Mental Health Problems and Risk of Suicidal Ideation and Attempts in Adolescents

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abstract

BACKGROUND: Obtaining recent estimates of the prevalence of suicide-related outcomes across adolescence and its associated mental health problems (MHPs) is important for clinical practice. We estimated the prevalence of suicide-related outcomes at ages 13, 15, 17, and 20 years (2011–2018) in a contemporary population-based cohort and documented associations with MHPs throughout adolescence.

METHODS: Data came from 1618 participants in the Québec Longitudinal Study of Child Development. Internalizing (depression and anxiety) and externalizing (oppositional/defiance, conduct issues, and attention deficit and/or hyperactivity) MHPs were assessed with validated questionnaires. Outcomes were self-reported past-year passive and serious suicidal ideation and suicide attempt.

RESULTS: Lifetime prevalence of passive suicidal ideation (13–17 years old), serious suicidal ideation, and suicide attempt (13–20 years old) were 22.2%, 9.8%, and 6.7%, respectively. Prevalence was twice as high for females as for males. Overall, rates of passive (15–17 years old; 11.8%–18.4%) and serious ideation (13–20 years old; 3.3%–9.5%) increased over time but were stable for attempt (13–20 years old; 3.5%–3.8%). In univariable analyses, all MHPs were associated with suicide-related outcomes at all ages (risk rate ratio range: 2.57–3.10 [passive ideation] and 2.10–4.36 [suicide attempt]), and associations were similar for male and female participants (sex interaction $P > .05$). Magnitude of associations were generally stronger for more severe suicide-related outcomes (passive ideation < serious ideation < attempt). In multivariable analyses, internalizing problems were associated with suicidal ideation, whereas both depressive and conduct symptoms were associated with attempt.

CONCLUSIONS: Suicidal ideation and attempt were common, especially for females and youth presenting with depressive and conduct problem symptoms. Clinicians should systematically assess suicidal risk in teenagers, especially in those presenting with MHPs.

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WHAT'S KNOWN ON THIS SUBJECT: Suicide-related outcomes are associated with a range of mental health problems (MHPs) in adolescence, but the importance of different internalizing and externalizing MHPs may vary across adolescence and for different suicide-related outcomes (passive ideation, serious ideation, and suicide attempt).

WHAT THIS STUDY ADDS: Suicide-related outcomes are common in adolescence, with stable rates of suicide attempt and increasing rates of suicidal ideation. Internalizing MHPs are independently associated with suicidal ideation (passive and serious), whereas externalizing and internalizing MHPs are independently associated with suicide attempt.

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Suicide in adolescence is a leading public health concern worldwide, with ~140 000 youth aged 10 to 24 years dying by suicide every year.[1,2] In many countries, including Canada, suicide is the second most common cause of death in this age group.[1,3] In addition to the thousands of youth who have died by suicide, many more have thought about suicide either passively or actively and/or have attempted suicide. In the US National Comorbidity Survey, 12.1% of adolescents reported serious thoughts of suicide, 4% developed a suicidal plan, and 4.1% attempted suicide before reaching adulthood.[4]

Previous studies tracking the course of suicidal ideation and/or suicide attempt longitudinally reported that these suicide-related outcomes increase during adolescence, peak in midadolescence, and decline during the transition into adulthood.[5–8] However, these studies were based on noncontemporary cohorts of youth, limiting the generalization of findings for today's adolescents. Documenting the course of suicidal ideation and suicide attempt in a population-based cohort of today's youth is important, especially in light of recent studies showing an increase in emergency visits for suicide attempt in recent years,[9–11] including in the Canadian province of Québec.[12]

Suicidal ideation and attempt are closely associated with mental health problems (MHPs),[4,13,14] with the vast majority of adolescents with suicidal ideation and/or suicide attempt meeting criteria for at least one MHP. Both internalizing (eg, depression and anxiety) and externalizing (eg, attention-deficit/hyperactivity disorder [ADHD], oppositional defiant disorder, and conduct disorder) problems have been associated with suicidal ideation and/or suicide attempt,[15] and the magnitude of associations tend to be stronger with increasing severity (eg, stronger associations seen for attempt compared with ideation).[4,14] However, it is still unclear whether patterns of concurrent associations between MHPs and suicide-related outcomes vary across age. Only a few studies have documented associations between MHPs and suicide-related outcomes in different age groups.[16–20] Most studies were published before 2000, relied on cross-sectional designs and convenience samples, focused on suicide mortality (ie, only one study examined MHP correlates with suicide-related outcomes other than mortality[17]), and used heterogeneous categorizations of younger versus older adolescents (eg, <11 vs 11–14 years in one study[18] and <17 vs ≥17 in another study[19]), thus preventing comparisons across studies. These limitations suggest that longitudinal investigations among contemporary adolescents assessed at multiple time points would be helpful to clarify associations between MHPs and suicide-related outcomes.

Using a birth cohort of individuals born in 1997 and 1998 in the Canadian province of Québec, our first aim was to document the prevalence of suicidal ideation (passive or serious) and suicide attempt from early (age 13 years) to late (age 20 years) adolescence. Our second aim was to describe MHP correlates of these suicide-related outcomes across different ages.

METHODS

Participants

The Québec Longitudinal Study of Child Development is an ongoing population-based study of a cohort of individuals born in 1997 and 1998 in the Canadian province of Québec and followed until 20 years of age. The study is conducted by the Institut de la Statistique du Québec. The Québec Master Birth Registry was used to select a representative sample of infants. The target population was singleton infants who were born at 59 or 60 weeks of gestational age to mothers residing in each geographic area of Québec, with the exception of Northern Québec, Cree territory, Inuit territory, and Native Reserves (2.2% of all births) because children from those remote regions were mostly out of reach. At its inception, 2120 families participated in the first assessment, representing 94.5% of the target population. This cohort has had annual and biannual follow-ups from 5 months until 20 years of age. More details about the study design can be found online (www.iamillbe.stat.gouv.qc.ca).

In the current study, we included 1618 participants for whom measures of suicidal ideation and/or suicide attempt were available at ages 13, 15, 17, or 20 years (76% of the original cohort).

The Ethics Committee of the Institut de la Statistique du Québec and the Research Ethics Board of the Sainte-Justine Research Center approved each phase of the study, and informed consent was obtained at every time point from the participating adolescents and their parents.

Measures

Self-reported Suicide-Related Outcomes (13, 15, 17, and 20 Years Old)

Self-reported past-year passive suicidal ideation, serious suicidal ideation, and suicide attempt were collected at 13, 15, 17, and 20 years of age. The 3 items that were used were as follows: (1) "Did you ever think about suicide?" ("never" to "very often"; this item was not available at 20 years old). If yes, they were asked, (2) "Did you ever seriously think of attempting suicide?" (yes or no). If yes, they were asked, (3) "How many times did you attempt suicide?" Three suicide-related outcomes were derived on the basis of participants' responses: (a) passive suicidal ideation if they reported suicidal ideation, with no serious ideation or suicide attempt (available

at 13, 15, and 17 years only); (b) serious suicidal ideation if they reported serious ideation with no attempt; and (c) suicide attempt.

MHPs (13, 15, 17, and 20 Years Old)

Information on symptoms related to 5 MHPs were identified from validated and standardized self-report questionnaires: depression, anxiety, opposition and/or defiance, conduct issues, and attention-deficit and/or hyperactivity problems (Supplemental Information). All measures, which are described in Table 1, were age appropriate and showed satisfactory psychometric properties. Correlations among these measures are reported in Supplemental Tables 4 through 6.

Statistical Analyses

First, we described the prevalence of suicide-related outcomes (ie, passive ideation, serious ideation, and attempt) from ages 13 to 20 years in the whole sample and separately for males and females. Lifetime estimates were also calculated. Second, multinomial logistic regressions were used to identify univariable associations between each MHP and suicide-related outcomes across ages. Third, multivariable analyses were conducted by entering all MHPs in a multinomial logistic regression model to estimate the independent contribution of each MHP to suicide-related outcomes across ages. All models were adjusted for sex. Interactions between MHPs and sex were tested, but none reached statistical significance ($P > .05$). In these regressions, associations were expressed as risk rate ratios (RRRs) with 95% confidence intervals, representing the increased risk of suicide-related outcomes for each SD increase on the continuous MHPs indicators.

The maximum available sample size for each age was as follows: n = 1225 at 13 years, n = 1428 at 15 years, n = 1228 at 17 years, and n = 1235 at 20 years. Missing data for participants included in the study sample (N = 1618) were imputed using multiple imputation by chained equations.[33] Imputation models included all modeled variables plus key variables such as sex, maternal depressive symptoms, parental socioeconomic status, family structure, family functioning, peer victimization, and childhood mental health symptoms (ie, depression and/or anxiety, opposition, and ADHD). All models were estimated across 50 imputed data sets, and the results were pooled.

In addition, to account for baseline differences between participants included (N = 1618) in analyses and those not included (n = 502), we conducted analyses with inverse probability weights. Weights represent participants' probabilities of being included in the study sample (N = 1618) conditional on variables related to differential attrition. These variables were as follows: male sex (47.8% in the included sample versus 61.1% in the nonincluded sample; $P < .001$), family socioeconomic status (M = −0.01 for included versus M = −0.29 for nonincluded; $P < .001$), and hostile-reactive parenting practices (M = 1.84 for included versus M = 2.16 for nonincluded; $P < .001$).

RESULTS

Lifetime Estimates of Self-reported Suicide-Related Outcomes

Lifetime estimates for passive suicidal ideation (13–17 years old), serious suicidal ideation, and suicide attempt (both 13–20 years old) were 22.2%, 9.8%, and 6.7%, respectively. Prevalence of all suicide-related outcomes were almost twice as high for female as for male participants: prevalence for passive suicidal ideation, serious suicidal ideation, and suicide attempt were 28.4%, 11.5%, and 9.2% for female participants and 15.4%, 8.0%, and 4.0% for male participants, respectively.

Prevalence of Self-reported Suicide-Related Outcomes at 13, 15, 17, and 20 Years Old

In the whole sample, prevalence of passive suicidal ideation increased throughout adolescence (11.8%, 18.3%, and 18.4% at 13, 15, and 17 years old, respectively). The prevalence of serious suicidal ideation also increased throughout adolescence (3.3%, 3.9%, 5.8%, and 9.5% at 13, 15, 17, and 20 years old, respectively). However, the prevalence of suicide attempt was ∼4% during this developmental period (3.7%, 3.5%, 3.8%, and 3.5% at 13, 15, 17, and 20 years old, respectively; Fig 1). Although the prevalence of self-reported suicide-related outcomes was generally higher in female than in male participants, the temporal trend was similar in male and female participants.

Univariable Associations Between MHPs and Self-reported Suicide-Related Outcomes at Age 13 Years

Results of all univariable analyses are shown in Table 2. At age 13 years, depressive symptoms constituted the MHP that was most strongly associated with all suicide-related outcomes, with RRRs and 95% confidence intervals (for each SD increase on the continuous MHP indicators) for passive suicidal ideation, serious suicidal ideation, and suicide attempt of 2.57 (2.15–3.07), 2.99 (2.25–3.99), and 2.93 (2.21–3.89), respectively. The association between suicide-related outcomes and anxiety was statistically significant but weaker in magnitude, with RRRs of 1.58 (1.35–1.85) for passive suicidal ideation, 1.65 (1.22–2.24) for serious suicidal ideation, and 1.80 (1.33–2.43) for suicide attempt. Among externalizing MHPs, RRRs were higher for suicide attempt than

TABLE 1 Summary of MHP Assessments at 13, 15, 17, and 20 Years Old in the Quebec Longitudinal Study of Child Development

Measure Used	Age at Assessment, y	Description of Measure
Depressive symptoms		
Children Depression Inventory-Short Form[21,22]	13	10 items in the past 2 wk on a 3-point scale (eg, I am sad once in a while; I am sad many times; I am sad all the time)
Mental Health and Social Inadaptation Assessment; depression subscale[23]	15 and 17	8 items in the past 12 mo on a 3-point scale (eg, I felt sad and unhappy; never true, sometimes true, and always true)
Center for Epidemiologic Studies Depression-Short Form[24,25]	20	13 items in the past 2 wk on a 4-point scale (eg, I felt depressed; rarely or none of the time [<1 d], some or a little of the time [1–2 d], occasionally or a moderate amount of the time [3–4 d], most or all of the days [5–7 d])
Anxiety symptoms		
Behavior Questionnaire; anxiety subscale[26–28]	13	3 items in the past 6 mo (eg, I worried a lot; never or not true, sometimes or somewhat true, often or very true)
Mental Health and Social Inadaptation Assessment; anxiety subscale[23]	15 and 17	9 items in the past 12 mo (eg, I was worried about my own health; never true, sometimes true, always true)
Generalized Anxiety Disorder 7-Item[29,30]	20	7 items in the past 2 wk (eg, feeling nervous, anxious or on edge; not at all, several days, over half the days, nearly every day)
ADHD symptoms		
Behavior Questionnaire; hyperactivity and/or inattention subscale[26–28]	13	7 items in the past 6 mo (eg, I am impulsive, or I act without thinking; never or not true, sometimes or somewhat true, often or very true)
Mental Health and Social Inadaptation Assessment; ADHD subscale[23]	15 and 17	16 items in the past 12 mo (eg, I was impulsive [react quickly without thinking]; never true, sometimes true, always true)
ADHD Self-Report Scale; version 1.1[31]	20	18 items in the past 6 mo (eg, feel overly active and compelled to do things, like you were driven by a motor; never, sometimes, often)
Oppositional and/or defiance symptoms		
Behavior Questionnaire; oppositional and/or defiance subscale[26–28]	13	4 items in the past 6 mo (eg, I am defiant or refuse to comply with adults' requests or rules; never or not true, sometimes or somewhat true, often or very true)
Mental Health and Social Inadaptation Assessment; opposition subscale[23]	15 and 17	9 items in the past 12 mo (eg, I refused to do what my parents or my teacher were telling me to do, never true, sometimes true, always true)
Conduct symptoms		
Behavior Questionnaire; conduct subscale[26–28]	13	7 items in the past 6 mo (eg, I steal outside my home; never or not true, sometimes or somewhat true, often or very true)
Mental Health and Social Inadaptation Assessment; conduct subscale[23]	15 and 17	16 items in the past 12 mo (eg, I stole money or objects from school or from stores; never true, sometimes true, always true)
Self-Reported Delinquency Questionnaire[32]	20	7 items in the past 12 mo (eg, stolen something from a store; never, 1–2 times, several times, often)

passive and serious suicidal ideation. Specifically, RRRs ranged from 1.66 (1.38–2.00 for ADHD symptoms) to 1.80 (1.50–2.15 for conduct problem symptoms) for passive suicidal ideation and from 1.85 (1.32–2.58 for oppositional/defiant symptoms) to 2.02 (1.54–2.65 for conduct problem symptoms) for serious suicidal ideation; for suicide attempt, RRRs ranged from 2.40 (1.75–3.28 for ADHD symptoms) to 2.85 (2.24–3.63 for conduct symptoms).

Univariable Association Between MHPs and Self-reported Suicide-Related Outcomes at Age 15 Years

At age 15 years, depressive symptoms still constituted the MHP that was most strongly associated with all suicide-related outcomes, with RRRs for passive suicidal ideation, serious suicidal ideation, and suicide attempt of 3.10 (2.58–3.71), 4.68 (3.21–6.82), and 4.36 (3.00–6.33), respectively. Associations were significant for anxiety symptoms, although RRRs were smaller: 2.38 (2.01–2.81) for passive suicidal ideation, 2.90 (2.05–4.10) for serious suicidal ideation, and 3.16 (2.16–4.62) for suicide attempt. Associations between externalizing MHPs and suicide-related outcomes were smaller in magnitude and similar across suicide-related outcomes compared with those for internalizing MHPs. RRRs ranged from 1.58 (1.38–1.82) for the association of oppositional/defiant symptoms with passive suicidal ideation to 2.15 (1.58–2.93) for the association of ADHD symptoms with suicide attempt.

Univariable Associations Between MHPs and Self-reported Suicide-Related Outcomes at Age 17 Years

At age 17 years, depressive and anxiety symptoms showed the strongest associations with all suicide-related outcomes. For depressive symptoms, RRRs for passive suicidal ideation, serious suicidal ideation, and suicide attempt were 2.68 (2.21–3.25), 3.00 (2.24–4.02), and 3.17 (2.19–4.58), respectively, whereas for anxiety

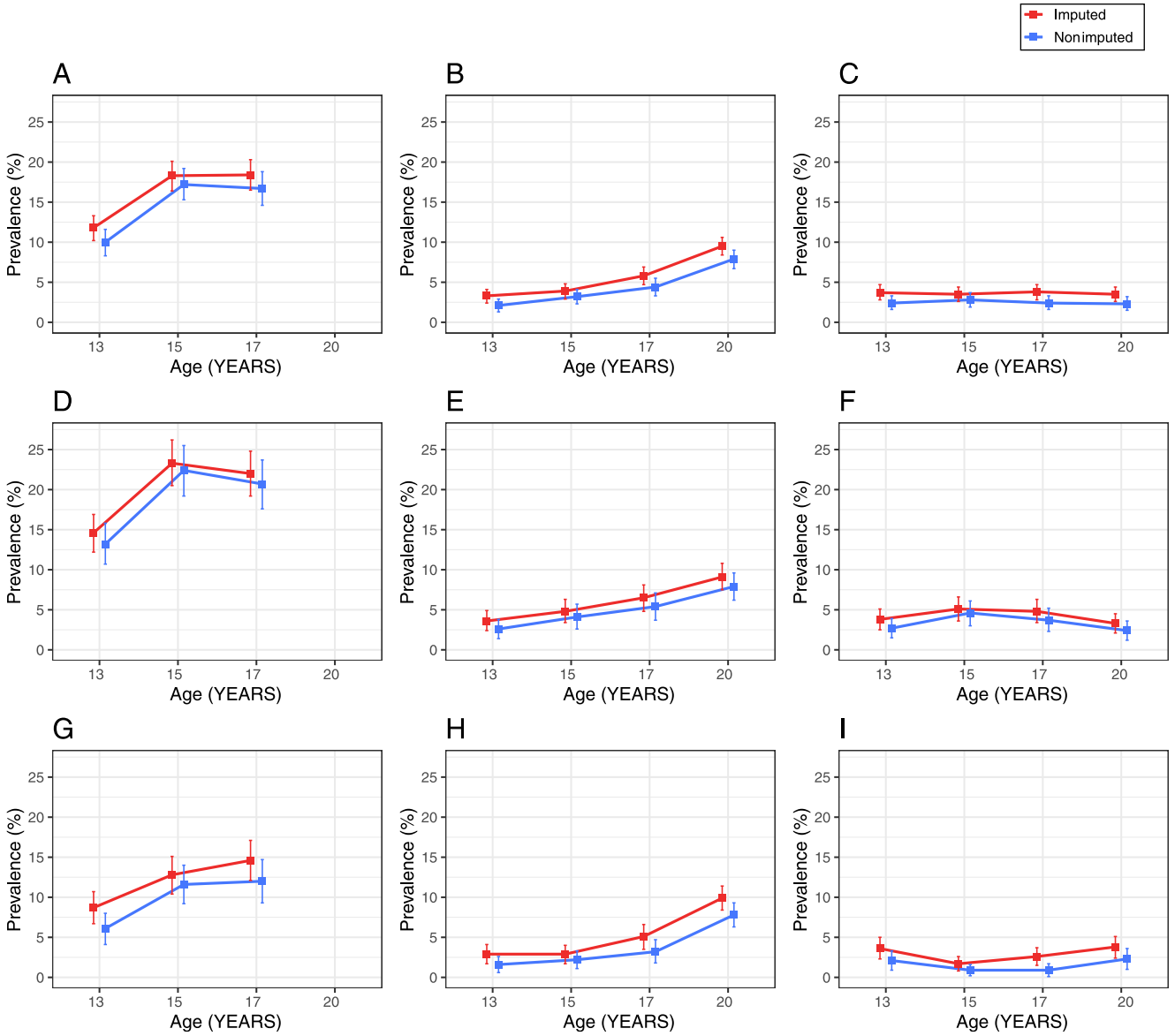

FIGURE 1

Prevalence of self-reported suicide-related outcomes at 13, 15, 17, and 20 years old in the overall sample and in female and male participants separately. A, Passive ideation, sex combined. B, Serious ideation, sex combined. C, Attempt, sex combined. D, Passive ideation, female participants. E, Serious ideation, female participants. F, Attempt, female participants. G, Passive ideation, male participants. H, Serious ideation, male participants. I, Attempt, male participants. [a] Data were compiled from the final master file of the Québec Longitudinal Study of Child Development (1998–2018), Gouvernement du Québec, and the Institut de la Statistique du Québec. Information on passive suicidal ideation was not available at 20 years old. Prevalence of suicide-related outcomes was estimated on the basis of the imputed and weighted sample (N = 1618) and maximum available sample (N = 1225–1428).

symptoms, they were 2.28 (1.90–2.74), 2.43 (1.83–3.22), and 2.28 (1.53–3.40), respectively. For externalizing MHPs, RRRs ranged from 1.49 (1.28–1.73) for the association of conduct symptoms with passive suicidal ideation to 2.11 (1.57–2.84) for the association of ADHD symptoms with suicide attempt.

Univariable Associations Between MHPs and Self-reported Suicide-Related Outcomes at Age 20 Years

Consistent with what we found for previous ages, strong associations with suicidal ideation and suicide attempt were found for internalizing MHPs (serious suicidal ideation: 2.42 [1.98–2.95] for depressive symptoms and 1.87 [1.56–2.25] for anxiety symptoms; suicide attempt: 2.10 [1.54–2.86] for depressive symptoms and 1.80 [1.35–2.39] for anxiety symptoms). In terms of externalizing MHPs, RRRs for serious suicidal ideation ranged from 1.48 (1.23–1.78) for ADHD symptoms to 1.52 (1.30–1.79) for conduct symptoms. In terms of suicide

TABLE 2 Sex-Adjusted RRRs and 95% Confidence Intervals for Cross-sectional Associations of Common MHPs and Self-reported Suicide-Related Outcomes at 13, 15, 17, and 20 Years Old (N = 1618)

Symptoms	Sex-Adjusted RRRs (95% Confidence Intervals) for MHPs		
	Passive Ideation	Serious Ideation	Attempt
13 y			
Depressive	2.57 (2.15–3.07)	2.99 (2.25–3.99)	2.93 (2.21–3.89)
Anxiety	1.58 (1.35–1.85)	1.65 (1.22–2.24)	1.80 (1.33–2.43)
Opposition and/or defiant	1.71 (1.43–2.05)	1.85 (1.32–2.58)	2.77 (2.02–3.80)
Conduct	1.80 (1.50–2.15)	2.02 (1.54–2.65)	2.85 (2.24–3.63)
ADHD	1.66 (1.38–2.00)	1.86 (1.33–2.62)	2.40 (1.75–3.28)
15 y			
Depressive	3.10 (2.58–3.71)	4.68 (3.21–6.82)	4.36 (3.00–6.33)
Anxiety	2.38 (2.01–2.81)	2.90 (2.05–4.10)	3.16 (2.16–4.62)
Opposition and/or defiant	1.58 (1.38–1.82)	2.14 (1.66–2.75)	2.12 (1.61–2.80)
Conduct	1.66 (1.44–1.91)	1.83 (1.47–2.27)	1.80 (1.43–2.28)
ADHD	1.73 (1.49–2.01)	2.09 (1.56–2.80)	2.15 (1.58–2.93)
17 y			
Depressive	2.68 (2.21–3.25)	3.00 (2.24–4.02)	3.17 (2.19–4.58)
Anxiety	2.28 (1.90–2.74)	2.43 (1.83–3.22)	2.28 (1.53–3.40)
Opposition and/or defiant	1.68 (1.44–1.96)	1.70 (1.34–2.16)	1.74 (1.30–2.34)
Conduct	1.49 (1.28–1.73)	1.58 (1.27–1.96)	1.83 (1.42–2.37)
ADHD	1.57 (1.34–1.84)	1.70 (1.33–2.16)	2.11 (1.57–2.84)
20 y			
Depressive	NA	2.42 (1.98–2.95)	2.10 (1.54–2.86)
Anxiety	NA	1.87 (1.56–2.25)	1.80 (1.35–2.39)
Conduct	NA	1.52 (1.30–1.79)	1.58 (1.27–1.98)
ADHD	NA	1.48 (1.23–1.78)	1.39 (1.02–1.91)

Data were compiled from the final master file of the Québec Longitudinal Study of Child Development (1998–2018), Gouvernement du Québec, and Institut de la Statistique du Québec. RRRs and 95% confidence intervals are based on weighted and imputed data and are adjusted for sex. NA, information on passive suicidal ideation was not available at 20 y old.

attempt, RRRs ranged from 1.39 (1.02–1.91) for ADHD symptoms to 1.58 (1.27–1.98) for conduct symptoms.

Multivariable Associations Between MHPs and Self-reported Suicide-Related Outcomes From 13 to 20 Years

RRRs for the independent associations of each MHP with suicide-related outcomes are reported in Table 3. After mutually adjusting for all examined MHPs, internalizing problems (ie, depression at ages 13, 15, and 20 years and anxiety at ages 15 and 17 years) were independently associated with passive and serious suicidal ideation, whereas no independent significant associations were observed for any of the externalizing problems. For suicide attempt, independent associations were observed for both internalizing problems (ie, depression at 13 and 20 years old) and externalizing problems (ie, conduct problems at 13, 15, and 20 years old). No independent significant associations were observed at 17 years old for serious suicidal ideation and suicide attempt, although conduct problems were marginally significant for suicide attempt.

DISCUSSION

Our results using a representative cohort of today's adolescents from the Canadian province of Québec provide information on prevalence and MHP correlates of suicide-related outcomes from early to late adolescence. We estimated that 9.8% of adolescents experienced serious suicidal ideation and 6.7% attempted suicide by 20 years of age. These estimates are consistent with the National Comorbidity Survey Replication Adolescent Supplement, a large survey of 6483 US adolescents aged 13 to 18 years in 2001 to 2004,[4] and the Ontario Child Health Study, a cohort of 2396 adolescents aged 14 to 17 years in 2014.[34] The lifetime prevalence of passive suicidal ideation was 22.2%, indicating that many adolescents think about suicide without a serious desire to attempt suicide. Although direct comparisons of prevalence are hindered by differences in the measurement of suicidal ideation, our estimate is in line with meta-analytic data reporting lifetime prevalence of suicidal ideation of 29.9% in adolescents[35] and 22.2% in college students.[36] As reported elsewhere,[37–40] female participants were more likely than male participants to experience suicidal ideation or attempt suicide. These sex differences in suicidal ideation and suicide attempt might be attributed to various factors, such as mental health (eg, higher prevalence of depression in female participants) or social stigma (eg, greater stigma around suicide in male than in female participants).[41] Our study extends previous knowledge by showing that sex differences are observed throughout adolescence, from ages 13 to 20 years.

TABLE 3 Fully Adjusted RRRs and 95% Confidence Intervals for Cross-sectional Associations of Common MHPs and Self-reported Suicide-Related Outcomes at 13, 15, 17, and 20 Years Old (N = 1618)

	Passive Ideation	Serious Ideation	Attempt
13 y			
Depressive	2.29 (1.88–2.80)	2.62 (1.87–3.66)	1.95 (1.38–2.75)
Anxiety	1.05 (0.86–1.27)	0.96 (0.66–1.39)	0.94 (0.62–1.41)
Conduct	1.15 (0.92–1.45)	1.25 (0.88–1.77)	1.87 (1.39–2.51)
Oppositional and/or defiant	1.21 (0.97–1.52)	1.16 (0.78–1.74)	1.42 (0.97–2.09)
ADHD	1.08 (0.85–1.37)	1.20 (0.79–1.81)	1.13 (0.74–1.74)
15 y			
Depressive	1.37 (1.04–1.80)	1.94 (1.16–3.25)	1.47 (0.85–2.53)
Anxiety	1.43 (1.09–1.89)	1.07 (0.65–1.76)	1.04 (0.61–1.76)
Conduct	1.11 (0.88–1.40)	1.19 (0.82–1.71)	1.49 (1.10–2.01)
Oppositional and/or defiant	1.21 (0.95–1.55)	1.20 (0.75–1.92)	1.33 (0.85–2.08)
ADHD	0.85 (0.65–1.12)	0.84 (0.52–1.35)	0.96 (0.58–1.61)
17 y			
Depressive	1.01 (0.74–1.38)	1.39 (0.81–2.38)	1.30 (0.74–2.26)
Anxiety	1.58 (1.17–2.13)	1.26 (0.72–2.22)	1.00 (0.59–1.69)
Conduct	0.91 (0.70–1.18)	1.25 (0.78–2.02)	1.42 (0.98–2.06)
Oppositional and/or defiant	1.24 (0.96–1.61)	0.67 (0.39–1.15)	1.23 (0.78–1.92)
ADHD	1.16 (0.89–1.52)	1.11 (0.68–1.83)	1.18 (0.71–1.94)
20 y			
Depressive	1.43 (1.12–1.82)	1.72 (1.13–2.62)	1.65 (1.06–2.56)
Anxiety	1.02 (0.80–1.31)	0.91 (0.56–1.48)	0.98 (0.63–1.52)
Conduct	1.03 (0.86–1.24)	1.18 (0.88–1.58)	1.31 (1.04–1.65)
Oppositional and/or defiant	NA	NA	NA
ADHD	1.21 (0.99–1.47)	1.16 (0.8–1.68)	0.89 (0.58–1.37)

Data were compiled from the final master file of the Québec Longitudinal Study of Child Development (1998–2018), Gouvernement du Québec, and Institut de la Statistique du Québec. RRRs and 95% confidence intervals are based on weighted and imputed data and are adjusted for sex and all MHPs. NA, information on passive suicidal ideation was not available at 20 y old.

To our knowledge, this is the first epidemiological study with repeated assessments of suicide-related outcomes over 7 years in today's generation of youth. The few longitudinal studies that are based on past generations of youth reported that suicidal ideation and suicide attempt peak in midadolescence and decrease in late adolescence or early adulthood.[5–8,42] Here, the 12-month prevalence of suicide attempt was relatively stable across adolescence (from 13 to 20 years old). Furthermore, we noticed a 40% increase in the 12-month prevalence of serious suicidal ideation in late adolescence (17–20 years old). Future studies are needed to confirm our results and better understand reasons for such increases in rates of serious suicidal ideation in late adolescence.

Our univariable findings also demonstrate that all MHPs were associated with the outcome variables, with the magnitude of associations increasing in strength with the severity of the suicide-related outcomes. However, in multivariable analyses adjusting for all MHPs simultaneously, depressive symptoms were most consistently associated with passive and serious suicidal ideation. Although having a major depressive episode is a well-known risk factor of suicidal ideation and suicide attempt,[1,43] our study adds to the general body of knowledge by showing associations with suicide-related outcomes across the full spectrum of depressive symptoms. This suggests that youth who present with depressive symptoms (and not solely those who are clinically depressed) may be more likely to experience suicidal ideation or attempt suicide. Contrary to the hypothesis that passive suicidal ideation might not be reflective of psychopathology given its high prevalence,[35,36] we found that anxiety and depressive symptoms were associated with increased risk of passive suicidal ideation.

In univariable analyses, externalizing problems (eg, conduct, opposition and/or defiance, and attentional and/or hyperactivity symptoms) were associated with passive suicidal ideation, serious suicidal ideation, and suicide attempt at all 4 time points, with stronger associations seen in younger adolescents. In multivariable analyses, none of the externalizing problems were significantly associated with passive or serious suicidal ideation. However, externalizing problems remained associated with suicide attempt in these multivariable analyses. This indicates that the most consistent predictor of suicide attempt across development was conduct problems even after depressive symptoms were taken into account. This finding is consistent with previous longitudinal studies suggesting that both internalizing and externalizing problems independently predict

suicidal behaviors, and showing the unique contribution of externalizing problems to suicidal acts.[44–46]

This study is based on a well-established longitudinal cohort with repeated measures of suicide-related outcomes and MHPs throughout adolescence. Additionally, the data included in this study have been recently collected (last data collection was in 2018), thus representing today's generation of youth. Despite these strengths, the following limitations must be acknowledged. First, because of sample attrition (eg, emigration, loss to follow-up, and refusal), our analyses were conducted on 1618 of 2120 individuals (76%) in the initial sample. To minimize attrition biases, analyses were performed using sample weights accounting for the probability of being missing at follow-up. Second, although instruments used to measure MHPs all showed satisfactory psychometric proprieties, different instruments were used in early (13 years old) and late (20 years old) adolescence. This may introduce a bias in the magnitude of associations when different time points are compared. Third, passive suicidal ideation was not measured at age 20 years. Therefore, all participants received the question on serious suicidal ideation, which differs from previous data collection, in which only participants endorsing suicidal ideation were asked about serious suicidal ideation. Consequently, the rate of serious suicidal ideation at age 20 years may be overestimated. Fourth, although we examined a comprehensive set of MHPs, other problems (such as substance use[47] and psychotic symptoms[48]) associated with suicide-related outcomes were not examined in this study. Fifth, the instruments used to assess MHPs are not diagnostic tools; therefore, we could not determine if the endorsed symptoms met criteria for a mental disorder as defined by the Diagnostic and Statistical Manual of Mental Disorders. Moreover, because self-reports were also used to assess suicide-related outcomes, these may have been influenced by recall bias and participants' interpretation of the questions. Finally, the variation in the prevalence of suicide-related outcomes from 13 to 20 years of age may be partially influenced by the overall increase in emergency visits for suicidal risk,[9,10] including in Québec,[12] and not uniquely due to age differences.

CONCLUSIONS

Suicide is a leading cause of death among youth,[2] and rates of death by suicide and emergency visits and/or hospitalization for suicide attempt[12] have increased over the past few years, especially among female patients.[12,49,50] In this cohort of today's youth, we found that serious suicidal ideation and suicide attempt were relatively common (lifetime prevalence of ∼17% combined), Additionally, 1 youth out of 5 has thought about suicide without a serious desire to attempt suicide during adolescence. MHPs were important correlates of suicide-related outcomes, with both depressive and conduct symptoms being independently associated with suicidal risk. These findings suggest that suicide risk should be systematically assessed in adolescents who present with mental health symptoms and not solely in adolescents with clinically diagnosed mental disorders.

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ABBREVIATIONS

ADHD: attention-deficit/hyperactivity disorder
MHP: mental health problem
RRR: risk rate ratio

Drs Orri and Geoffroy conceptualized and designed the study, conducted the analyses, drafted the initial manuscript, reviewed and revised the manuscript, had full access to the data used in this study, and take responsibility for the integrity and accuracy of the data analysis; Ms Perret, Ms Scardera, Ms Bolanis, and Dr Temcheff participated in the analysis and interpretation of data, drafted the initial manuscript, and reviewed and revised the manuscript for important intellectual content; Drs Boivin, Tremblay, Côté, Séguin, and Turecki designed the data collection instruments, obtained funding, coordinated and supervised data collection, contributed to data analysis and interpretation, and reviewed and revised the manuscript for important intellectual content; and all authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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REFERENCES

1. Hawton K, Saunders KE, O'Connor RC. Self-harm and suicide in adolescents. *Lancet*. 2012;379(9834):2373–2382
2. Glenn CR, Kleiman EM, Kellerman J, et al. Annual research review: a meta-analytic review of worldwide suicide rates in adolescents. *J Child Psychol Psychiatry*. 2020;61(3):294–308
3. Skinner R, McFaull S. Suicide among children and adolescents in Canada: trends and sex differences, 1980–2008. *CMAJ*. 2012;184(9): 1029–1034
4. Nock MK, Green JG, Hwang I, et al. Prevalence, correlates, and treatment of lifetime suicidal behavior among adolescents: results from the National Comorbidity Survey Replication Adolescent Supplement. *JAMA Psychiatry*. 2013;70(3):300–310
5. Steinhausen HC, Bösiger R, Metzke CW. Stability, correlates, and outcome of adolescent suicidal risk. *J Child Psychol Psychiatry*. 2006;47(7):713–722
6. Rueter MA, Kwon HK. Developmental trends in adolescent suicidal ideation. *J Res Adolesc*. 2005;15(2):205–222
7. Lewinsohn PM, Rohde P, Seeley JR, Baldwin CL. Gender differences in suicide attempts from adolescence to young adulthood. *J Am Acad Child Adolesc Psychiatry*. 2001;40(4):427–434
8. Dhossche D, Ferdinand R, van der Ende J, Hofstra MB, Verhulst F. Diagnostic outcome of adolescent self-reported suicidal ideation at 8-year follow-up. *J Affect Disord*. 2002;72(3):273–279
9. Plemmons G, Hall M, Doupnik S, et al. Hospitalization for suicide ideation or attempt: 2008–2015. *Pediatrics*. 2018; 141(6):e20172426
10. Burstein B, Agostino H, Greenfield B. Suicidal attempts and ideation among children and adolescents in US emergency departments, 2007–2015. *JAMA Pediatr*. 2019;173(6): 598–600
11. Mojtabai R, Olfson M, Han B. National trends in the prevalence and treatment of depression in adolescents and young adults. *Pediatrics*. 2016;138(6): e20161878
12. Levesque P, Pelletier É, Perron P-A. Le Suicide Au Québec: 1981 À 2017- Mise À Jour 2020. In: *Québec: Bureau d'Information et d'Etudes En Santé Des Populations*. Quebec, Canada: Institut National de Santé Publique au Québec; 2020:25
13. Gili M, Castellvi P, Vives M, et al. Mental disorders as risk factors for suicidal behavior in young people: a meta-analysis and systematic review of longitudinal studies. *J Affect Disord*. 2019;245:152–162
14. Foley DL, Goldston DB, Costello EJ, Angold A. Proximal psychiatric risk factors for suicidality in youth: the Great Smoky Mountains Study. *Arch Gen Psychiatry*. 2006;63(9):1017–1024
15. Goldston DB, Daniel SS, Erkanli A, et al. Psychiatric diagnoses as contemporaneous risk factors for suicide attempts among adolescents and young adults: developmental changes. *J Consult Clin Psychol*. 2009; 77(2):281–290
16. Brent DA, Baugher M, Bridge J, Chen T, Chiappetta L. Age- and sex-related risk factors for adolescent suicide. *J Am Acad Child Adolesc Psychiatry*. 1999; 38(12):1497–1505
17. Gould MS, King R, Greenwald S, et al. Psychopathology associated with suicidal ideation and attempts among children and adolescents. *J Am Acad Child Adolesc Psychiatry*. 1998;37(9): 915–923
18. Sheftall AH, Asti L, Horowitz LM, et al. Suicide in elementary school-aged children and early adolescents. *Pediatrics*. 2016;138(4):e20160436
19. Shaffer D, Gould MS, Fisher P, et al. Psychiatric diagnosis in child and adolescent suicide. *Arch Gen Psychiatry*. 1996;53(4):339–348
20. Grøholt B, Ekeberg O, Wichstrøm L, Haldorsen T. Suicide among children and younger and older adolescents in Norway: a comparative study. *J Am Acad Child Adolesc Psychiatry*. 1998; 37(5):473–481
21. Kovacs M. The Children's Depression Inventory (CDI). *Psychopharmacol Bull*. 1985;21(4):995–998

22. Allgaier A-K, Frühe B, Pietsch K, Saravo B, Baethmann M, Schulte-Körne G. Is the Children's Depression Inventory Short version a valid screening tool in pediatric care? A comparison to its full-length version. *J Psychosom Res*. 2012; 73(5):369–374

23. Côté SM, Orri M, Brendgen M, et al. Psychometric properties of the Mental Health and Social Inadaptation Assessment for Adolescents (MIA) in a population-based sample. *Int J Methods Psychiatr Res*. 2017;26(4)

24. Radloff LS. The CES-D scale: A self-report depression scale for research in the general population. *Appl Psychol Meas*. 1977;1(3):385-4010146-6216

25. Poulin C, Hand D, Boudreau B. Validity of a 12-item version of the CES-D used in the National Longitudinal Study of Children and Youth. *Chronic Dis Can*. 2005;26(2–3):65–72

26. Statistics Canada and Human Resources Development Canada. *National Longitudinal Survey of Children and Youth: Overview of Survey Instruments for 1994–1995 Data Collection Cycle 1*. Ottawa ON: Statistics Canada and Human Resources Development Canada; 1995

27. Tremblay RE, Desmarais-Gervais L, Gagnon C, Charlebois P. The Preschool Behaviour Questionnaire: Stability of its factor structure between cultures, sexes, ages and socioeconomic classes. *Int J Behav Dev*. 1987;10(4):467-484.0165-0254

28. Offord DR, Boyle MH, Racine Y. Ontario Child Health Study: correlates of disorder. *J Am Acad Child Adolesc Psychiatry*. 1989;28(6):856–860

29. Spitzer RL, Kroenke K, Williams JBW, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med*. 2006;166(10): 1092–1097

30. Löwe B, Decker O, Müller S, et al. Validation and standardization of the Generalized Anxiety Disorder Screener (GAD-7) in the general population. *Med Care*. 2008;46(3):266–274

31. Kessler RC, Adler L, Ames M, et al. The World Health Organization Adult ADHD Self-Report Scale (ASRS): a short screening scale for use in the general population. *Psychol Med*. 2005;35(2): 245–256

32. Vitaro F, Brendgen M, Tremblay RE. Influence of deviant friends on delinquency: searching for moderator variables. *J Abnorm Child Psychol*. 2000;28(4):313–325

33. Azur MJ, Stuart EA, Frangakis C, Leaf PJ. Multiple imputation by chained equations: what is it and how does it work? *Int J Methods Psychiatr Res*. 2011;20(1):40–49

34. Georgiades K, Boylan K, Duncan L, et al; 2014 Ontario Child Health Study Team. Prevalence and correlates of youth suicidal ideation and attempts: evidence from the 2014 Ontario Child Health Study. *Can J Psychiatry*. 2019; 64(4):265–274

35. Evans E, Hawton K, Rodham K, Deeks J. The prevalence of suicidal phenomena in adolescents: a systematic review of population-based studies. *Suicide Life Threat Behav*. 2005;35(3):239–250

36. Mortier P, Cuijpers P, Kiekens G, et al. The prevalence of suicidal thoughts and behaviours among college students: a meta-analysis. *Psychol Med*. 2018; 48(4):554–565

37. Voss C, Ollmann TM, Miché M, et al. Prevalence, onset, and course of suicidal behavior among adolescents and young adults in Germany. *JAMA Netw Open*. 2019;2(10):e1914386

38. Klonsky ED, May AM, Saffer BY. Suicide, suicide attempts, and suicidal ideation. *Annu Rev Clin Psychol*. 2016;12:307–330

39. Rhodes AE, Boyle MH, Bridge JA, et al. Antecedents and sex/gender differences in youth suicidal behavior. *World J Psychiatry*. 2014;4(4):120–132

40. Miranda-Mendizabal A, Castellví P, Parés-Badell O, et al. Gender differences in suicidal behavior in adolescents and young adults: systematic review and meta-analysis of longitudinal studies. *Int J Public Health*. 2019;64(2):265–283

41. Canetto SS, Sakinofsky I. The gender paradox in suicide. *Suicide Life Threat Behav*. 1998;28(1):1–23

42. Geoffroy M, Orri M, Girard A, Perret LC, Turecki G. Trajectories of suicide attempts from early adolescence to emerging adulthood: prospective 11-year follow-up of a Canadian cohort. *Psychol Med*. 2020:1–11. doi:10.1017/S0033291720000732

43. Hawton K, Casañas I Comabella C, Haw C, Saunders K. Risk factors for suicide in individuals with depression: a systematic review. *J Affect Disord*. 2013;147(1–3):17–28

44. Geoffroy M-C, Gunnell D, Power C. Prenatal and childhood antecedents of suicide: 50-year follow-up of the 1958 British Birth Cohort study. *Psychol Med*. 2014;44(6):1245–1256

45. Orri M, Galéra C, Turecki G, et al. Pathways of association between childhood irritability and adolescent suicidality. *J Am Acad Child Adolesc Psychiatry*. 2019;58(1):99–107.e3

46. Sourander A, Klomek AB, Niemelä S, et al. Childhood predictors of completed and severe suicide attempts: findings from the Finnish 1981 Birth Cohort Study. *Arch Gen Psychiatry*. 2009;66(4):398–406

47. Pompili M, Serafini G, Innamorati M, et al. Substance abuse and suicide risk among adolescents. *Eur Arch Psychiatry Clin Neurosci*. 2012;262(6): 469–485

48. Kelleher I, Corcoran P, Keeley H, et al. Psychotic symptoms and population risk for suicide attempt: a prospective cohort study. *JAMA Psychiatry*. 2013; 70(9):940–948

49. Simon T. QuickStats: suicide rates*,† for teens aged 15-19 years, by sex - United States, 1975-2015. *MMWR Morb Mortal Wkly Rep*. 2017;66(30):816

50. Ruch DA, Sheftall AH, Schlagbaum P, Rausch J, Campo JV, Bridge JA. Trends in suicide among youth aged 10 to 19 years in the United States, 1975 to 2016 [published correction appears in *JAMA Netw Open*. 2019;2(6):e197687]. *JAMA Netw Open*. 2019;2(5):e193886

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