) yes**
Conviction history	**(0) no**	unknown	(+1) yes
Difficult/dysfunctional or abusive relationship with mother of child	(0) no	unknown	**(+1) yes**
FAMILY			
Maternal pregnancy/Birth of a sibling	(0) no	unknown	**(+1) yes**
New child adopted	**(0) no**	unknown	(+1) yes
More than one child in the home	(0) no	unknown	**(+1) yes**
Medical illness of parent or caregiver	**(0) no**	unknown	(+1) yes
Death of parent or important person	**(0) no**	unknown	(+1) yes
Other trauma to significant person in the child's life	**(0) no**	unknown	(+1) yes
Mother is engaged in a domestically violent relationship/Domestic violence	**(0) no**	unknown	(+1) yes

Has a primary relationship with substance user	(0) no	unknown	**(+1) yes**
Parent or caregiver traumatic divorce or separation	**(0) no**	unknown	(+1) yes
Custody dispute	**(0) no**	unknown	(+1) yes
New romantic relationship	**(0) no**	unknown	(+1) yes
New adult in household (e.g., romantic partner)	**(0) no**	unknown	(+1) yes
Parent or caregiver remarriage	**(0) no**	unknown	(+1) yes
Substance use by household member (non-parental)	**(0) no**	unknown	(+1) yes
Parental substance use relapse	**(0) no**	unknown	(+1) yes
Child protective services involvement	(0) no	unknown	**(+1) yes**
Removal of non-index child from home	**(0) no**	unknown	(+1) yes
Child put up for adoption	**(0) no**	unknown	(+1) yes
Parental unemployment or job instability	(0) no	unknown	**(+1) yes**
Poverty or near poverty (less than $10,000)	(0) no	unknown	**(+1) yes**
Head of household has no more than a semiskilled occupation	(0) no	unknown	**(+1) yes**
Inadequate, unsafe or overcrowded housing or homelessness	(0) no	unknown	**(+1) yes**
Multiple housing moves (2+)	**(0) no**	unknown	(+1) yes
Parental arrest	**(0) no**	unknown	(+1) yes
Parental incarceration (or return from incarceration)	**(0) no**	unknown	(+1) yes
PRE-NATAL/PREGNANCY			
Domestic violence	**(0) no**	unknown	(+1) yes
Alcohol use	(0) no	unknown	**(+1) yes**
Cannabis use	**(0) no**	unknown	(+1) yes
Crack/cocaine use	**(0) no**	unknown	(+1) yes
Heroin use	**(0) no**	unknown	(+1) yes
Methadone use	(0) no	unknown	**(+1) yes**
Other opiates use	**(0) no**	unknown	(+1) yes
Nicotine use	(0) no	unknown	**(+1) yes**
Prescription drug use	**(0) no**	unknown	(+1) yes
Other drug use (eg., amphetamines, hallucinogens, barbiturates/sleeping pills, sedatives/hyponotics/tranquilizers, inhalants	**(0) no**	unknown	(+1) yes
Poly-substance exposure versus single substance exposure during pregnancy	(0) no	unknown	**(+1) yes**
Continuous exposure over all three trimesters during pregnancy	(0) no	unknown	**(+1) yes**
Transiency	**(0) no**	unknown	(+1) yes
Low maternal weight gain	**(0) no**	unknown	(+1) yes
High blood pressure/ pre-eclampsia	**(0) no**	unknown	(+1) yes
Mother overweight pre-pregnancy	**(0) no**	unknown	(+1) yes
Poor pre-natal nutrition	**(0) no**	unknown	(+1) yes
Mom >35 years	**(0) no**	unknown	(+1) yes

Teenage pregnancy	**(0) no**	unknown	(+1) yes
Minimal prenatal care	**(0) no**	unknown	(+1) yes
History of miscarriages or terminations	(0) no	unknown	**(+1) yes**
Diabetes during pregnancy	**(0) no**	unknown	(+1) yes
Infections/STD	(0) no	unknown	**(+1) yes**
Anemia	**(0) no**	unknown	(+1) yes
Placenta Previa	**(0) no**	unknown	(+1) yes
Multiple fetuses	(0) no	unknown	**(+1) yes**
Vaginal bleeding (2^{nd} or 3^{rd} trimester)	**(0) no**	unknown	(+1) yes
BIRTH/POST-NATAL			
Mom >35 years	**(0) no**	unknown	(+1) yes
Teenage pregnancy	**(0) no**	unknown	(+1) yes
Caesarean delivery	(0) no	unknown	**(+1) yes**
Premature delivery	(0) no	unknown	**(+1) yes**
Birth complications	**(0) no**	unknown	(+1) yes
Post-partum depression	(0) no	unknown	**(+1) yes**
Apprehension at birth	**(0) no**	unknown	(+1) yes
Post-natal Medical Diagnoses:			
Fetal Alcohol Spectrum Disorder	**(0) no**	unknown	(+1) yes
Drug withdrawal	(0) no	unknown	**(+1) yes**
Genetic disorder	**(0) no**	unknown	(+1) yes
Seizure/tremors	**(0) no**	unknown	(+1) yes
Heart complications	**(0) no**	unknown	(+1) yes
Birth injuries	**(0) no**	unknown	(+1) yes
Birth defects	**(0) no**	unknown	(+1) yes
Breathing difficulty	**(0) no**	unknown	(+1) yes
Low birth weight	(0) no	unknown	**(+1) yes**
Meconium in placenta	**(0) no**	unknown	(+1) yes
Post-natal Interventions:			
Incubator	(0) no	unknown	**(+1) yes**
Tube feeding	(0) no	unknown	**(+1) yes**
Apnea monitor	(0) no	unknown	**(+1) yes**
Respirator (required ventilation)	**(0) no**	unknown	(+1) yes
Medication requires	**(0) no**	unknown	(+1) yes
CHILD			
Hospitalization of child	**(0) no**	unknown	(+1) yes
Child medical illness	**(0) no**	unknown	(+1) yes
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	**(0) no**	unknown	(+1) yes
Presence of FASD diagnosis	(0) no	unknown	**(+1) yes**
Child in foster care or kin care/Change in primary caregiver	(0) no	unknown	**(+1) yes**
Child neglect (physical, emotional)	(0) no	unknown	**(+1) yes**
Child abuse (physical, sexual, emotional)	**(0) no**	unknown	(+1) yes

Child reunification with parent after separation	(0) no	unknown	**(+1) yes**
Multiple changes in childcare provider	(0) no	unknown	**(+1) yes**
Stress surrounding child starting daycare/entered school system	(0) no	unknown	**(+1) yes**
Challenging temperament style	(0) no	unknown	**(+1) yes**
Psychosocial & Health Concerns at Intake:			
Chronic colds	**(0) no**	unknown	(+1) yes
Chronic respiratory problems	**(0) no**	unknown	(+1) yes
Chronic ear infections	**(0) no**	unknown	(+1) yes
Heart problems	**(0) no**	unknown	(+1) yes
Gastroenteritis	**(0) no**	unknown	(+1) yes
Limitation in mobility	**(0) no**	unknown	(+1) yes
Seizures	**(0) no**	unknown	(+1) yes
Psychological/emotional problem	**(0) no**	unknown	(+1) yes
Developmental delays/delays to meet developmental milestones	(0) no	unknown	**(+1) yes**
Injuries	**(0) no**	unknown	(+1) yes
Eating problems	**(0) no**	unknown	(+1) yes
Slow weight gain	**(0) no**	unknown	(+1) yes
Behind in immunization	**(0) no**	unknown	(+1) yes
Visual impairment	**(0) no**	unknown	(+1) yes
Hearing impairment	**(0) no**	unknown	(+1) yes
Speech impairment	(0) no	unknown	**(+1) yes**
Cognitive impairment	**(0) no**	unknown	(+1) yes
Frequent injuries	**(0) no**	unknown	(+1) yes
Behavioural problems	(0) no	unknown	**(+1) yes**
Asthma	**(0) no**	unknown	(+1) yes
PARENT-CHILD INTERACTION			
Low parental efficacy (BaP)	**(0) no**	unknown	(+1) yes
Low parental satisfaction (BaP)	**(0) no**	unknown	(+1) yes
High defensive responding (PSI)	**(0) no**	unknown	(+1) yes
High parental distress (PSI)	**(0) no**	unknown	(+1) yes
High parent-child dysfunctional interactions (PSI)	(0) no	unknown	**(+1) yes**
Mother's perception of having a difficult child (PSI)	(0) no	unknown	**(+1) yes**
Clinical level of stress in parenting role (PSI)	(0) no	unknown	**(+1) yes**
High parental expectations (AAPI)	**(0) no**	unknown	(+1) yes
Low parental empathy (AAPI)	(0) no	unknown	**(+1) yes**
Reversed familial/parent-child roles (AAPI)	**(0) no**	unknown	(+1) yes
High hostile ineffective parenting (NLSCY)	**(0) no**	unknown	(+1) yes
High inconsistent parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Low positive parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Reporting challenging relationship with child	(0) no	unknown	**(+1) yes**
Child apprehension within first three years of life	(0) no	unknown	**(+1) yes**

SOCIAL NETWORK			
Disadvantaged minority ethnic background	**(0) no**	unknown	(+1) yes
Immigrant status	**(0) no**	unknown	(+1) yes
Acculturation or language conflicts	**(0) no**	unknown	(+1) yes

Table X: Cumulative Protective Factor Score – B2

DOMAIN	SCORING		
PARENT - MOTHER			
Attends Basic Life Skills group at BTC	(0) no	unknown	**(+1) yes**
Attends Emotional Awareness Life Skills group at BTC	**(0) no**	unknown	(+1) yes
Attends Connections group at BTC	(0) no	unknown	**(+1) yes**
Attends Relapse Prevention group at BTC	(0) no	unknown	**(+1) yes**
Attends Recovery Group at BTC	**(0) no**	unknown	(+1) yes
Attends Mindfulness group at BTC	**(0) no**	unknown	(+1) yes
In recovery for substance use	(0) no	unknown	**(+1) yes**
Attending substance use treatment	(0) no	unknown	**(+1) yes**
Accessing addiction support	(0) no	unknown	**(+1) yes**
Accessing urine screens	(0) no	unknown	**(+1) yes**
Accessing mental health support/therapy/trauma counselling	**(0) no**	unknown	(+1) yes
High perceived social support – Family (PSS)	**(0) no**	unknown	(+1) yes
High perceived social support – Friends (PSS)	(0) no	unknown	**(+1) yes**
Is comfortable with closeness and intimacy (RAAS)	**(0) no**	unknown	(+1) yes
Feels she can depend on others (RAAS)	**(0) no**	unknown	(+1) yes
Does not worry about being rejected or unloved (RAAS)	(0) no	unknown	**(+1) yes**
High confidence regarding ability to cope with relapse crisis situations (old DTCQ)	(0) no	unknown	**(+1) yes**
Maternal level of education: has completed post-secondary education	(0) no	unknown	**(+1) yes**
PARENT - OTHER			
No substance use history	**(0) no**	unknown	(+1) yes
If substance use history, in recovery for substance use	(0) no	unknown	**(+1) yes**
Parent attending substance use treatment	**(0) no**	unknown	(+1) yes
Accessing addiction support	(0) no	unknown	**(+1) yes**
Accessing mental health support/therapy/trauma counselling	**(0) no**	unknown	(+1) yes
Presence of positive secondary parental figure to child	(0) no	unknown	**(+1) yes**
FAMILY			
Partner supportive of maternal substance use treatment services	(0) no	unknown	**(+1) yes**
Family supportive of maternal substance use treatment services	**(0) no**	unknown	(+1) yes
Presence of extended familial supports	**(0) no**	unknown	(+1) yes
High SES	**(0) no**	unknown	(+1) yes
Accessing couples therapy services	**(0) no**	unknown	(+1) yes
Accessing family therapy services	**(0) no**	unknown	(+1) yes
Family cohesion	**(0) no**	unknown	(+1) yes
PRE-NATAL/PREGNANCY			
Early-intervention through BTC Pregnancy Outreach Program	**(0) no**	unknown	(+1) yes
Attends BTC Pregnancy Outreach Program Prenatal Relapse Prevention group	**(0) no**	unknown	(+1) yes

BIRTH/POST-NATAL			
Neonatal follow-up	**(0) no**	unknown	(+1) yes
CHILD			
Easy temperament	**(0) no**	unknown	(+1) yes
Child was/is in daycare	(0) no	unknown	**(+1) yes**
Child involved in extra-curricular activities	**(0) no**	unknown	(+1) yes
Child has positive teacher relationships at school/daycare	(0) no	unknown	**(+1) yes**
Received occupational therapy	(0) no	unknown	**(+1) yes**
Received speech/language therapy	(0) no	unknown	**(+1) yes**
Received psychological assessment	(0) no	unknown	**(+1) yes**
Child protective services involvement	(0) no	unknown	**(+1) yes**
PARENT-CHILD INTERACTION			
High parental efficacy (BaP)	**(0) no**	unknown	(+1) yes
High parental satisfaction (BaP)	**(0) no**	unknown	(+1) yes
Low parental distress (PSI)	**(0) no**	unknown	(+1) yes
Low parent-child dysfunctional interactions (PSI)	**(0) no**	unknown	(+1) yes
Mother's perception of having an easy child (PSI)	**(0) no**	unknown	(+1) yes
Low level of stress in parenting role (PSI)	**(0) no**	unknown	(+1) yes
Low parental expectations (AAPI)	(0) no	unknown	**(+1) yes**
High parental empathy (AAPI)	**(0) no**	unknown	(+1) yes
Intact familial/parent-child roles (AAPI)	**(0) no**	unknown	(+1) yes
Low hostile ineffective parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Low inconsistent parenting (NLSCY)	(0) no	unknown	**(+1) yes**
High positive parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Attended New Mom Support group at BTC	(0) no	unknown	**(+1) yes**
Attends Mother Goose group at BTC	**(0) no**	unknown	(+1) yes
Attends Learning Through Play group at BTC	**(0) no**	unknown	(+1) yes
SOCIAL NETWORK/PROFESSIONAL CARE/SERVICES			
Non-family adult support network	(0) no	unknown	**(+1) yes**
Public health services	**(0) no**	unknown	(+1) yes
High risk nurse services	**(0) no**	unknown	(+1) yes
Physician	(0) no	unknown	**(+1) yes**
Financial Allowances (e.g., ODSP, OCCS, Ontario Works)	(0) no	unknown	**(+1) yes**

Table XI: Cumulative Risk Factor Score – B3

DOMAIN	SCORING		
PARENT - MOTHER			
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	(0) no	unknown	**(+1) yes**
Family history of mental illness	(0) no	unknown	**(+1) yes**
Chronic medical illness	**(0) no**	unknown	(+1) yes
Maternal level of education: has not completed high school	**(0) no**	unknown	(+1) yes
Conviction history	**(0) no**	unknown	(+1) yes
Mother has history of child abuse/neglect	(0) no	unknown	**(+1) yes**
Mother has history of interpersonal violence/trauma	**(0) no**	unknown	(+1) yes
Maternal anxiety symptoms (clinical level – BAI)	**(0) no**	unknown	(+1) yes
Mother endorses depressive symptoms (clinical level – CESD-D)	(0) no	unknown	**(+1) yes**
Teenage parent	**(0) no**	unknown	(+1) yes
More than 3 births	(0) no	unknown	**(+1) yes**
Has tried to quit substance use ever	(0) no	unknown	**(+1) yes**
Reports having had withdrawal symptoms when trying to stop substance use	(0) no	unknown	**(+1) yes**
Low perceived social support – Family (PSS)	**(0) no**	unknown	(+1) yes
Low perceived social support – Friends (PSS)	**(0) no**	unknown	(+1) yes
Is not comfortable with closeness and intimacy (RAAS)	(0) no	unknown	**(+1) yes**
Does not feel she can depend on others (RAAS)	(0) no	unknown	**(+1) yes**
Worries about being rejected or unloved (RAAS)	**(0) no**	unknown	(+1) yes
Low confidence regarding ability to cope with relapse crisis situations (old DTCQ)	**(0) no**	unknown	(+1) yes
History of self-harm behaviours or suicide attempt	**(0) no**	unknown	(+1) yes
PARENT - OTHER			
Secondary parent is absent from child's life	**(0) no**	unknown	(+1) yes
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	**(0) no**	unknown	(+1) yes
Substance use	(0) no	unknown	**(+1) yes**
Has tried to quit substance use ever	(0) no	unknown	**(+1) yes**
Conviction history	**(0) no**	unknown	(+1) yes
Difficult/dysfunctional or abusive relationship with mother of child	(0) no	unknown	**(+1) yes**
FAMILY			
Maternal pregnancy/Birth of a sibling	(0) no	unknown	**(+1) yes**
New child adopted	**(0) no**	unknown	(+1) yes
More than one child in the home	(0) no	unknown	**(+1) yes**
Medical illness of parent or caregiver	**(0) no**	unknown	(+1) yes
Death of parent or important person	**(0) no**	unknown	(+1) yes
Other trauma to significant person in the child's life	**(0) no**	unknown	(+1) yes
Mother is engaged in a domestically violent relationship/Domestic violence	**(0) no**	unknown	(+1) yes

Has a primary relationship with substance user	(0) no	unknown	**(+1) yes**
Parent or caregiver traumatic divorce or separation	**(0) no**	unknown	(+1) yes
Custody dispute	**(0) no**	unknown	(+1) yes
New romantic relationship	**(0) no**	unknown	(+1) yes
New adult in household (e.g., romantic partner)	**(0) no**	unknown	(+1) yes
Parent or caregiver remarriage	**(0) no**	unknown	(+1) yes
Substance use by household member (non-parental)	**(0) no**	unknown	(+1) yes
Parental substance use relapse	**(0) no**	unknown	(+1) yes
Child protective services involvement	(0) no	unknown	**(+1) yes**
Removal of non-index child from home	**(0) no**	unknown	(+1) yes
Child put up for adoption	**(0) no**	unknown	(+1) yes
Parental unemployment or job instability	(0) no	unknown	**(+1) yes**
Poverty or near poverty (less than $10,000)	(0) no	unknown	**(+1) yes**
Head of household has no more than a semiskilled occupation	(0) no	unknown	**(+1) yes**
Inadequate, unsafe or overcrowded housing or homelessness	(0) no	unknown	**(+1) yes**
Multiple housing moves (2+)	**(0) no**	unknown	(+1) yes
Parental arrest	**(0) no**	unknown	(+1) yes
Parental incarceration (or return from incarceration)	**(0) no**	unknown	(+1) yes
PRE-NATAL/PREGNANCY			
Domestic violence	**(0) no**	unknown	(+1) yes
Alcohol use	(0) no	unknown	**(+1) yes**
Cannabis use	**(0) no**	unknown	(+1) yes
Crack/cocaine use	(0) no	unknown	**(+1) yes**
Heroin use	**(0) no**	unknown	(+1) yes
Methadone use	**(0) no**	unknown	(+1) yes
Other opiates use	**(0) no**	unknown	(+1) yes
Nicotine use	(0) no	unknown	**(+1) yes**
Prescription drug use	**(0) no**	unknown	(+1) yes
Other drug use (eg., amphetamines, hallucinogens, barbiturates/sleeping pills, sedatives/hyponotics/tranquilizers, inhalants	**(0) no**	unknown	(+1) yes
Poly-substance exposure versus single substance exposure during pregnancy	(0) no	unknown	**(+1) yes**
Continuous exposure over all three trimesters during pregnancy	(0) no	unknown	**(+1) yes**
Transiency	**(0) no**	unknown	(+1) yes
Low maternal weight gain	**(0) no**	unknown	(+1) yes
High blood pressure/ pre-eclampsia	**(0) no**	unknown	(+1) yes
Mother overweight pre-pregnancy	**(0) no**	unknown	(+1) yes
Poor pre-natal nutrition	**(0) no**	unknown	(+1) yes
Mom >35 years	(0) no	unknown	**(+1) yes**

Teenage pregnancy	**(0) no**	unknown	(+1) yes
Minimal prenatal care	(0) no	unknown	**(+1) yes**
History of miscarriages or terminations	(0) no	unknown	**(+1) yes**
Diabetes during pregnancy	**(0) no**	unknown	(+1) yes
Infections/STD	(0) no	unknown	**(+1) yes**
Anemia	**(0) no**	unknown	(+1) yes
Placenta Previa	**(0) no**	unknown	(+1) yes
Multiple fetuses	**(0) no**	unknown	(+1) yes
Vaginal bleeding (2nd or 3rd trimester)	**(0) no**	unknown	(+1) yes
BIRTH/POST-NATAL			
Mom >35 years	(0) no	unknown	**(+1) yes**
Teenage pregnancy	**(0) no**	unknown	(+1) yes
Caesarean delivery	(0) no	unknown	**(+1) yes**
Premature delivery	**(0) no**	unknown	(+1) yes
Birth complications	**(0) no**	unknown	(+1) yes
Post-partum depression	**(0) no**	unknown	(+1) yes
Apprehension at birth	**(0) no**	unknown	(+1) yes
Post-natal Medical Diagnoses:			
Fetal Alcohol Spectrum Disorder	**(0) no**	unknown	(+1) yes
Drug withdrawal	**(0) no**	unknown	(+1) yes
Genetic disorder	**(0) no**	unknown	(+1) yes
Seizure/tremors	**(0) no**	unknown	(+1) yes
Heart complications	**(0) no**	unknown	(+1) yes
Birth injuries	**(0) no**	unknown	(+1) yes
Birth defects	**(0) no**	unknown	(+1) yes
Breathing difficulty	**(0) no**	unknown	(+1) yes
Low birth weight	**(0) no**	unknown	(+1) yes
Meconium in placenta	**(0) no**	unknown	(+1) yes
Post-natal Interventions:			
Incubator	**(0) no**	unknown	(+1) yes
Tube feeding	**(0) no**	unknown	(+1) yes
Apnea monitor	**(0) no**	unknown	(+1) yes
Respirator (required ventilation)	**(0) no**	unknown	(+1) yes
Medication requires	**(0) no**	unknown	(+1) yes
CHILD			
Hospitalization of child	**(0) no**	unknown	(+1) yes
Child medical illness	**(0) no**	unknown	(+1) yes
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	**(0) no**	unknown	(+1) yes
Presence of FASD diagnosis	**(0) no**	unknown	(+1) yes
Child in foster care or kin care/Change in primary caregiver	(0) no	unknown	**(+1) yes**
Child neglect (physical, emotional)	(0) no	unknown	**(+1) yes**
Child abuse (physical, sexual, emotional)	**(0) no**	unknown	(+1) yes

Child reunification with parent after separation	(0) no	unknown	**(+1) yes**
Multiple changes in childcare provider	**(0) no**	unknown	(+1) yes
Stress surrounding child starting daycare/entered school system	(0) no	unknown	**(+1) yes**
Challenging temperament style	(0) no	unknown	**(+1) yes**
Psychosocial & Health Concerns at Intake:			
Chronic colds	**(0) no**	unknown	(+1) yes
Chronic respiratory problems	**(0) no**	unknown	(+1) yes
Chronic ear infections	**(0) no**	unknown	(+1) yes
Heart problems	**(0) no**	unknown	(+1) yes
Gastroenteritis	**(0) no**	unknown	(+1) yes
Limitation in mobility	(0) no	unknown	**(+1) yes**
Seizures	**(0) no**	unknown	(+1) yes
Psychological/emotional problem	**(0) no**	unknown	(+1) yes
Developmental delays/delays to meet developmental milestones	**(0) no**	unknown	(+1) yes
Injuries	**(0) no**	unknown	(+1) yes
Eating problems	**(0) no**	unknown	(+1) yes
Slow weight gain	**(0) no**	unknown	(+1) yes
Behind in immunization	**(0) no**	unknown	(+1) yes
Visual impairment	**(0) no**	unknown	(+1) yes
Hearing impairment	**(0) no**	unknown	(+1) yes
Speech impairment	**(0) no**	unknown	(+1) yes
Cognitive impairment	**(0) no**	unknown	(+1) yes
Frequent injuries	**(0) no**	unknown	(+1) yes
Behavioural problems	(0) no	unknown	**(+1) yes**
Asthma	**(0) no**	unknown	(+1) yes
PARENT-CHILD INTERACTION			
Low parental efficacy (BaP)	**(0) no**	unknown	(+1) yes
Low parental satisfaction (BaP)	**(0) no**	unknown	(+1) yes
High defensive responding (PSI)	**(0) no**	unknown	(+1) yes
High parental distress (PSI)	**(0) no**	unknown	(+1) yes
High parent-child dysfunctional interactions (PSI)	(0) no	unknown	**(+1) yes**
Mother's perception of having a difficult child (PSI)	**(0) no**	unknown	(+1) yes
Clinical level of stress in parenting role (PSI)	**(0) no**	unknown	(+1) yes
High parental expectations (AAPI)	**(0) no**	unknown	(+1) yes
Low parental empathy (AAPI)	(0) no	unknown	**(+1) yes**
Reversed familial/parent-child roles (AAPI)	**(0) no**	unknown	(+1) yes
High hostile ineffective parenting (NLSCY)	**(0) no**	unknown	(+1) yes
High inconsistent parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Low positive parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Reporting challenging relationship with child	**(0) no**	unknown	(+1) yes
Child apprehension within first three years of life	(0) no	unknown	**(+1) yes**

SOCIAL NETWORK			
Disadvantaged minority ethnic background	**(0) no**	unknown	(+1) yes
Immigrant status	**(0) no**	unknown	(+1) yes
Acculturation or language conflicts	**(0) no**	unknown	(+1) yes

Table XII: Cumulative Protective Factor Score – B3

DOMAIN	SCORING		
PARENT - MOTHER			
Attends Basic Life Skills group at BTC	(0) no	unknown	**(+1) yes**
Attends Emotional Awareness Life Skills group at BTC	**(0) no**	unknown	(+1) yes
Attends Connections group at BTC	(0) no	unknown	**(+1) yes**
Attends Relapse Prevention group at BTC	(0) no	unknown	**(+1) yes**
Attends Recovery Group at BTC	**(0) no**	unknown	(+1) yes
Attends Mindfulness group at BTC	**(0) no**	unknown	(+1) yes
In recovery for substance use	(0) no	unknown	**(+1) yes**
Attending substance use treatment	(0) no	unknown	**(+1) yes**
Accessing addiction support	(0) no	unknown	**(+1) yes**
Accessing urine screens	(0) no	unknown	**(+1) yes**
Accessing mental health support/therapy/trauma counselling	**(0) no**	unknown	(+1) yes
High perceived social support – Family (PSS)	**(0) no**	unknown	(+1) yes
High perceived social support – Friends (PSS)	(0) no	unknown	**(+1) yes**
Is comfortable with closeness and intimacy (RAAS)	**(0) no**	unknown	(+1) yes
Feels she can depend on others (RAAS)	**(0) no**	unknown	(+1) yes
Does not worry about being rejected or unloved (RAAS)	(0) no	unknown	**(+1) yes**
High confidence regarding ability to cope with relapse crisis situations (old DTCQ)	(0) no	unknown	**(+1) yes**
Maternal level of education: has completed post-secondary education	(0) no	unknown	**(+1) yes**
PARENT - OTHER			
No substance use history	**(0) no**	unknown	(+1) yes
If substance use history, in recovery for substance use	(0) no	unknown	**(+1) yes**
Parent attending substance use treatment	**(0) no**	unknown	(+1) yes
Accessing addiction support	(0) no	unknown	**(+1) yes**
Accessing mental health support/therapy/trauma counselling	**(0) no**	unknown	(+1) yes
Presence of positive secondary parental figure to child	(0) no	unknown	**(+1) yes**
FAMILY			
Partner supportive of maternal substance use treatment services	(0) no	unknown	**(+1) yes**
Family supportive of maternal substance use treatment services	**(0) no**	unknown	(+1) yes
Presence of extended familial supports	**(0) no**	unknown	(+1) yes
High SES	**(0) no**	unknown	(+1) yes
Accessing couples therapy services	**(0) no**	unknown	(+1) yes
Accessing family therapy services	**(0) no**	unknown	(+1) yes
Family cohesion	**(0) no**	unknown	(+1) yes
PRE-NATAL/PREGNANCY			
Early-intervention through BTC Pregnancy Outreach Program	**(0) no**	unknown	(+1) yes

Attends BTC Pregnancy Outreach Program Prenatal Relapse Prevention group	**(0) no**	unknown	(+1) yes
BIRTH/POST-NATAL			
Neonatal follow-up	**(0) no**	unknown	(+1) yes
CHILD			
Easy temperament	**(0) no**	unknown	(+1) yes
Child was/is in daycare	(0) no	unknown	**(+1) yes**
Child involved in extra-curricular activities	**(0) no**	unknown	(+1) yes
Child has positive teacher relationships at school/daycare	(0) no	unknown	**(+1) yes**
Received occupational therapy	(0) no	unknown	**(+1) yes**
Received speech/language therapy	**(0) no**	unknown	(+1) yes
Received psychological assessment	(0) no	unknown	**(+1) yes**
Child protective services involvement	(0) no	unknown	**(+1) yes**
PARENT-CHILD INTERACTION			
High parental efficacy (BaP)	**(0) no**	unknown	(+1) yes
High parental satisfaction (BaP)	**(0) no**	unknown	(+1) yes
Low parental distress (PSI)	**(0) no**	unknown	(+1) yes
Low parent-child dysfunctional interactions (PSI)	**(0) no**	unknown	(+1) yes
Mother's perception of having an easy child (PSI)	**(0) no**	unknown	(+1) yes
Low level of stress in parenting role (PSI)	**(0) no**	unknown	(+1) yes
Low parental expectations (AAPI)	(0) no	unknown	**(+1) yes**
High parental empathy (AAPI)	**(0) no**	unknown	(+1) yes
Intact familial/parent-child roles (AAPI)	**(0) no**	unknown	(+1) yes
Low hostile ineffective parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Low inconsistent parenting (NLSCY)	(0) no	unknown	**(+1) yes**
High positive parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Attended New Mom Support group at BTC	(0) no	unknown	**(+1) yes**
Attends Mother Goose group at BTC	**(0) no**	unknown	(+1) yes
Attends Learning Through Play group at BTC	**(0) no**	unknown	(+1) yes
SOCIAL NETWORK/PROFESSIONAL CARE/SERVICES			
Non-family adult support network	(0) no	unknown	**(+1) yes**
Public health services	**(0) no**	unknown	(+1) yes
High risk nurse services	**(0) no**	unknown	(+1) yes
Physician	(0) no	unknown	**(+1) yes**
Financial Allowances (e.g., ODSP, OCCS, Ontario Works)	(0) no	unknown	**(+1) yes**

Table XIII: Cumulative Risk Factor Score – B4

DOMAIN	SCORING		
PARENT - MOTHER			
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	(0) no	unknown	**(+1) yes**
Family history of mental illness	(0) no	unknown	**(+1) yes**
Chronic medical illness	**(0) no**	unknown	(+1) yes
Maternal level of education: has not completed high school	**(0) no**	unknown	(+1) yes
Conviction history	**(0) no**	unknown	(+1) yes
Mother has history of child abuse/neglect	(0) no	unknown	**(+1) yes**
Mother has history of interpersonal violence/trauma	**(0) no**	unknown	(+1) yes
Maternal anxiety symptoms (clinical level – BAI)	**(0) no**	unknown	(+1) yes
Mother endorses depressive symptoms (clinical level – CESD-D)	(0) no	unknown	**(+1) yes**
Teenage parent	**(0) no**	unknown	(+1) yes
More than 3 births	(0) no	unknown	**(+1) yes**
Has tried to quit substance use ever	(0) no	unknown	**(+1) yes**
Reports having had withdrawal symptoms when trying to stop substance use	(0) no	unknown	**(+1) yes**
Low perceived social support – Family (PSS)	**(0) no**	unknown	(+1) yes
Low perceived social support – Friends (PSS)	**(0) no**	unknown	(+1) yes
Is not comfortable with closeness and intimacy (RAAS)	(0) no	unknown	**(+1) yes**
Does not feel she can depend on others (RAAS)	(0) no	unknown	**(+1) yes**
Worries about being rejected or unloved (RAAS)	**(0) no**	unknown	(+1) yes
Low confidence regarding ability to cope with relapse crisis situations (old DTCQ)	**(0) no**	unknown	(+1) yes
History of self-harm behaviours or suicide attempt	**(0) no**	unknown	(+1) yes
PARENT - OTHER			
Secondary parent is absent from child's life	**(0) no**	unknown	(+1) yes
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	**(0) no**	unknown	(+1) yes
Substance use	(0) no	unknown	**(+1) yes**
Has tried to quit substance use ever	(0) no	unknown	**(+1) yes**
Conviction history	**(0) no**	unknown	(+1) yes
Difficult/dysfunctional or abusive relationship with mother of child	(0) no	unknown	**(+1) yes**
FAMILY			
Maternal pregnancy/Birth of a sibling	(0) no	unknown	**(+1) yes**
New child adopted	**(0) no**	unknown	(+1) yes
More than one child in the home	(0) no	unknown	**(+1) yes**
Medical illness of parent or caregiver	**(0) no**	unknown	(+1) yes
Death of parent or important person	**(0) no**	unknown	(+1) yes
Other trauma to significant person in the child's life	**(0) no**	unknown	(+1) yes
Mother is engaged in a domestically violent relationship/Domestic violence	**(0) no**	unknown	(+1) yes

Has a primary relationship with substance user	(0) no	unknown	**(+1) yes**
Parent or caregiver traumatic divorce or separation	**(0) no**	unknown	(+1) yes
Custody dispute	**(0) no**	unknown	(+1) yes
New romantic relationship	**(0) no**	unknown	(+1) yes
New adult in household (e.g., romantic partner)	**(0) no**	unknown	(+1) yes
Parent or caregiver remarriage	**(0) no**	unknown	(+1) yes
Substance use by household member (non-parental)	**(0) no**	unknown	(+1) yes
Parental substance use relapse	**(0) no**	unknown	(+1) yes
Child protective services involvement	(0) no	unknown	**(+1) yes**
Removal of non-index child from home	**(0) no**	unknown	(+1) yes
Child put up for adoption	**(0) no**	unknown	(+1) yes
Parental unemployment or job instability	(0) no	unknown	**(+1) yes**
Poverty or near poverty (less than $10,000)	(0) no	unknown	**(+1) yes**
Head of household has no more than a semiskilled occupation	(0) no	unknown	**(+1) yes**
Inadequate, unsafe or overcrowded housing or homelessness	(0) no	unknown	**(+1) yes**
Multiple housing moves (2+)	**(0) no**	unknown	(+1) yes
Parental arrest	**(0) no**	unknown	(+1) yes
Parental incarceration (or return from incarceration)	**(0) no**	unknown	(+1) yes
PRE-NATAL/PREGNANCY			
Domestic violence	**(0) no**	unknown	(+1) yes
Alcohol use	(0) no	unknown	**(+1) yes**
Cannabis use	**(0) no**	unknown	(+1) yes
Crack/cocaine use	(0) no	unknown	**(+1) yes**
Heroin use	**(0) no**	unknown	(+1) yes
Methadone use	**(0) no**	unknown	(+1) yes
Other opiates use	**(0) no**	unknown	(+1) yes
Nicotine use	(0) no	unknown	**(+1) yes**
Prescription drug use	**(0) no**	unknown	(+1) yes
Other drug use (eg., amphetamines, hallucinogens, barbiturates/sleeping pills, sedatives/hyponotics/tranquilizers, inhalants	**(0) no**	unknown	(+1) yes
Poly-substance exposure versus single substance exposure during pregnancy	(0) no	unknown	**(+1) yes**
Continuous exposure over all three trimesters during pregnancy	(0) no	unknown	**(+1) yes**
Transiency	**(0) no**	unknown	(+1) yes
Low maternal weight gain	**(0) no**	unknown	(+1) yes
High blood pressure/ pre-eclampsia	**(0) no**	unknown	(+1) yes
Mother overweight pre-pregnancy	**(0) no**	unknown	(+1) yes
Poor pre-natal nutrition	**(0) no**	unknown	(+1) yes
Mom >35 years	(0) no	unknown	**(+1) yes**
Teenage pregnancy	**(0) no**	unknown	(+1) yes
Minimal prenatal care	(0) no	unknown	**(+1) yes**

History of miscarriages or terminations	(0) no	unknown	**(+1) yes**
Diabetes during pregnancy	**(0) no**	unknown	(+1) yes
Infections/STD	(0) no	unknown	**(+1) yes**
Anemia	**(0) no**	unknown	(+1) yes
Placenta Previa	**(0) no**	unknown	(+1) yes
Multiple fetuses	**(0) no**	unknown	(+1) yes
Vaginal bleeding (2nd or 3rd trimester)	**(0) no**	unknown	(+1) yes
BIRTH/POST-NATAL			
Mom >35 years	(0) no	unknown	**(+1) yes**
Teenage pregnancy	**(0) no**	unknown	(+1) yes
Caesarean delivery	**(0) no**	unknown	(+1) yes
Premature delivery	(0) no	unknown	**(+1) yes**
Birth complications	**(0) no**	unknown	(+1) yes
Post-partum depression	**(0) no**	unknown	(+1) yes
Apprehension at birth	**(0) no**	unknown	(+1) yes
Post-natal Medical Diagnoses:			
Fetal Alcohol Spectrum Disorder	**(0) no**	unknown	(+1) yes
Drug withdrawal	**(0) no**	unknown	(+1) yes
Genetic disorder	**(0) no**	unknown	(+1) yes
Seizure/tremors	**(0) no**	unknown	(+1) yes
Heart complications	(0) no	unknown	**(+1) yes**
Birth injuries	**(0) no**	unknown	(+1) yes
Birth defects	**(0) no**	unknown	(+1) yes
Breathing difficulty	**(0) no**	unknown	(+1) yes
Low birth weight	**(0) no**	unknown	(+1) yes
Meconium in placenta	**(0) no**	unknown	(+1) yes
Post-natal Interventions:			
Incubator	**(0) no**	unknown	(+1) yes
Tube feeding	**(0) no**	unknown	(+1) yes
Apnea monitor	**(0) no**	unknown	(+1) yes
Respirator (required ventilation)	**(0) no**	unknown	(+1) yes
Medication requires	**(0) no**	unknown	(+1) yes
CHILD			
Hospitalization of child	**(0) no**	unknown	(+1) yes
Child medical illness	**(0) no**	unknown	(+1) yes
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	**(0) no**	unknown	(+1) yes
Presence of FASD diagnosis	**(0) no**	unknown	(+1) yes
Child in foster care or kin care/Change in primary caregiver	(0) no	unknown	**(+1) yes**
Child neglect (physical, emotional)	(0) no	unknown	**(+1) yes**
Child abuse (physical, sexual, emotional)	**(0) no**	unknown	(+1) yes
Child reunification with parent after separation	(0) no	unknown	**(+1) yes**
Multiple changes in childcare provider	**(0) no**	unknown	(+1) yes

Stress surrounding child starting daycare/entered school system	(0) no	unknown	**(+1) yes**
Challenging temperament style	**(0) no**	unknown	(+1) yes
Psychosocial & Health Concerns at Intake:			
Chronic colds	**(0) no**	unknown	(+1) yes
Chronic respiratory problems	**(0) no**	unknown	(+1) yes
Chronic ear infections	**(0) no**	unknown	(+1) yes
Heart problems	(0) no	unknown	**(+1) yes**
Gastroenteritis	**(0) no**	unknown	(+1) yes
Limitation in mobility	**(0) no**	unknown	(+1) yes
Seizures	**(0) no**	unknown	(+1) yes
Psychological/emotional problem	**(0) no**	unknown	(+1) yes
Developmental delays/delays to meet developmental milestones	**(0) no**	unknown	(+1) yes
Injuries	**(0) no**	unknown	(+1) yes
Eating problems	**(0) no**	unknown	(+1) yes
Slow weight gain	**(0) no**	unknown	(+1) yes
Behind in immunization	**(0) no**	unknown	(+1) yes
Visual impairment	**(0) no**	unknown	(+1) yes
Hearing impairment	**(0) no**	unknown	(+1) yes
Speech impairment	**(0) no**	unknown	(+1) yes
Cognitive impairment	**(0) no**	unknown	(+1) yes
Frequent injuries	**(0) no**	unknown	(+1) yes
Behavioural problems	**(0) no**	unknown	(+1) yes
Asthma	**(0) no**	unknown	(+1) yes
PARENT-CHILD INTERACTION			
Low parental efficacy (BaP)	**(0) no**	unknown	(+1) yes
Low parental satisfaction (BaP)	**(0) no**	unknown	(+1) yes
High defensive responding (PSI)	**(0) no**	unknown	(+1) yes
High parental distress (PSI)	(0) no	unknown	**(+1) yes**
High parent-child dysfunctional interactions (PSI)	(0) no	unknown	**(+1) yes**
Mother's perception of having a difficult child (PSI)	**(0) no**	unknown	(+1) yes
Clinical level of stress in parenting role (PSI)	**(0) no**	unknown	(+1) yes
High parental expectations (AAPI)	**(0) no**	unknown	(+1) yes
Low parental empathy (AAPI)	(0) no	unknown	**(+1) yes**
Reversed familial/parent-child roles (AAPI)	**(0) no**	unknown	(+1) yes
High hostile ineffective parenting (NLSCY)	**(0) no**	unknown	(+1) yes
High inconsistent parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Low positive parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Reporting challenging relationship with child	(0) no	unknown	**(+1) yes**
Child apprehension within first three years of life	(0) no	unknown	**(+1) yes**
SOCIAL NETWORK			
Disadvantaged minority ethnic background	**(0) no**	unknown	(+1) yes

Immigrant status	**(0) no**	unknown	(+1) yes
Acculturation or language conflicts	**(0) no**	unknown	(+1) yes

Table XIV: Cumulative Protective Factor Score – B4

DOMAIN	SCORING		
PARENT - MOTHER			
Attends Basic Life Skills group at BTC	(0) no	unknown	**(+1) yes**
Attends Emotional Awareness Life Skills group at BTC	**(0) no**	unknown	(+1) yes
Attends Connections group at BTC	(0) no	unknown	**(+1) yes**
Attends Relapse Prevention group at BTC	(0) no	unknown	**(+1) yes**
Attends Recovery Group at BTC	**(0) no**	unknown	(+1) yes
Attends Mindfulness group at BTC	**(0) no**	unknown	(+1) yes
In recovery for substance use	(0) no	unknown	**(+1) yes**
Attending substance use treatment	(0) no	unknown	**(+1) yes**
Accessing addiction support	(0) no	unknown	**(+1) yes**
Accessing urine screens	(0) no	unknown	**(+1) yes**
Accessing mental health support/therapy/trauma counselling	**(0) no**	unknown	(+1) yes
High perceived social support – Family (PSS)	**(0) no**	unknown	(+1) yes
High perceived social support – Friends (PSS)	(0) no	unknown	**(+1) yes**
Is comfortable with closeness and intimacy (RAAS)	**(0) no**	unknown	(+1) yes
Feels she can depend on others (RAAS)	**(0) no**	unknown	(+1) yes
Does not worry about being rejected or unloved (RAAS)	(0) no	unknown	**(+1) yes**
High confidence regarding ability to cope with relapse crisis situations (old DTCQ)	(0) no	unknown	**(+1) yes**
Maternal level of education: has completed post-secondary education	(0) no	unknown	**(+1) yes**
PARENT - OTHER			
No substance use history	**(0) no**	unknown	(+1) yes
If substance use history, in recovery for substance use	(0) no	unknown	**(+1) yes**
Parent attending substance use treatment	**(0) no**	unknown	(+1) yes
Accessing addiction support	(0) no	unknown	**(+1) yes**
Accessing mental health support/therapy/trauma counselling	**(0) no**	unknown	(+1) yes
Presence of positive secondary parental figure to child	(0) no	unknown	**(+1) yes**
FAMILY			
Partner supportive of maternal substance use treatment services	(0) no	unknown	**(+1) yes**
Family supportive of maternal substance use treatment services	**(0) no**	unknown	(+1) yes
Presence of extended familial supports	**(0) no**	unknown	(+1) yes
High SES	**(0) no**	unknown	(+1) yes
Accessing couples therapy services	**(0) no**	unknown	(+1) yes
Accessing family therapy services	**(0) no**	unknown	(+1) yes
Family cohesion	**(0) no**	unknown	(+1) yes
PRE-NATAL/PREGNANCY			
Early-intervention through BTC Pregnancy Outreach Program	**(0) no**	unknown	(+1) yes
Attends BTC Pregnancy Outreach Program Prenatal Relapse Prevention group	**(0) no**	unknown	(+1) yes

BIRTH/POST-NATAL			
Neonatal follow-up	**(0) no**	unknown	(+1) yes
CHILD			
Easy temperament	(0) no	unknown	**(+1) yes**
Child was/is in daycare	(0) no	unknown	**(+1) yes**
Child involved in extra-curricular activities	**(0) no**	unknown	(+1) yes
Child has positive teacher relationships at school/daycare	(0) no	unknown	**(+1) yes**
Received occupational therapy	(0) no	unknown	**(+1) yes**
Received speech/language therapy	**(0) no**	unknown	(+1) yes
Received psychological assessment	(0) no	unknown	**(+1) yes**
Child protective services involvement	(0) no	unknown	**(+1) yes**
PARENT-CHILD INTERACTION			
High parental efficacy (BaP)	**(0) no**	unknown	(+1) yes
High parental satisfaction (BaP)	**(0) no**	unknown	(+1) yes
Low parental distress (PSI)	**(0) no**	unknown	(+1) yes
Low parent-child dysfunctional interactions (PSI)	**(0) no**	unknown	(+1) yes
Mother's perception of having an easy child (PSI)	**(0) no**	unknown	(+1) yes
Low level of stress in parenting role (PSI)	**(0) no**	unknown	(+1) yes
Low parental expectations (AAPI)	(0) no	unknown	**(+1) yes**
High parental empathy (AAPI)	**(0) no**	unknown	(+1) yes
Intact familial/parent-child roles (AAPI)	**(0) no**	unknown	(+1) yes
Low hostile ineffective parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Low inconsistent parenting (NLSCY)	(0) no	unknown	**(+1) yes**
High positive parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Attended New Mom Support group at BTC	(0) no	unknown	**(+1) yes**
Attends Mother Goose group at BTC	**(0) no**	unknown	(+1) yes
Attends Learning Through Play group at BTC	**(0) no**	unknown	(+1) yes
SOCIAL NETWORK/PROFESSIONAL CARE/SERVICES			
Non-family adult support network	(0) no	unknown	**(+1) yes**
Public health services	**(0) no**	unknown	(+1) yes
High risk nurse services	**(0) no**	unknown	(+1) yes
Physician	(0) no	unknown	**(+1) yes**
Financial Allowances (e.g., ODSP, OCCS, Ontario Works)	(0) no	unknown	**(+1) yes**

Table XV: Cumulative Risk Factor Score – C1

DOMAIN	SCORING		
PARENT - MOTHER			
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	(0) no	unknown	**(+1) yes**
Family history of mental illness	(0) no	unknown	**(+1) yes**
Chronic medical illness	**(0) no**	unknown	(+1) yes
Maternal level of education: has not completed high school	(0) no	unknown	**(+1) yes**
Conviction history	**(0) no**	unknown	(+1) yes
Mother has history of child abuse/neglect	(0) no	unknown	**(+1) yes**
Mother has history of interpersonal violence/trauma	(0) no	unknown	**(+1) yes**
Maternal anxiety symptoms (clinical level – BAI)	(0) no	unknown	**(+1) yes**
Mother endorses depressive symptoms (clinical level – CESD-D)	(0) no	unknown	**(+1) yes**
Teenage parent	**(0) no**	unknown	(+1) yes
More than 3 births	**(0) no**	unknown	(+1) yes
Has tried to quit substance use ever	(0) no	unknown	**(+1) yes**
Reports having had withdrawal symptoms when trying to stop substance use	(0) no	**unknown**	(+1) yes
Low perceived social support – Family (PSS)	**(0) no**	unknown	(+1) yes
Low perceived social support – Friends (PSS)	**(0) no**	unknown	(+1) yes
Is not comfortable with closeness and intimacy (RAAS)	**(0) no**	unknown	(+1) yes
Does not feel she can depend on others (RAAS)	**(0) no**	unknown	(+1) yes
Worries about being rejected or unloved (RAAS)	**(0) no**	unknown	(+1) yes
Low confidence regarding ability to cope with relapse crisis situations (old DTCQ)	**(0) no**	unknown	(+1) yes
History of self-harm behaviours or suicide attempt	**(0) no**	unknown	(+1) yes
PARENT - OTHER			
Secondary parent is absent from child's life	**(0) no**	unknown	(+1) yes
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	**(0) no**	unknown	(+1) yes
Substance use	(0) no	unknown	**(+1) yes**
Has tried to quit substance use ever	(0) no	unknown	**(+1) yes**
Conviction history	**(0) no**	unknown	(+1) yes
Difficult/dysfunctional or abusive relationship with mother of child	(0) no	unknown	**(+1) yes**
FAMILY			
Maternal pregnancy/Birth of a sibling	(0) no	unknown	**(+1) yes**
New child adopted	**(0) no**	unknown	(+1) yes
More than one child in the home	(0) no	unknown	**(+1) yes**
Medical illness of parent or caregiver	**(0) no**	unknown	(+1) yes
Death of parent or important person	**(0) no**	unknown	(+1) yes
Other trauma to significant person in the child's life	**(0) no**	unknown	(+1) yes
Mother is engaged in a domestically violent relationship/Domestic violence	**(0) no**	unknown	(+1) yes

Has a primary relationship with substance user	(0) no	unknown	**(+1) yes**
Parent or caregiver traumatic divorce or separation	(0) no	unknown	**(+1) yes**
Custody dispute	**(0) no**	unknown	(+1) yes
New romantic relationship	**(0) no**	unknown	(+1) yes
New adult in household (e.g., romantic partner)	**(0) no**	unknown	(+1) yes
Parent or caregiver remarriage	**(0) no**	unknown	(+1) yes
Substance use by household member (non-parental)	(0) no	unknown	**(+1) yes**
Parental substance use relapse	(0) no	unknown	**(+1) yes**
Child protective services involvement	(0) no	unknown	**(+1) yes**
Removal of non-index child from home	**(0) no**	unknown	(+1) yes
Child put up for adoption	(0) no	unknown	**(+1) yes**
Parental unemployment or job instability	(0) no	unknown	**(+1) yes**
Poverty or near poverty (less than $10,000)	(0) no	unknown	**(+1) yes**
Head of household has no more than a semiskilled occupation	(0) no	unknown	**(+1) yes**
Inadequate, unsafe or overcrowded housing or homelessness	(0) no	unknown	**(+1) yes**
Multiple housing moves (2+)	**(0) no**	unknown	(+1) yes
Parental arrest	**(0) no**	unknown	(+1) yes
Parental incarceration (or return from incarceration)	**(0) no**	unknown	(+1) yes
PRE-NATAL/PREGNANCY			
Domestic violence	**(0) no**	unknown	(+1) yes
Alcohol use	(0) no	unknown	**(+1) yes**
Cannabis use	(0) no	unknown	**(+1) yes**
Crack/cocaine use	**(0) no**	unknown	(+1) yes
Heroin use	**(0) no**	unknown	(+1) yes
Methadone use	**(0) no**	unknown	(+1) yes
Other opiates use	**(0) no**	unknown	(+1) yes
Nicotine use	(0) no	unknown	**(+1) yes**
Prescription drug use	(0) no	unknown	**(+1) yes**
Other drug use (eg., amphetamines, hallucinogens, barbiturates/sleeping pills, sedatives/hyponotics/tranquilizers, inhalants	(0) no	unknown	**(+1) yes**
Poly-substance exposure versus single substance exposure during pregnancy	(0) no	unknown	**(+1) yes**
Continuous exposure over all three trimesters during pregnancy	**(0) no**	unknown	(+1) yes
Transiency	**(0) no**	unknown	(+1) yes
Low maternal weight gain	**(0) no**	unknown	(+1) yes
High blood pressure/ pre-eclampsia	(0) no	unknown	**(+1) yes**
Mother overweight pre-pregnancy	**(0) no**	unknown	(+1) yes
Poor pre-natal nutrition	**(0) no**	unknown	(+1) yes
Mom >35 years	**(0) no**	unknown	(+1) yes
Teenage pregnancy	**(0) no**	unknown	(+1) yes
Minimal prenatal care	**(0) no**	unknown	(+1) yes

History of miscarriages or terminations	**(0) no**	unknown	(+1) yes
Diabetes during pregnancy	**(0) no**	unknown	(+1) yes
Infections/STD	**(0) no**	unknown	(+1) yes
Anemia	**(0) no**	unknown	(+1) yes
Placenta Previa	**(0) no**	unknown	(+1) yes
Multiple fetuses	**(0) no**	unknown	(+1) yes
Vaginal bleeding (2nd or 3rd trimester)	**(0) no**	unknown	(+1) yes
BIRTH/POST-NATAL			
Mom >35 years	**(0) no**	unknown	(+1) yes
Teenage pregnancy	**(0) no**	unknown	(+1) yes
Caesarean delivery	**(0) no**	unknown	(+1) yes
Premature delivery	**(0) no**	unknown	(+1) yes
Birth complications	**(0) no**	unknown	(+1) yes
Post-partum depression	**(0) no**	unknown	(+1) yes
Apprehension at birth	**(0) no**	unknown	(+1) yes
Post-natal Medical Diagnoses:			
Fetal Alcohol Spectrum Disorder	**(0) no**	unknown	(+1) yes
Drug withdrawal	**(0) no**	unknown	(+1) yes
Genetic disorder	**(0) no**	unknown	(+1) yes
Seizure/tremors	**(0) no**	unknown	(+1) yes
Heart complications	**(0) no**	unknown	(+1) yes
Birth injuries	**(0) no**	unknown	(+1) yes
Birth defects	**(0) no**	unknown	(+1) yes
Breathing difficulty	**(0) no**	unknown	(+1) yes
Low birth weight	**(0) no**	unknown	(+1) yes
Meconium in placenta	**(0) no**	unknown	(+1) yes
Post-natal Interventions:			
Incubator	(0) no	**unknown**	(+1) yes
Tube feeding	(0) no	**unknown**	(+1) yes
Apnea monitor	(0) no	**unknown**	(+1) yes
Respirator (required ventilation)	(0) no	**unknown**	(+1) yes
Medication requires	(0) no	**unknown**	(+1) yes
CHILD			
Hospitalization of child	**(0) no**	unknown	(+1) yes
Child medical illness	**(0) no**	unknown	(+1) yes
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	**(0) no**	unknown	(+1) yes
Presence of FASD diagnosis	**(0) no**	unknown	(+1) yes
Child in foster care or kin care/Change in primary caregiver	(0) no	unknown	**(+1) yes**
Child neglect (physical, emotional)	(0) no	unknown	**(+1) yes**
Child abuse (physical, sexual, emotional)	**(0) no**	unknown	(+1) yes
Child reunification with parent after separation	(0) no	unknown	**(+1) yes**
Multiple changes in childcare provider	**(0) no**	unknown	(+1) yes

Stress surrounding child starting daycare/entered school system	(0) no	unknown	**(+1) yes**
Challenging temperament style	(0) no	unknown	**(+1) yes**
Psychosocial & Health Concerns at Intake:			
Chronic colds	(0) no	unknown	**(+1) yes**
Chronic respiratory problems	(0) no	unknown	**(+1) yes**
Chronic ear infections	**(0) no**	unknown	(+1) yes
Heart problems	**(0) no**	unknown	(+1) yes
Gastroenteritis	**(0) no**	unknown	(+1) yes
Limitation in mobility	**(0) no**	unknown	(+1) yes
Seizures	**(0) no**	unknown	(+1) yes
Psychological/emotional problem	**(0) no**	unknown	(+1) yes
Developmental delays/delays to meet developmental milestones	**(0) no**	unknown	(+1) yes
Injuries	**(0) no**	unknown	(+1) yes
Eating problems	**(0) no**	unknown	(+1) yes
Slow weight gain	**(0) no**	unknown	(+1) yes
Behind in immunization	**(0) no**	unknown	(+1) yes
Visual impairment	**(0) no**	unknown	(+1) yes
Hearing impairment	**(0) no**	unknown	(+1) yes
Speech impairment	**(0) no**	unknown	(+1) yes
Cognitive impairment	**(0) no**	unknown	(+1) yes
Frequent injuries	**(0) no**	unknown	(+1) yes
Behavioural problems	(0) no	unknown	**(+1) yes**
Asthma	(0) no	unknown	**(+1) yes**
PARENT-CHILD INTERACTION			
Low parental efficacy (BaP)	**(0) no**	unknown	(+1) yes
Low parental satisfaction (BaP)	**(0) no**	unknown	(+1) yes
High defensive responding (PSI)	**(0) no**	unknown	(+1) yes
High parental distress (PSI)	**(0) no**	unknown	(+1) yes
High parent-child dysfunctional interactions (PSI)	**(0) no**	unknown	(+1) yes
Mother's perception of having a difficult child (PSI)	**(0) no**	unknown	(+1) yes
Clinical level of stress in parenting role (PSI)	**(0) no**	unknown	(+1) yes
High parental expectations (AAPI)	**(0) no**	unknown	(+1) yes
Low parental empathy (AAPI)	**(0) no**	unknown	(+1) yes
Reversed familial/parent-child roles (AAPI)	**(0) no**	unknown	(+1) yes
High hostile ineffective parenting (NLSCY)	**(0) no**	unknown	(+1) yes
High inconsistent parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Low positive parenting (NLSCY)	(0) no	unknown	**(+1) yes**
Reporting challenging relationship with child	(0) no	unknown	**(+1) yes**
Child apprehension within first three years of life	**(0) no**	unknown	(+1) yes
SOCIAL NETWORK			
Disadvantaged minority ethnic background	**(0) no**	unknown	(+1) yes

Immigrant status	**(0) no**	unknown	(+1) yes
Acculturation or language conflicts	**(0) no**	unknown	(+1) yes

Table XVI: Cumulative Protective Factor Score – C1

DOMAIN	SCORING		
PARENT - MOTHER			
Attends Basic Life Skills group at BTC	**(0) no**	unknown	(+1) yes
Attends Emotional Awareness Life Skills group at BTC	**(0) no**	unknown	(+1) yes
Attends Connections group at BTC	**(0) no**	unknown	(+1) yes
Attends Relapse Prevention group at BTC	(0) no	unknown	**(+1) yes**
Attends Recovery Group at BTC	**(0) no**	unknown	(+1) yes
Attends Mindfulness group at BTC	**(0) no**	unknown	(+1) yes
In recovery for substance use	**(0) no**	unknown	(+1) yes
Attending substance use treatment	(0) no	unknown	**(+1) yes**
Accessing addiction support	**(0) no**	unknown	(+1) yes
Accessing urine screens	**(0) no**	unknown	(+1) yes
Accessing mental health support/therapy/trauma counselling	(0) no	unknown	**(+1) yes**
High Perceived Social Support – Family (PSS)	(0) no	unknown	**(+1) yes**
High Perceived Social Support – Friends (PSS)	(0) no	unknown	**(+1) yes**
Is comfortable with closeness and intimacy (RAAS)	(0) no	unknown	**(+1) yes**
Feels she can depend on others (RAAS)	**(0) no**	unknown	(+1) yes
Does not worry about being rejected or unloved (RAAS)	(0) no	unknown	**(+1) yes**
High confidence regarding ability to cope with relapse crisis situations (old DTCQ)	(0) no	unknown	**(+1) yes**
Maternal level of education: has completed post-secondary education	**(0) no**	unknown	(+1) yes
PARENT - OTHER			
No substance use history	**(0) no**	unknown	(+1) yes
If substance use history, in recovery for substance use	**(0) no**	unknown	(+1) yes
Parent attending substance use treatment	**(0) no**	unknown	(+1) yes
Accessing addiction support	**(0) no**	unknown	(+1) yes
Accessing mental health support/therapy/trauma counselling	**(0) no**	unknown	(+1) yes
Presence of positive secondary parental figure to child	**(0) no**	unknown	(+1) yes
FAMILY			
Partner supportive of maternal substance use treatment services	**(0) no**	unknown	(+1) yes
Family supportive of maternal substance use treatment services	**(0) no**	unknown	(+1) yes
Presence of extended familial supports	**(0) no**	unknown	(+1) yes
High SES	**(0) no**	unknown	(+1) yes
Accessing couples therapy services	**(0) no**	unknown	(+1) yes
Accessing family therapy services	**(0) no**	unknown	(+1) yes
Family cohesion	**(0) no**	unknown	(+1) yes
PRE-NATAL/PREGNANCY			
Early-intervention through BTC Pregnancy Outreach Program	**(0) no**	unknown	(+1) yes

Attends BTC Pregnancy Outreach Program Prenatal Relapse Prevention group	**(0) no**	unknown	(+1) yes
BIRTH/POST-NATAL			
Neonatal follow-up	**(0) no**	unknown	(+1) yes
CHILD			
Easy temperament	**(0) no**	unknown	(+1) yes
Child was/is in daycare	(0) no	unknown	**(+1) yes**
Child involved in extra-curricular activities	(0) no	unknown	**(+1) yes**
Child has positive teacher relationships at school/daycare	**(0) no**	unknown	(+1) yes
Received occupational therapy	**(0) no**	unknown	(+1) yes
Received speech/language therapy	**(0) no**	unknown	(+1) yes
Received psychological assessment	(0) no	unknown	**(+1) yes**
Child protective services involvement	(0) no	unknown	**(+1) yes**
PARENT-CHILD INTERACTION			
High parental efficacy (BaP)	**(0) no**	unknown	(+1) yes
High parental satisfaction (BaP)	**(0) no**	unknown	(+1) yes
Low parental distress (PSI)	**(0) no**	unknown	(+1) yes
Low parent-child dysfunctional interactions (PSI)	**(0) no**	unknown	(+1) yes
Mother's perception of having an easy child (PSI)	**(0) no**	unknown	(+1) yes
Low level of stress in parenting role (PSI)	**(0) no**	unknown	(+1) yes
Low parental expectations (AAPI)	**(0) no**	unknown	(+1) yes
High parental empathy (AAPI)	(0) no	unknown	**(+1) yes**
Intact familial/parent-child roles (AAPI)	**(0) no**	unknown	(+1) yes
Low hostile ineffective parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Low inconsistent parenting (NLSCY)	(0) no	unknown	**(+1) yes**
High positive parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Attended New Mom Support group at BTC	**(0) no**	unknown	(+1) yes
Attends Mother Goose group at BTC	**(0) no**	unknown	(+1) yes
Attends Learning Through Play group at BTC	**(0) no**	unknown	(+1) yes
SOCIAL NETWORK/PROFESSIONAL CARE/SERVICES			
Non-family adult support network	**(0) no**	unknown	(+1) yes
Public health services	**(0) no**	unknown	(+1) yes
High risk nurse services	**(0) no**	unknown	(+1) yes
Physician	**(0) no**	**unknown**	**(+1) yes**
Financial Allowances (e.g., ODSP, OCCS, Ontario Works)	**(0) no**	**unknown**	**(+1) yes**

Table XVII: Cumulative Risk Factor Score – C2

DOMAIN	SCORING		
PARENT - MOTHER			
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	(0) no	unknown	**(+1) yes**
Family history of mental illness	(0) no	unknown	**(+1) yes**
Chronic medical illness	**(0) no**	unknown	(+1) yes
Maternal level of education: has not completed high school	(0) no	unknown	**(+1) yes**
Conviction history	**(0) no**	unknown	(+1) yes
Mother has history of child abuse/neglect	(0) no	unknown	**(+1) yes**
Mother has history of interpersonal violence/trauma	(0) no	unknown	**(+1) yes**
Maternal anxiety symptoms (clinical level – BAI)	(0) no	unknown	**(+1) yes**
Mother endorses depressive symptoms (clinical level – CESD-D)	(0) no	unknown	**(+1) yes**
Teenage parent	**(0) no**	unknown	(+1) yes
More than 3 births	**(0) no**	unknown	(+1) yes
Has tried to quit substance use ever	(0) no	unknown	**(+1) yes**
Reports having had withdrawal symptoms when trying to stop substance use	(0) no	**unknown**	(+1) yes
Low perceived social support – Family (PSS)	**(0) no**	unknown	(+1) yes
Low perceived social support – Friends (PSS)	**(0) no**	unknown	(+1) yes
Is not comfortable with closeness and intimacy (RAAS)	**(0) no**	unknown	(+1) yes
Does not feel she can depend on others (RAAS)	**(0) no**	unknown	(+1) yes
Worries about being rejected or unloved (RAAS)	**(0) no**	unknown	(+1) yes
Low confidence regarding ability to cope with relapse crisis situations (old DTCQ)	**(0) no**	unknown	(+1) yes
History of self-harm behaviours or suicide attempt	**(0) no**	unknown	(+1) yes
PARENT - OTHER			
Secondary parent is absent from child's life	**(0) no**	unknown	(+1) yes
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	**(0) no**	unknown	(+1) yes
Substance use	(0) no	unknown	**(+1) yes**
Has tried to quit substance use ever	(0) no	unknown	**(+1) yes**
Conviction history	**(0) no**	unknown	(+1) yes
Difficult/dysfunctional or abusive relationship with mother of child	(0) no	unknown	**(+1) yes**
FAMILY			
Maternal pregnancy/Birth of a sibling	**(0) no**	unknown	(+1) yes
New child adopted	**(0) no**	unknown	(+1) yes
More than one child in the home	(0) no	unknown	**(+1) yes**
Medical illness of parent or caregiver	**(0) no**	unknown	(+1) yes
Death of parent or important person	**(0) no**	unknown	(+1) yes
Other trauma to significant person in the child's life	**(0) no**	unknown	(+1) yes
Mother is engaged in a domestically violent relationship/Domestic violence	**(0) no**	unknown	(+1) yes

Has a primary relationship with substance user	(0) no	unknown	**(+1) yes**
Parent or caregiver traumatic divorce or separation	(0) no	unknown	**(+1) yes**
Custody dispute	**(0) no**	unknown	(+1) yes
New romantic relationship	**(0) no**	unknown	(+1) yes
New adult in household (e.g., romantic partner)	**(0) no**	unknown	(+1) yes
Parent or caregiver remarriage	**(0) no**	unknown	(+1) yes
Substance use by household member (non-parental)	(0) no	unknown	**(+1) yes**
Parental substance use relapse	(0) no	unknown	**(+1) yes**
Child protective services involvement	(0) no	unknown	**(+1) yes**
Removal of non-index child from home	**(0) no**	unknown	(+1) yes
Child put up for adoption	(0) no	unknown	**(+1) yes**
Parental unemployment or job instability	(0) no	unknown	**(+1) yes**
Poverty or near poverty (less than $10,000)	(0) no	unknown	**(+1) yes**
Head of household has no more than a semiskilled occupation	(0) no	unknown	**(+1) yes**
Inadequate, unsafe or overcrowded housing or homelessness	(0) no	unknown	**(+1) yes**
Multiple housing moves (2+)	**(0) no**	unknown	(+1) yes
Parental arrest	**(0) no**	unknown	(+1) yes
Parental incarceration (or return from incarceration)	**(0) no**	unknown	(+1) yes
PRE-NATAL/PREGNANCY			
Domestic violence	**(0) no**	unknown	(+1) yes
Alcohol use	**(0) no**	unknown	(+1) yes
Cannabis use	**(0) no**	unknown	(+1) yes
Crack/cocaine use	**(0) no**	unknown	(+1) yes
Heroin use	**(0) no**	unknown	(+1) yes
Methadone use	**(0) no**	unknown	(+1) yes
Other opiates use	**(0) no**	unknown	(+1) yes
Nicotine use	(0) no	unknown	**(+1) yes**
Prescription drug use	**(0) no**	unknown	(+1) yes
Other drug use (eg., amphetamines, hallucinogens, barbiturates/sleeping pills, sedatives/hyponotics/tranquilizers, inhalants	**(0) no**	unknown	(+1) yes
Poly-substance exposure versus single substance exposure during pregnancy	**(0) no**	unknown	(+1) yes
Continuous exposure over all three trimesters during pregnancy	**(0) no**	unknown	(+1) yes
Transiency	**(0) no**	unknown	(+1) yes
Low maternal weight gain	**(0) no**	unknown	(+1) yes
High blood pressure/ pre-eclampsia	(0) no	unknown	**(+1) yes**
Mother overweight pre-pregnancy	(0) no	unknown	**(+1) yes**
Poor pre-natal nutrition	**(0) no**	unknown	(+1) yes
Mom >35 years	**(0) no**	unknown	(+1) yes
Teenage pregnancy	**(0) no**	unknown	(+1) yes
Minimal prenatal care	**(0) no**	unknown	(+1) yes

History of miscarriages or terminations	**(0) no**	unknown	(+1) yes
Diabetes during pregnancy	**(0) no**	unknown	(+1) yes
Infections/STD	**(0) no**	unknown	(+1) yes
Anemia	**(0) no**	unknown	(+1) yes
Placenta Previa	**(0) no**	unknown	(+1) yes
Multiple fetuses	**(0) no**	unknown	(+1) yes
Vaginal bleeding (2nd or 3rd trimester)	**(0) no**	unknown	(+1) yes
BIRTH/POST-NATAL			
Mom >35 years	**(0) no**	unknown	(+1) yes
Teenage pregnancy	**(0) no**	unknown	(+1) yes
Caesarean delivery	**(0) no**	unknown	(+1) yes
Premature delivery	**(0) no**	unknown	(+1) yes
Birth complications	**(0) no**	unknown	(+1) yes
Post-partum depression	**(0) no**	unknown	(+1) yes
Apprehension at birth	**(0) no**	unknown	(+1) yes
Post-natal Medical Diagnoses:			
Fetal Alcohol Spectrum Disorder	**(0) no**	unknown	(+1) yes
Drug withdrawal	**(0) no**	unknown	(+1) yes
Genetic disorder	**(0) no**	unknown	(+1) yes
Seizure/tremors	**(0) no**	unknown	(+1) yes
Heart complications	**(0) no**	unknown	(+1) yes
Birth injuries	**(0) no**	unknown	(+1) yes
Birth defects	**(0) no**	unknown	(+1) yes
Breathing difficulty	**(0) no**	unknown	(+1) yes
Low birth weight	**(0) no**	unknown	(+1) yes
Meconium in placenta	**(0) no**	unknown	(+1) yes
Post-natal Interventions:			
Incubator	**(0) no**	unknown	(+1) yes
Tube feeding	**(0) no**	unknown	(+1) yes
Apnea monitor	**(0) no**	unknown	(+1) yes
Respirator (required ventilation)	**(0) no**	unknown	(+1) yes
Medication requires	**(0) no**	unknown	(+1) yes
CHILD			
Hospitalization of child	**(0) no**	unknown	(+1) yes
Child medical illness	**(0) no**	unknown	(+1) yes
Presence of a diagnosed DSM-IV-R/DSM-5 mental illness	**(0) no**	unknown	(+1) yes
Presence of FASD diagnosis	**(0) no**	unknown	(+1) yes
Child in foster care or kin care/Change in primary caregiver	(0) no	unknown	**(+1) yes**
Child neglect (physical, emotional)	(0) no	unknown	**(+1) yes**
Child abuse (physical, sexual, emotional)	**(0) no**	unknown	(+1) yes
Child reunification with parent after separation	(0) no	unknown	**(+1) yes**
Multiple changes in childcare provider	**(0) no**	unknown	(+1) yes

Stress surrounding child starting daycare/entered school system	(0) no	unknown	**(+1) yes**
Challenging temperament style	**(0) no**	unknown	(+1) yes
Psychosocial & Health Concerns at Intake:			
Chronic colds	(0) no	unknown	**(+1) yes**
Chronic respiratory problems	(0) no	unknown	**(+1) yes**
Chronic ear infections	**(0) no**	unknown	(+1) yes
Heart problems	**(0) no**	unknown	(+1) yes
Gastroenteritis	**(0) no**	unknown	(+1) yes
Limitation in mobility	**(0) no**	unknown	(+1) yes
Seizures	**(0) no**	unknown	(+1) yes
Psychological/emotional problem	**(0) no**	unknown	(+1) yes
Developmental delays/delays to meet developmental milestones	**(0) no**	unknown	(+1) yes
Injuries	**(0) no**	unknown	(+1) yes
Eating problems	**(0) no**	unknown	(+1) yes
Slow weight gain	**(0) no**	unknown	(+1) yes
Behind in immunization	**(0) no**	unknown	(+1) yes
Visual impairment	**(0) no**	unknown	(+1) yes
Hearing impairment	**(0) no**	unknown	(+1) yes
Speech impairment	**(0) no**	unknown	(+1) yes
Cognitive impairment	**(0) no**	unknown	(+1) yes
Frequent injuries	(0) no	unknown	**(+1) yes**
Behavioural problems	**(0) no**	unknown	(+1) yes
Asthma	**(0) no**	unknown	(+1) yes
PARENT-CHILD INTERACTION			
Low parental efficacy (BaP)	**(0) no**	unknown	(+1) yes
Low parental satisfaction (BaP)	**(0) no**	unknown	(+1) yes
High defensive responding (PSI)	**(0) no**	unknown	(+1) yes
High parental distress (PSI)	**(0) no**	unknown	(+1) yes
High parent-child dysfunctional interactions (PSI)	**(0) no**	unknown	(+1) yes
Mother's perception of having a difficult child (PSI)	**(0) no**	unknown	(+1) yes
Clinical level of stress in parenting role (PSI)	**(0) no**	unknown	(+1) yes
High parental expectations (AAPI)	**(0) no**	unknown	(+1) yes
Low parental empathy (AAPI)	**(0) no**	unknown	(+1) yes
Reversed familial/parent-child roles (AAPI)	(0) no	unknown	**(+1) yes**
High hostile ineffective parenting (NLSCY)	**(0) no**	unknown	(+1) yes
High inconsistent parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Low positive parenting (NLSCY)	(0) no	unknown	**(+1) yes**
Reporting challenging relationship with child	**(0) no**	unknown	(+1) yes
Child apprehension within first three years of life	(0) no	unknown	**(+1) yes**
SOCIAL NETWORK			
Disadvantaged minority ethnic background	**(0) no**	unknown	(+1) yes

Immigrant status	**(0) no**	unknown	(+1) yes
Acculturation or language conflicts	**(0) no**	unknown	(+1) yes

Table XVIII: Cumulative Protective Factor Score – C2

DOMAIN	SCORING		
PARENT - MOTHER			
Attends Basic Life Skills group at BTC	**(0) no**	unknown	(+1) yes
Attends Emotional Awareness Life Skills group at BTC	**(0) no**	unknown	(+1) yes
Attends Connections group at BTC	**(0) no**	unknown	(+1) yes
Attends Relapse Prevention group at BTC	(0) no	unknown	**(+1) yes**
Attends Recovery Group at BTC	**(0) no**	unknown	(+1) yes
Attends Mindfulness group at BTC	**(0) no**	unknown	(+1) yes
In recovery for substance use	**(0) no**	unknown	(+1) yes
Attending substance use treatment	(0) no	unknown	**(+1) yes**
Accessing addiction support	**(0) no**	unknown	(+1) yes
Accessing urine screens	**(0) no**	unknown	(+1) yes
Accessing mental health support/therapy/trauma counselling	(0) no	unknown	**(+1) yes**
High Perceived Social Support – Family (PSS)	(0) no	unknown	**(+1) yes**
High Perceived Social Support – Friends (PSS)	(0) no	unknown	**(+1) yes**
Is comfortable with closeness and intimacy (RAAS)	(0) no	unknown	**(+1) yes**
Feels she can depend on others (RAAS)	**(0) no**	unknown	(+1) yes
Does not worry about being rejected or unloved (RAAS)	(0) no	unknown	**(+1) yes**
High confidence regarding ability to cope with relapse crisis situations (old DTCQ)	(0) no	unknown	**(+1) yes**
Maternal level of education: has completed post-secondary education	**(0) no**	unknown	(+1) yes
PARENT - OTHER			
No substance use history	**(0) no**	unknown	(+1) yes
If substance use history, in recovery for substance use	**(0) no**	unknown	(+1) yes
Parent attending substance use treatment	**(0) no**	unknown	(+1) yes
Accessing addiction support	**(0) no**	unknown	(+1) yes
Accessing mental health support/therapy/trauma counselling	**(0) no**	unknown	(+1) yes
Presence of positive secondary parental figure to child	**(0) no**	unknown	(+1) yes
FAMILY			
Partner supportive of maternal substance use treatment services	**(0) no**	unknown	(+1) yes
Family supportive of maternal substance use treatment services	**(0) no**	unknown	(+1) yes
Presence of extended familial supports	**(0) no**	unknown	(+1) yes
High SES	**(0) no**	unknown	(+1) yes
Accessing couples therapy services	**(0) no**	unknown	(+1) yes
Accessing family therapy services	**(0) no**	unknown	(+1) yes
Family cohesion	**(0) no**	unknown	(+1) yes
PRE-NATAL/PREGNANCY			
Early-intervention through BTC Pregnancy Outreach Program	**(0) no**	unknown	(+1) yes

Attends BTC Pregnancy Outreach Program Prenatal Relapse Prevention group	**(0) no**	unknown	(+1) yes
BIRTH/POST-NATAL			
Neonatal follow-up	**(0) no**	unknown	(+1) yes
CHILD			
Easy temperament	(0) no	unknown	**(+1) yes**
Child was/is in daycare	(0) no	unknown	**(+1) yes**
Child involved in extra-curricular activities	(0) no	unknown	**(+1) yes**
Child has positive teacher relationships at school/daycare	(0) no	unknown	**(+1) yes**
Received occupational therapy	**(0) no**	unknown	(+1) yes
Received speech/language therapy	(0) no	unknown	**(+1) yes**
Received psychological assessment	(0) no	unknown	**(+1) yes**
Child protective services involvement	(0) no	unknown	**(+1) yes**
PARENT-CHILD INTERACTION			
High parental efficacy (BaP)	**(0) no**	unknown	(+1) yes
High parental satisfaction (BaP)	**(0) no**	unknown	(+1) yes
Low defensive responding (PSI)	**(0) no**	unknown	(+1) yes
Low parent-child dysfunctional interactions (PSI)	**(0) no**	unknown	(+1) yes
Mother's perception of having an easy child (PSI)	**(0) no**	unknown	(+1) yes
Low level of stress in parenting role (PSI)	**(0) no**	unknown	(+1) yes
Low parental expectations (AAPI)	**(0) no**	unknown	(+1) yes
High parental empathy (AAPI)	**(0) no**	unknown	(+1) yes
Intact familial/parent-child roles (AAPI)	**(0) no**	unknown	(+1) yes
Low hostile ineffective parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Low inconsistent parenting (NLSCY)	(0) no	unknown	**(+1) yes**
High positive parenting (NLSCY)	**(0) no**	unknown	(+1) yes
Attended New Mom Support group at BTC	**(0) no**	unknown	(+1) yes
Attends Mother Goose group at BTC	**(0) no**	unknown	(+1) yes
Attends Learning Through Play group at BTC	**(0) no**	unknown	(+1) yes
SOCIAL NETWORK/PROFESSIONAL CARE/SERVICES			
Non-family adult support network	**(0) no**	unknown	(+1) yes
Public health services	**(0) no**	unknown	(+1) yes
High risk nurse services	**(0) no**	unknown	(+1) yes
Physician	(0) no	unknown	**(+1) yes**
Financial Allowances (e.g., ODSP, OCCS, Ontario Works)	(0) no	unknown	**(+1) yes**