

# Suicidality and Associated Factors Among Individuals Assessed for Fetal Alcohol Spectrum Disorder Across the Lifespan in Canada


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**Suicidabilité et facteurs associés chez les personnes évaluées pour les troubles du spectre de l'alcoolisation fœtale de durée de vie au Canada**

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## Abstract

**Objective:** Individuals with fetal alcohol spectrum disorder (FASD) experience a range of complex neurodevelopmental, psychological, and socioenvironmental vulnerabilities. There is growing evidence that suicidal ideation, attempts, and death by suicide are significant concerns within this population. In this study, we (1) determined the rate of suicidal ideation/attempts in a large group of individuals with prenatal alcohol exposure (PAE) who were assessed for FASD in Canada and (2) investigated the associations between suicidal ideation/attempts and select demographic and biopsychosocial factors in this group.

**Method:** A secondary analysis of data from Canada's National FASD Database, a national repository of clinical information gathered through FASD assessment and diagnostic clinics across the country, was conducted. Descriptive analyses, chi-square/Fisher's exact tests, and binary logistic regression were used to examine demographic and biopsychosocial variables and their associations with suicidality.

**Results:** In our sample of 796 participants ( $M_{age} = 17.7$  years, range = 6–59; 57.6% male) assessed for FASD, 25.9% were reported to experience suicidal ideation/attempts. Numerous demographic and biopsychosocial factors were found to be significantly associated with suicidal ideation/attempts. The strongest associations with suicidal ideation/attempts were substance use, history of trauma/abuse, and impaired affect regulation.

**Conclusions:** With this study, we contribute to the emerging evidence of elevated risk of suicidality among individuals with PAE/FASD and improve our understanding of factors that may exacerbate this risk. Findings have relevance for improving

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screening, prevention, and proactive treatment approaches for individuals with PAE and FASD, their families, and wider support systems.

### Abrégé

**Objectif:** Les personnes souffrant des troubles du spectre de l'alcoolisation fœtale (TSAF) éprouvent une série de vulnérabilités complexes neurodéveloppementales, psychologiques et socio-environnementales. Des données probantes croissantes constatent que l'idéation suicidaire, les tentatives de suicide et les décès par suicide sont des problèmes significatifs au sein de cette population. Dans la présente étude, nous: (1) avons déterminé le taux d'idéation suicidaire et de tentatives de suicide dans un vaste groupe de personnes exposées à l'alcool prénatal (EAP) qui ont été évaluées pour le TSAF au Canada, et (2) avons investigué les associations entre l'idéation suicidaire/tentatives de suicide et les facteurs démographiques et biopsychosociaux sélectionnés dans ce groupe.

**Méthode:** Une analyse secondaire des données de la Base de données nationale canadienne sur l'ETCAF, un dépôt national d'information clinique recueillie par les évaluations de TSAF et les cliniques diagnostiques du pays, a été menée. Des analyses descriptives, des tests de chi carré et exacts de Fisher, et la régression logistique binaire ont servi à examiner les variables démographiques et biopsychosociales ainsi que leurs associations à la suicidabilité.

**Résultats:** Dans notre échantillon de 796 participants ( $M_{age} = 17,7$  ans, éventail = 6 à 59; 57,6% de sexe masculin) évalués pour le TSAF, 25,9% ont été déclarés aux prises avec l'idéation suicidaire/tentatives de suicide. De nombreux facteurs démographiques et biopsychosociaux ont été constatés être associés significativement à l'idéation suicidaire/tentatives de suicide. Les associations les plus fortes avec l'idéation suicidaire/tentatives de suicide étaient l'utilisation de substances, des antécédents de trauma, et une régulation déficiente de l'affect.

**Conclusions:** Avec cette étude, nous contribuons aux données probantes émergentes du risque élevé de suicidabilité chez les personnes souffrant de EAP/TSAF et nous améliorons notre connaissance des facteurs qui peuvent exacerber ce risque. Les résultats sont pertinents pour améliorer le dépistage, la prévention, et les approches de traitement proactif pour les personnes souffrant d'EAP et de TSAF, leur famille, et les systèmes de soutien élargis.

### Keywords

fetal alcohol spectrum disorder, prenatal alcohol exposure, suicidality, suicidal ideation, suicide attempts, risk factors, biopsychosocial, mental health

## Introduction

Individuals with fetal alcohol spectrum disorder (FASD) experience a range of neurodevelopmental (ND) challenges stemming from prenatal alcohol exposure (PAE),<sup>1</sup> as well as notable social and environmental adversity across the lifespan.<sup>2-7</sup> Most individuals with FASD have cooccurring mental health difficulties,<sup>7-9</sup> and many struggle with substance use.<sup>5,10,11</sup> Combined, the biopsychosocial vulnerabilities associated with PAE/FASD can increase risk for negative outcomes, and one of the most concerning of these is elevated risk for suicidality.<sup>12-15</sup> "Suicidality" is a spectrum of thoughts and behaviours including suicidal ideation, suicide-related communication, suicide attempts, and death by suicide.<sup>16,17</sup> In a seminal study of long-term outcomes of individuals with FASD, researchers reported that 19% of children and 43% of adults experienced suicide threats, and 2% of children and 24% of adults reported suicide attempts.<sup>18</sup> Since then, there is growing evidence that suicidality is a serious concern for this population across the lifespan.<sup>13,19-22</sup> Canadian researchers recently reported suicide as a leading cause of death in a group of individuals with FASD.<sup>22</sup>

Another group of individuals with FASD were reported to begin experiencing suicidality at a significantly younger age than those without FASD (21 vs. 33 years).<sup>21</sup> Among children and adolescents with FASD in one study, past year rates of suicide attempts requiring medical assistance were reported as 5.5 times greater than in the general population, and males were at particularly high risk.<sup>20</sup>

Several factors may be associated with suicidality in FASD. For instance, researchers have pointed toward lower IQ, higher number of home placements, and the presence of depressive and anxiety disorders<sup>15,20</sup> as potential risk factors. Some individuals with FASD who experience suicidality also face complex psychosocial and environmental adversity, including abuse, exposure to violence, mental health and substance use challenges, financial instability, and inconsistent social support.<sup>14,23</sup> Intergenerational factors may be at play, as higher rates of suicidality during the postpartum period have been reported among mothers of children with FASD compared with mothers of children without FASD.<sup>24</sup> Although this literature lays important groundwork, the field is still in its infancy, and previous studies have significant limitations.

**Table 1.** Demographic Characteristics and Rates of Suicidality Among Individuals With PAE Assessed for FASD in Canada.

Demographic factors	n (%)	Suicidality, n (%)	$\chi^2$	P-value	Effect size <sup>a</sup>
<b>Age group in years (N = 796)</b>					
6–12	285 (35.8)	34 (11.9)	46.06	<0.001	0.241
13–17	245 (30.8)	85 (34.7)			
18–24	125 (15.7)	44 (35.2)			
≥25	141 (17.7)	43 (30.5)			
<b>Sex (N = 795)</b>					
Male	458 (57.6)	115 (25.1)	0.36	0.547	0.021
Female	337 (42.4)	91 (27.0)			
<b>Region (N = 796)</b>					
Western/Northern	26 (3.3)	17 (65.4)	34.27	<0.001	0.207
Prairie	593 (74.5)	129 (21.8)			
Central	128 (16.1)	47 (36.7)			
Atlantic	49 (6.2)	13 (26.5)			
<b>Living situation (N = 784)</b>					
Biological parent(s)	158 (20.2)	43 (27.2)	30.48	<0.001	0.197
Other family member(s) <sup>b</sup>	173 (22.1)	34 (19.7)			
Foster	135 (17.2)	24 (17.8)			
Adoptive	109 (13.9)	24 (22.0)			
Group home	37 (4.6)	19 (51.4)			
Institutional <sup>c</sup>	29 (3.7)	12 (41.4)			
Unhoused <sup>d</sup>	26 (3.3)	6 (23.1)			
Independent/other <sup>e</sup>	117 (14.9)	41 (35.0)			

Note. FASD = fetal alcohol spectrum disorder; PAE = prenatal alcohol exposure.

<sup>a</sup>Phi coefficient or Cramer's V.

<sup>b</sup>Grandparents, aunts/uncles, cousins, siblings, adult children, and kinship care.

<sup>c</sup>Participants in custody or in-patient treatment settings.

<sup>d</sup>Participants experiencing homelessness or living in shelters.

<sup>e</sup>Participants living independently, with a spouse/partner, friend(s), or roommate(s).

## Current Study

This study was part of a larger project undertaken to explore the risk and protective factors related to suicidality in FASD. We investigated rates of suicidal ideation/attempts and associated demographic and biopsychosocial factors in a large Canadian sample of individuals with PAE assessed for FASD. Our intention with this study was to help guide efforts to promote safety, wellbeing, and positive outcomes for this population.

## Materials & Methods

### Procedure and Data Source

We conducted a secondary analysis of data from the National FASD Database (“the Database”), a comprehensive collection of clinical information from individuals with PAE assessed for FASD across Canada.<sup>25</sup> Database information is gathered through a multidisciplinary<sup>1</sup> assessment following the current Canadian FASD Diagnostic Guideline, involving a comprehensive evaluation of clients’ functioning across 10 ND domains.<sup>1</sup> Data is also collected on PAE,<sup>2</sup> cooccurring mental health and other ND diagnoses, and other clinical and socioenvironmental difficulties commonly associated with FASD (see Appendix for full list of Database

variables collected for this study). The Database includes a specific variable on suicidality (“suicide attempt(s)/ideation”), which was the central focus of this study<sup>3</sup>. Data entry varies across clinics but is most often completed by a clinic coordinator via retrospective chart review after the assessment is complete.

### Sample

Records were included in this study if they had 1) confirmed PAE; 2) a definitive FASD diagnostic outcome (i.e., FASD with or without sentinel facial features, or no FASD; at-risk for FASD was excluded); and 3) indication of the presence or absence of suicidality (i.e., cases with no response were excluded). Preliminary examination revealed no cases of suicidality among children younger than 6 years, so this age group was excluded from analyses. An initial 1,055 records were extracted in February 2021, and after excluding individuals without confirmed PAE ( $n=106$ ; 10%), at-risk for FASD ( $n=112$ ; 11%), and under 6 years ( $n=41$ ; 4%), the final number of records was 796.

### Data Analysis and Interpretation

Statistical analyses were conducted using IBM SPSS Statistics Version 27 for Mac. Descriptive statistics were

used to characterize the sample's overall rate of suicidality, as well as demographic (age, sex, region, living situation) and biopsychosocial (ND impairments, FASD diagnostic outcome, Full Scale IQ [FSIQ] category, sleep problems, cooccurring mental health and ND disorders, substance use, trauma/abuse, and socio environmental difficulties<sup>4</sup>) characteristics. Pearson chi-square or Fisher's exact tests were conducted to examine group differences in rates of suicidality based on demographic and biopsychosocial variables.<sup>5</sup>

A standard binomial logistic regression was used to explore select factors contributing to suicidality. Independent variables were age (entered in the first block to control for anticipated developmental trends), sleep problems, trauma/abuse, impaired affect regulation, impaired adaptive function, and substance use. In the context of FASD assessment, "impaired affect regulation" is defined as symptoms commensurate with the DSM-5 criteria for depressive and/or anxiety disorders, and adaptive function includes "adaptive behaviour, social skills, or social communication."<sup>1</sup> Variables included in the regression were determined based on statistical significance at the univariate level (Table 2) and previous research on potential biopsychosocial risk factors for suicidality among individuals with and without FASD. Priorities for variable selection were to minimize the number of predictors, reduce missing data and multicollinearity, and account for a substantial amount of variability.<sup>6</sup> Findings were interpreted by a diverse team of researchers, including scientists, physicians, psychologists, epidemiologists, social workers, and individuals with lived experience to ensure that results were presented with clinical and practical relevance.

### Ethics

Ethical approval for this study was obtained from the Laurentian University Research Ethics Board (REB number 6020678). Approval for the larger Database project, and for secondary use of data, was granted by the Ottawa Health Science Network Research Ethics Board (Protocol ID 20160423-01H) in 2016 and is renewed yearly. Informed consent was not obtained from participants in this study.<sup>7</sup>

## Results

### Participant Characteristics and Overall Rate of Suicidality

The mean age of participants was 17.7 years of age ( $SD = 10.6$ , range = 6 to 59), and slightly over half (57.6%) were male. The most common living situations were with biological parents (20.2%) or other family members (22.1%), and most participants were from the Prairie provinces of Canada (74.5%).<sup>8</sup> Most clients were referred through social service agencies (43.2%) and self/family (25.3%), whereas other referrals came from the medical (13.2%), legal

(8.8%), and education (6.3%) systems (the remaining 3.3% were referred through other sources). One-quarter of participants (25.9%) were reported to experience suicidal attempts/ideation (see Table 1).

### Demographic Trends

Rates of suicidality differed significantly by age group, region, and living situation, but not sex (see Table 1). The highest rates of suicidality were among transition-aged youth 18–24 years (35.2%) and adolescents 13–17 years (34.7%). By region and living situation, participants from Western/Northern Canada (65.4%) and those living in group care (51.4%) had the highest rates. Rates were relatively lower (though still notably high) among children aged 6–12 years (11.9%), those living in Prairie provinces (21.8%), and in foster care (17.8%).

### Biopsychosocial Trends

**ND Impairment.** On average, participants had significant impairments in 4.6 domains ( $SD = 2.34$ , range = 0 to 10), the most common of which was executive function (66.0%; see Table 2). There were significantly higher rates of suicidality among participants with impaired affect regulation (34.7%) and adaptive function (29.4%) than participants without impairments in these areas (18.7% and 19.5%, respectively). Of the 745 participants with data available on FSIQ category,<sup>9</sup> most had a standard score in the intellectual disability (i.e., <70; 39.1%) or borderline (i.e., 70–85; 39.2%) range. Just over half (55.4%) of participants were diagnosed with FASD. There were no significant differences in suicidality based on FSIQ category or FASD diagnostic outcome.

**Sleep Problems.** Sleep problems were identified in 47.0% of participants and associated with suicidality, with significantly higher rates of suicidality among participants with sleep problems (31.3%) than those without (21.1%).

**Cooccurring Mental Health and ND Disorders.** The mean number of cooccurring disorders was 2.64 ( $SD = 1.75$ , range = 0 to 8), and the most common diagnoses were attention deficit hyperactivity disorder (ADHD) (61.9%) and depressive/mood disorders (46.5%). Several disorders were significantly associated with suicidality, with the largest effect sizes found among those with anxiety, depressive/mood, and posttraumatic stress disorder/adjustment disorders (see Table 2).

**Substance Use Challenges.** Of the 678 participants with data on substance use, 44.8% experienced challenges in this area.<sup>10</sup> Suicidality was significantly more common among participants with substance use challenges (40.8%) than those without (8.6%).

**Table 2.** Biopsychosocial Characteristics and Rates of Suicidality Among Individuals With PAE Assessed for FASD in Canada.

Biopsychosocial factors	<i>n</i> (%)	Suicidality, <i>n</i> (%)	$\chi^2$	<i>P</i> -value	Effect size <sup>a</sup>
<b>FASD diagnosis (<i>N</i> = 796)</b>					
FASD with SFF	106 (13.3)	30 (28.3)	3.03	0.220	0.062
FASD without SFF	517 (64.9)	140 (27.1)			
No FASD	173 (21.7)	36 (20.8)			
<b>Neurodevelopmental impairments</b>					
Motor ( <i>N</i> = 728)	155 (21.3)	47 (30.3)	2.51	0.113	0.059
Neuroanatomy/physiology ( <i>N</i> = 696)	73 (10.5)	26 (35.6)	4.05	0.044	0.076
Cognition ( <i>N</i> = 782)	461 (59.0)	112 (24.3)	1.17	0.280	-0.039
Language ( <i>N</i> = 760)	310 (40.8)	87 (28.1)	1.59	0.207	0.046
Academics ( <i>N</i> = 769)	479 (62.3)	121 (25.3)	0.03	0.853	-0.007
Memory ( <i>N</i> = 773)	347 (44.9)	93 (26.8)	0.37	0.544	0.022
Attention ( <i>N</i> = 765)	485 (63.4)	117 (24.1)	1.30	0.254	-0.041
Executive functioning ( <i>N</i> = 771)	509 (66.0)	131 (25.7)	0.09	0.769	-0.011
Affect regulation ( <i>N</i> = 749)	354 (47.3)	123 (34.7)	24.69	<0.001	0.182
Adaptive functioning ( <i>N</i> = 774)	487 (62.9)	143 (29.4)	9.18	0.002	0.109
<b>FSIQ category (<i>N</i> = 745)</b>					
<70	291 (39.1)	73 (25.1)	0.83	0.662	0.033
70–85	292 (39.2)	76 (26.0)			
>85	162 (21.7)	36 (22.2)			
Sleep problems ( <i>N</i> = 796)	374 (47.0)	117 (31.3)	10.74	0.001	0.116
<b>Cooccurring disorders</b>					
<b>Mental health</b>					
Anxiety disorder ( <i>N</i> = 690)	264 (38.3)	105 (39.8)	85.21	<0.001	0.351
Attachment disorder ( <i>N</i> = 605)	75 (12.4)	21 (28.0)	4.12	0.042	0.082
Bipolar disorder ( <i>N</i> = 406)	11 (2.7)	6 (54.5)	<sup>b</sup>	0.003	0.180
Conduct disorder ( <i>N</i> = 610)	89 (14.6)	35 (39.3)	30.56	<0.001	0.224
Depressive/mood disorder ( <i>N</i> = 686)	319 (46.5)	120 (37.6)	82.63	<0.001	0.347
OCD ( <i>N</i> = 519)	18 (3.5)	6 (33.3)	<sup>b</sup>	0.029	0.105
ODD ( <i>N</i> = 461)	89 (19.3)	26 (29.2)	10.82	0.001	0.153
Personality disorder ( <i>N</i> = 424)	24 (5.7)	11 (45.8)	<sup>b</sup>	0.001	0.191
PTSD/adjustment disorder ( <i>N</i> = 471)	113 (24.0)	53 (46.9)	57.20	<0.001	0.348
Schizophrenia/psychotic disorder ( <i>N</i> = 402)	15 (3.7)	6 (40.0)	<sup>b</sup>	0.016	0.136
<b>Neurodevelopmental</b>					
ADHD ( <i>N</i> = 753)	466 (61.9)	115 (24.7)	0.01	0.929	0.003
ASD ( <i>N</i> = 431)	18 (4.2)	6 (33.3)	<sup>b</sup>	0.106	0.086
DCD ( <i>N</i> = 636)	54 (8.5)	20 (37.0)	10.24	0.001	0.127
Intellectual disability ( <i>N</i> = 782)	332 (42.5)	85 (25.6)	0.20	0.659	0.016
Language disorder ( <i>N</i> = 749)	207 (27.6)	72 (34.8)	16.11	<0.001	0.147
Substance use challenges ( <i>N</i> = 678)	304 (44.8)	124 (40.8)	98.34	<0.001	0.381
History of trauma/abuse ( <i>N</i> = 796)	490 (61.6)	162 (33.1)	34.27	<0.001	0.208
<b>Socioenvironmental difficulties</b>					
School problems ( <i>N</i> = 746)	380 (50.9)	127 (33.4)	22.14	<0.001	0.172
Employment problems ( <i>N</i> = 764)	261 (34.2)	78 (29.9)	6.61	0.010	0.093
Independent living needs ( <i>N</i> = 764)	399 (52.2)	136 (34.1)	36.77	<0.001	0.219
Housing problems ( <i>N</i> = 775)	158 (20.4)	61 (38.6)	16.99	<0.001	0.148
Legal problems: victim/custody ( <i>N</i> = 769)	69 (9.0)	31 (44.9)	15.08	<0.001	0.140
Legal problems: offending ( <i>N</i> = 762)	170 (22.3)	87 (51.2)	71.22	<0.001	0.306

Note. ADHD = attention deficit hyperactivity disorder; ASD = autism spectrum disorder; DCD = developmental coordination disorder; FASD = fetal alcohol spectrum disorder; FSIQ = full scale intelligence quotient; OCD = obsessive compulsive disorder; ODD = oppositional defiant disorder; PAE = prenatal alcohol exposure; PTSD = posttraumatic stress disorder; SFF = sentinel facial features.

<sup>a</sup>Phi coefficient or Cramer's *V*.

<sup>b</sup>Fisher's exact tests.

**Trauma/Abuse.** Experiences of trauma and/or abuse were reported in 61.6% of participants, who had significantly higher rates of suicidality (33.1%) than those without similar histories (14.4%).

**Socioenvironmental Difficulties.** On average, participants were reported to experience 1.82 (*SD* = 1.42, range = 0 to 6) socio-environmental adversities at the time of their FASD assessment, most commonly problems with independence

**Table 3.** Logistic Regression Predicting the Likelihood of Suicidality Among Individuals With PAE Assessed for FASD in Canada.

Predictors	B	SE	Wald	P-value	Odds ratio	95% CI
Block 1						
Age group	-0.17	0.12	1.87	0.172	0.84	0.66 to 1.08
Block 2						
Sleep problems	0.35	0.22	2.43	0.119	1.42	0.91 to 2.19
Trauma/abuse	1.03	0.25	17.60	<0.001	2.79	1.73 to 4.51
Affect regulation impairment	0.62	0.24	6.82	0.009	1.87	1.17 to 2.98
Adaptive function impairment	0.18	0.24	0.55	0.459	1.20	0.75 to 1.92
Substance use	1.90	0.29	44.09	<0.001	6.68	3.81 to 11.70

Note. FASD = fetal alcohol spectrum disorder; PAE = prenatal alcohol exposure; SE = standard error.

(52.2%). All difficulties were associated with suicidality, and the largest effect size was found among participants who had legal problems with offending (see Table 2).

### Model of Suicidality

The final regression model was statistically significant,  $\chi^2(6) = 129.69$ ,  $P < 0.001$ , and accounted for between 18.6% (Cox & Snell  $R^2$ ) and 28.2% (Nagelkerke  $R^2$ ) of the variation in suicidality (see Table 3). Of the included variables, only trauma/abuse, impaired affect regulation, and substance use challenges remained significant in the final model. The odds of suicidality were 6.7 times higher in individuals with substance use challenges compared with those without, 2.8 times higher in individuals with histories of trauma/abuse compared with those without, and 1.9 times higher in those with impaired affect regulation compared with those without.

### Discussion

Suicidal ideation, attempts, and death by suicide are significant concerns among individuals with PAE/FASD. In this study, we replicated and extended previous research by examining the rate of suicidality and associated factors in a large cohort of individuals with PAE assessed for FASD in Canada. Suicidality was identified in 25.9% of participants, which is substantially higher than estimates in the general Canadian population (ranging from 3% to 12%).<sup>26,27</sup> However, this finding aligns with previously reported rates of suicidal ideation/attempts among individuals with PAE/FASD, ranging from 13% to 47.4%, depending on the sample and how suicidality was defined.<sup>13,20,21,28</sup>

Of the age groups examined, we found the highest rates of suicidality among adolescents (34.7%) and transition-aged youth (35.2%). These findings are consistent with trends in the general Canadian population, where suicide is the second leading cause of death among youth and young adults.<sup>29</sup> This developmental period is associated with increased complexity and difficulty for individuals with PAE/FASD, who are often exposed to many adverse life experiences.<sup>5,7,30</sup> This life stage also coincides with a transition from youth to adult services, where there is limited access

to, and availability of, FASD-informed supports. Additionally, there are increased expectations of responsibility and independence at this life stage, which may not be appropriate given potential discrepancies between the chronological age and level of functioning experienced by individuals with PAE/FASD.<sup>31,32</sup> Concerningly, nearly 12% of children aged 6–12 years in our sample also experienced suicidality. These findings highlight the urgent need for early monitoring and developmentally appropriate approaches to address factors related to vulnerability and suicide risk among individuals with PAE (with and without an FASD diagnosis).

Living situation was also significantly associated with suicidality in this study, with higher rates among participants living in a group home (51.4%) or institutional setting (41.4%) at the time of assessment compared to those living elsewhere. There are inherent vulnerabilities associated with out-of-home care, and the increased risk for suicidality we identified emphasizes the need for FASD-informed care and an appreciation of the neurobiological differences and complex needs of individuals with PAE/FASD in these circumstances. Growing up in a stable and nurturing home is a significant protective factor for people with FASD,<sup>7</sup> and findings from this study underscore the importance of these positive home environments for the health and well-being of individuals with PAE/FASD. Given the association between social isolation and suicidality in the general population,<sup>33</sup> efforts to increase social connection for individuals with PAE/FASD may not only support long term stability and community inclusion<sup>34</sup> but may also be an important component of suicide prevention.

Our finding that rates of suicidality did *not* differ based on FASD diagnostic outcome suggests that PAE in and of itself may be a critical factor. PAE has a deleterious effect on the brain's stress-response system<sup>4,35</sup> and the cumulative impacts of psychosocial and environmental adversity may further exacerbate sensitivity to stress.<sup>3</sup> Our findings indicate that when PAE cooccurs with trauma/abuse, mental health concerns, and substance use challenges, the risk of suicidality may be amplified. Substance use had the greatest association with suicidality in this study, increasing the odds by nearly seven times. Consistent with previous research,<sup>15</sup> impaired affect regulation (i.e., depressive/anxiety disorders) almost

doubled the likelihood of suicidality in this study. Moreover, nearly two-thirds of participants (61.6%) had a history of trauma/abuse, which almost tripled the likelihood of suicidality. We also found marked socioenvironmental difficulties among participants, and those who had legal problems with offending experienced especially high rates of suicidality (51.2%). Surprisingly, we did not find significant associations between suicidality and IQ, executive dysfunction, or cooccurring ADHD. The links between trauma, mental health concerns, substance use, justice involvement, and suicidality identified in this study are consistent with research in the general population<sup>36-39</sup> and especially problematic considering the lack of evidence-based interventions in these areas.<sup>40,41</sup>

A novel finding in this study was the association between sleep problems and suicidality, which is consistent with research in other populations,<sup>42-44</sup> where disturbances in sleep quantity<sup>45,46</sup> and quality<sup>47,48</sup> have been associated with suicidality in youth and adults without FASD. Coupled with the mounting evidence of sleep-related concerns among individuals with FASD,<sup>49,50</sup> the current findings indicate a clear need to consider sleep within prevention and intervention efforts for this population. Additionally, follow-up research is needed to tease apart the specific nature of the associations between sleep problems and suicidality among individuals with PAE/FASD, for instance, how or whether sleep quality and quantity, sleep disorders such as sleep apnea, or differences in circadian rhythms differentially impact the likelihood of suicidality in this population.

Together, our findings highlight the critical need for increased prevention and intervention initiatives within research, practice, and policy for individuals with PAE/FASD and their families. Efforts to support this population should be trauma informed and involve a comprehensive and individualized assessment of the biopsychosocial factors believed to increase suicide risk. Many of the associated factors identified in this study would arise in mental health and family medicine practice settings and provide a list of potential symptoms to inform screening, treatment, and management approaches. At the policy level, our findings indicate a need for anticipatory guidance<sup>51</sup> and surveillance approaches as well as prevention, screening, and treatment strategies for factors associated with suicidality among individuals with PAE/FASD. Policies are needed that support consistent and effective screening approaches as well as infrastructure for evidence-based and tailored long-term supports for this vulnerable population. Importantly, tailored resources and services are also needed for caregivers and families supporting individuals with PAE/FASD who experience suicidality.

### Limitations and Future Directions

Despite the notable contributions of this study, it also had several limitations. First, suicidality is broadly captured in the Database as “suicide attempt(s)/ideation,” with no

additional information on context, severity, chronicity, or frequency. Therefore, there is no way of knowing whether a positive endorsement signifies past or present suicidality or whether the individual has experienced ideation, attempts, or both. This lack of detail precluded a nuanced exploration of suicidality, and given the varied impacts, trajectories, risk levels, and outcomes associated with suicidal thoughts versus behaviours, there remains a critical need for research on the spectrum of suicidality experienced by individuals with PAE/FASD. Moreover, our lack of information about *how* suicidality was evaluated has significant implications for the reliability and validity of the data. Similarly, we are unable to determine whether suicide assessment differed across age groups. Future research should involve multi-method, multiinformant suicide assessment tools to explore suicidality in FASD across the lifespan, with special consideration for how some tools may be less appropriate for use with individuals with ND disorders.<sup>52,53</sup>

Similar limitations relate to how most Database variables are categorical and lack specificity in terms of how they are assessed. Except for the variables required for an FASD diagnosis, data may not have been assessed, collected, or entered systematically across clinics. As well, specific experiences that are common among individuals with PAE/FASD and may have important implications for suicidality (e.g., parental psychopathology, family history of suicidality, social connection) are not currently collected in the Database. Therefore, we were unable to examine the impacts of these factors on suicidality, and future research is needed to explore the unique contributions of these biological, prenatal, and postnatal influences.

Another methodological limitation of this study is that we did not include a control group of individuals without PAE who had similar needs and life experiences. This precludes us from being able to attribute the high rates of suicidality to alcohol exposure alone. Moreover, given that this was a cross-sectional study, there was no way to examine the directionality or interplay between suicidality and associated factors. Longitudinal studies are needed to identify factors that may influence trajectories for individuals with PAE/FASD. Future research should involve individuals with lived experience to provide context, meaning, and personal stories to enhance the quantitative data presented in this study. Caregivers and families of individuals with PAE/FASD experiencing suicidality should also be included in future research to explore their perspectives, perceived impacts of suicidality, as well as insights into effective supports.

Finally, although the investigation of risk factors is essential for informing suicide screening, prevention, and intervention, more work is needed to identify protective factors for this population. There is a call in the broader FASD literature to shift the narrative from deficits to strengths,<sup>54</sup> and our finding that suicidality was *not* endorsed in 74% of our sample raises the question of what factors may bolster

resilience and protect individuals with PAE/FASD against harmful outcomes.

## Conclusion

This study greatly increases our understanding of suicidality and associated factors within a large sample of individuals with PAE assessed for FASD across the lifespan in Canada. Findings may help to guide decision-making around the allocation of suicide prevention efforts and resources to ensure proactive and effective interventions. Coupled with existing evidence of the wide-ranging vulnerabilities experienced by individuals with PAE/FASD, this study highlights the urgent need for action in research, practice, and policy to better support this population. Future work in this area should include a targeted focus on identifying protective factors and building strengths and resilience among individuals with PAE/FASD and their families to promote positive outcomes.

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## Data Access

The data presented in this study are not publicly available due to privacy and ethical restrictions but are available upon request from Dr. Kelly Harding (kharding@laurentian.ca).

## Declaration of Conflicting Interests

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## Supplemental Material

Supplemental material for this article is available online.

## Notes

1. Assessments typically involve a physician, psychologist, and speech-language pathologist for adults and an occupational therapist and/or a child development specialist for children and adolescents.
2. The current FASD Diagnostic Guideline stipulates that the minimum threshold for an FASD diagnosis should be  $\geq 7$

drinks/week or  $\geq 2$  episodes of  $\geq 4$  drinks, though specific details related to the timing, quantity, and frequency of alcohol exposure are not entered into the Database. Confirmation of PAE is required from a reliable source such as maternal report, clinical observation, or medical/birth records.

3. Contextual information about suicidality (e.g., past or present, ideation or attempt) is not collected nor are details of how suicidality-related information is assessed at the clinic-level.
4. Socioenvironmental adversity included problems with school, employment, independent living, housing, and legal issues, at the time of FASD assessment.
5. Bonferroni correction was used to account for multiple comparisons, with an adjusted  $p$ -value of  $0.05/12 = 0.004$ . The denominator was set to the number of families of comparisons (i.e., age, sex, region, living situation, FASD diagnostic outcome, ND impairments, FSIQ category, sleep problems, cooccurring disorders, substance use, trauma/abuse, and socioenvironmental difficulties).
6. PTSD/adjustment disorders were significant at the univariate level but including the “trauma” variable was a more comprehensive indicator with fewer missing data points. Depressive/mood and anxiety disorders were both significant at the univariate level, but the “affect regulation” domain served as a more accurate proxy for these disorders, as it would have been consistently assessed across clinics as an FASD diagnostic factor. Socioenvironmental difficulties were excluded to reduce multicollinearity.
7. The investigators in the larger Database project were granted a waiver negating the typical requirement to obtain consent, as per the Tri-Council Policy Statement on Ethical Conduct for Research Involving Humans for research involving no more than minimal risk, when it is impossible or impractical to obtain informed consent, and when the waiver is unlikely to adversely affect participants.
8. Data on participant provinces/territories were aggregated into categories defined by the Canadian Government classifications (Government of Canada, 2012). This aggregation was done to prevent the identification of clinics, as some Canadian provinces and territories have only one clinic.
9. FSIQ standard score is not collected in the Database; FSIQ category was coded as  $<70$ ,  $70-85$ , and  $>85$  for the purpose of this study.
10. For the purpose of this study, substance use was coded as any past or present diagnosis of substance use disorder, or present substance use across a range of substances (see Appendix).

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