Childhood irritability and depressive/anxious mood profiles, and adolescent suicidal ideation/attempt.

A population-based cohort study

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**Key Points**

**Question.** Are children showing different profiles of irritability and depressive/anxious mood (6-12 years) at different suicidal risk in adolescence?

**Findings.** Children presenting with high irritability & high depressive/anxious mood symptoms during childhood (6-12 years) are 2 times more likely to think about suicide and/or make a suicide attempt in adolescence (13-17 years), compared to those showing depressive/anxious mood only or low irritability and low depressive/anxious mood.

**Meaning.** Childhood irritability should be considered when assessing adolescent suicidal risk, especially among those presenting high depressive/anxious mood symptoms.
Abstract

**Importance.** Suicidal ideation/suicide attempt (suicidality) are common in adolescence and a public health concern. Childhood depression is a key predictor of later suicidality and often co-occurs with irritability. No study examined the joint contribution of depressive mood and irritability during childhood on the prediction of later suicidality.

**Objective.** To investigate the association between childhood irritability and depressive/anxious mood profiles and adolescent’s suicidality.

**Design.** Population-based cohort.

**Setting.** Québec Longitudinal Study of Child Development (QLSCD).

**Participants.** QLSCD participants (n=1430) assessed yearly or bi-yearly (5 months-17 years).

**Exposure.** Profiles defined by the joint developmental trajectories of irritability and depressive/anxious mood (6-12 years).

**Main outcomes and measures.** Self-reported past-year suicidality, i.e., serious suicidal ideation/suicide attempt, at 13, 15 and 17 years. Irritability and depressive/anxious mood were assessed via teacher-report between 6 and 12 years (5-times).

**Results.** Group-based multi-trajectory modeling identified 5 profiles: ‘No irritability & low depressive/anxious mood’, ‘low irritability and low depressive/anxious mood’ (combined, 58.1%; reference), ‘moderate irritability & low depressive/anxious mood’ (24.7%), ‘high depressive/anxious mood only’ (6.6%), and ‘high irritability & depressive/anxious mood’ (10.6%). Children with ‘high irritability & high depressive/anxious mood’ reported higher rates of suicidality (16.5%) compared to those with the lowest symptoms (11.6%). In logistic regression analyses we found that the ‘high irritability & depressive/anxious mood’ profile (OR=2.22, 95%CI=1.32-3.74, Number-Needed-to-be-Exposed [NNE]=18) predicted suicidality. To a lesser extent, the ‘moderate irritability & low depressive/anxious mood’ profile was also associated with suicidality (OR=1.51, 95%CI=1.02-2.25, NNE=48). The ‘high depressive/anxious mood only’ profile could not be shown to be associated with later suicidality (OR=0.96, 95%CI=0.47-1.95, NNE=-320). The ‘high irritability & depressive/anxious mood’ profile had higher suicidal risk compared to the ‘depressive/anxious mood only’ profile (OR=2.28, 95%CI=1.02-5.15). Girls with ‘high irritability & high depressive/anxious mood’ were particularly at risk for suicidality (NNE=5).

**Conclusion and relevance.** Children with high irritability and depressive/anxious mood, and to a lesser extent with moderate irritability only, exhibited higher suicidal risk during adolescence compared to children with low symptom levels. Early manifestation of chronic irritability during childhood, especially when combined with depressive/anxious...
mood, conveys an elevated risk for adolescent suicidality. The putatively causal role of irritability should be investigated.
Introduction

Suicidal ideation and suicide attempt in adolescence are a major public health concern and are linked to long-term adjustment problems.\textsuperscript{1,2} Individuals showing depression are more at risk of thinking about suicide, attempting suicide, and killing themselves.\textsuperscript{3-5} Therefore, it is important to recognize and prevent early manifestations of depression that are associated with later suicidal behaviors.

Both irritability and depressive mood are core symptoms of depression. However, during childhood, irritability is more frequently observed as a core symptom of depression than in adulthood.\textsuperscript{6,7} Irritability is reported by one third of depressed children\textsuperscript{6} and is reflected in increased proneness to anger. According to DSM-5, irritability manifests itself clinically with frequent temper outbursts typically occurring in response to frustration, and can be verbal or behavioral (i.e., aggression against others, self, or objects).\textsuperscript{8} Irritability can be observed as a behavior during the interactions between children and parents, teachers, and peers.\textsuperscript{9} Chronic severe irritability is the main feature of disruptive mood dysregulation disorder (3\% of children in the general population),\textsuperscript{10} which is a new DSM-5 diagnosis that was introduced in order to solve the controversy surrounding the diagnosis of childhood bipolar disorder.\textsuperscript{11}

Despite the importance of childhood irritability in the characterization of mood disorders and depression, only two longitudinal population-based studies have investigated its predictive association with suicidality.\textsuperscript{12,13} Both studies suggested that irritability in adolescence increased suicidal risk in adulthood independently from depression. However, none of these studies examined the joint contribution of irritability and depression, as they did not distinguish between individuals presenting one or both dimensions. Thus, there is evidence on the \textit{independent} effect of depression and irritability, but there is a lack of information on their \textit{joint} effect on suicidal risk. Moreover, irritability was measured in adolescence. Childhood assessment of irritability is important from a developmental perspective, because childhood is the most relevant period in the manifestation of irritability.\textsuperscript{9} Finally, both studies assessed suicidality in adulthood. Suicidality usually emerge and peak during adolescence,\textsuperscript{2,14} therefore studies focusing on adolescence provide information on the first manifestations of suicidality.

Using data from a large birth cohort, prospectively followed over 17 years, our aims were twofold: 1) to identify longitudinal profiles of irritable and depressive/anxious mood during the course of childhood, and 2) to examine their predictive associations with suicidality (i.e., suicidal ideation/suicide attempt) during adolescence. To capture the overlap between the development of irritability and depressive/anxious mood in children, we estimated the joint developmental trajectories of these symptoms. This approach allows to identify distinct profiles of individuals
who may show either depressive/anxious or irritable mood, or both types of symptoms. Sex differences were explored, as there are important sexual differences in suicidality.15

Methods

Participants

Participants were drawn from the Quebec Longitudinal Study of Child Development (QLSCD), a representative sample of 2120 infants born in the Canadian province of Québec in 1997/98 who were followed up to 17 years of age. The original sample was selected from the Quebec Birth Registry using a stratified procedure based on living area and birth rate. Families were included if the pregnancy lasted 24-42 weeks and the mother could speak French or English.16 Data were collected yearly in childhood and biannually in adolescence by the Québec Statistics Institute.17 We used information on irritability and depressive/anxious mood assessed by teachers from 6 to 12 years and subsequent self-reported suicidality at 13, 15 and 17 years, resulting in a sample of 1430 participants. Those participants were broadly representative of the original sample, but differed in terms of child sex, socioeconomic status, and child verbal IQ (Table 1).

The QLSCD protocol was approved by the Quebec Institute of Statistics and the St-Justine Hospital Research Center ethics committees. Written informed consent was obtained from all the participants.

Measures

Teachers rating of irritability and depressive/anxious mood. School teachers rated children on the Behavior Questionnaire at the ages of 6, 7, 8, 10 and 12 years. The Behavior Questionnaire was created for the Canadian National Longitudinal Study of Children and Youth,18 and incorporates items from the Child Behavior Checklist,19 the Ontario Child Health Study Scales,20 and the Preschool Behavior Questionnaire.21 Items were rated using a 3-point likert scale according to the frequency of the behavior in the past 6 months (0=never, 1=sometimes, 2=often). At each time point, child’s behavior was assessed by a different teacher.

Depressive/anxious mood was assessed with 9 items (alpha: 0.84-0.86): “seemed to be unhappy or sad”, “was not as happy as other children”, “has no energy, was feeling tired”, “had trouble enjoying him/ herself”, “cried a lot”, “was too fearful or anxious”, “was worried”, “was nervous, high-strung or tense”, “was unable of making decisions”. At all time points, items were averaged to obtain the depressive/anxious mood score.

Irritability was assessed with 4 items (alpha: 0.85-0.91): “had temper tantrums or hot temper”, “reacted in an aggressive manner when teased”, “reacted in an aggressive manner when contradicted”, “reacted in an aggressive
manner when something was taken away from him/her”. At all time points, the irritability score was obtained by summing the first item (temper tantrum) with the average of the other 3 items, as they evaluated the same behaviors (reacting in an aggressive manner) in 3 different situations (see also eTable 1).

**Adolescent’s suicidality outcomes.** Serious suicidal ideation and suicide attempt were assessed at ages 13, 15 and 17 years. Adolescents were asked ‘in the past twelve months, did you ever seriously think of attempting suicide’ and if so ‘how many times did you attempt suicide’, dichotomized as no (0) or yes (1). Three variables were derived: lifetime suicidality (i.e., reporting serious suicide ideation or attempt at least once at 13, 15, or 17 years), lifetime suicidal ideation (i.e., reporting serious suicidal ideation at least once at 13, 15, or 17 years but no attempt), and lifetime suicide attempt (i.e., reporting at least one suicide attempt at 13, 15, or 17 years). In our sample, 182 (11.8%) participants reported suicidal ideation or suicide attempt, 95 (6.1%) reported serious suicidal ideation, and 87 (5.6%) reported suicide attempt (Table 2-3).

**Data analysis**

1. **Identifying childhood profiles of irritability and depressive/anxious mood.** We jointly estimated developmental trajectories of irritability and depressive/anxious mood between 6 and 12 years using multi-trajectory modeling. This is a new application of Group-Based Trajectory Modeling, which allows the jointly modeling of the trajectories of multiple outcomes using semi-parametric mixture models. The result of this analysis allowed the identification of different profiles defined by the joint development of irritability and depressive/anxious mood across childhood. Parameters were estimated using maximum likelihood estimation through a Newton-Raphson optimization algorithm and censored-normal models. The selection of the best model in terms of number of groups and polynomial order of the trajectories was based on the Bayesian Information Criterion. Then, each participant was assigned to the group having the highest posterior probability.

2. **Longitudinal associations between childhood irritability and depressive/anxious mood profiles, and adolescent suicidality.** We estimated the proportion of adolescents reporting suicidal ideation and/or suicide attempt for each profile. We computed two statistics to estimate the risk. First, we computed the Number Needed to be Exposed (NNE), i.e. the average number of individuals needing to be observed in a given profile (relative to the profile exhibiting the lowest symptoms) in order to observe an additional suicidal outcome \((NNE=1/[\text{Non-exposed event rate}-\text{Exposed event rate}])\). Second, we conducted logistic regressions to estimate the odds of showing suicidal ideation/suicide attempt for each of the mood profile, compared to the profile exhibiting the lowest level of symptoms. We provided the following estimates: (a) unadjusted, (b) adjusted for sex, and (c) adjusted for sex and socioeconomic status (SES). We
tested sex-by-profile interaction. However, as this analysis is underpowered, we additionally conducted exploratory analyses stratified by sex, as for the important sexual differences in suicidality.¹⁵

**Results**

1. **Identifying childhood profiles of irritability and depressive/anxious mood**

   The study included 1430 children that were followed up to 17 years of age; 676 (47.3%) were male. The best model identified 5 profiles (Figure 1): 1) no irritability & low depressive/anxious mood, 32.5%; 2) low irritability & low depressive/anxious mood, 25.6%; 3) moderate irritability & low depressive/anxious mood, 24.7%; 4) moderate declining irritability and high depressive/anxious mood (hereafter high depressive/anxious mood only), 6.6%; 5) high irritability & depressive/anxious mood, 10.6%. Profiles 1 and 2 were combined and used as the reference group (hereafter low irritability & depressive/anxious mood, 58.1%). Individual and family characteristics of each profile are presented in eTable 2. Briefly, children in the high irritability & depressive/anxious mood profile were more likely to be male, to be raised by a depressive and/or hostile-reactive mother, and to be from a socioeconomically advantaged family.

2. **Longitudinal associations between childhood irritability and depressive/anxious mood profiles, and adolescent suicidality**

   Table 2 shows % and n of adolescents presenting suicidal ideation/suicide attempt in each profile. Suicidality varied from 10.6% to 16.5% with the highest prevalence observed among children in the high irritability & high depressive/anxious mood profile. The NNE for this profile was 18, suggesting that if 18 children with high irritability and high depressive/anxious mood were sampled, we would observe one more case of suicidality with respect to a group of 18 children sampled from the low irritability & depressive/anxious mood profile.

   The sex-by-profile interaction was non-significant, although girls had higher rates of suicidal attempts and were disproportionally represented in some profiles. Exploratory analyses by sex suggested that the suicidal risk in the high irritability & high depressive/anxious mood profile was clinically more important for females (NNE=5) than for males (NNE=20). Among children in the moderate irritability profiles & low depressive/anxious mood profile, 13.0% reported suicidality (NNE=48). Although the proportion of females and males reporting suicidality was different within this profile (respectively, 18.1% and 9.6%), a similar number of females and males needed to be exposed to observe one additional case of suicidality (respectively, NNE=28 and NNE=22). In analyses based on the whole
sample and stratified by sex, the proportion of suicidality in the high depressive/anxious mood only profile (10.6%) was similar to the proportion observed in the low irritability and depressive/anxious mood profile (11.3%, NNE>50).

Table 3 shows odds ratios and 95% confidence intervals for moderate irritability & low depressive/anxious mood, high depressive/anxious mood only and high irritability & high depressive/anxious mood profiles compared to low irritably and depressive/anxious mood profile.

Consistently with NNE, we found that children with high irritability & high depressive/anxious mood had twice the odds of showing suicidality (OR=2.25, 95%CI=1.35-3.74), after adjusting for sex and SES. In addition, children with moderate irritability & low depressive/anxious mood had 1.5 times the odds of showing suicidality (OR=1.51, 95%CI=1.02-2.25). The high depressive/anxious mood only profile had the same odds of suicidality (OR=0.96, 95%CI=0.46-1.97) than the reference group.

When the two outcomes, suicidal ideation and suicide attempt, were examined separately in exploratory analyses (Table 4), findings were consistent with those obtained for combined outcomes: the high irritability & depressive/anxious mood profile predicted suicidal ideation (OR=2.07, 95%CI=1.05-4.10) and suicide attempt (OR=2.03, 95%CI=1.00-4.15). For the moderate irritability & low depressive/anxious mood profile, the effects for suicidal ideation (OR=1.44, 95%CI=0.85-2.43) and suicide attempt (OR=1.53, 95%CI=0.88-2.64) were comparable to those obtained for suicidality.

The risk of suicidality was higher in the high irritability & depressive/anxious mood profile (OR=2.28, 95%CI=1.02-5.15) compared to the high depressive/anxious mood only profile. This was also true for suicide attempt (OR=3.11, 95%CI=0.93-10.38), but not for suicidal ideation, for which no difference between the depressive/anxious mood only and the irritability & depressive/anxious mood profiles was found (OR=1.58, 95%CI=0.57-4.36).

Consistent with the NNE analyses, the odds ratio analyses stratified by sex showed different patterns for males and females: the moderate irritability & low depressive/anxious mood profile was more strongly associated with suicidality in males (OR=2.05, 95%CI=1.02-4.10) than females (OR=1.30, 95%CI=0.80-2.13), while the high irritability & depressive/anxious mood profile was more strongly associated with suicidality in females (OR=3.07, 95%CI=1.54-6.12) than males (OR=2.13, 95%CI=0.95-4.78; Table 3).

Results were robust to missing data and attrition in sensitivity analyses (eTable 3).

Discussion
This population-based study is the first to examine the joint contribution of irritability and depressive/anxious mood assessed repeatedly across childhood in the prediction of suicidality in adolescence. We show that children presenting high irritability & depression/anxious mood were 2 times more likely to report serious suicidal ideation and/or to attempt suicide in adolescence compared to those presenting neither irritability nor depressive/anxious mood. Consistent results were obtained for suicidal ideation and suicide attempt analyzed as separate outcome. Exploratory analyses by sex indicated that this association was more important for females than males, as indicated by the need to prevent the exposure among 5 females to avoid one case of suicidality (NNE=5 vs NNE=20 in males). However, the sex-by-profile interaction was non-significant, probably owing to low statistical power to detect this interaction. The magnitude of these associations was in line with those reported in previous population-based studies on the association of internalizing behaviors, previous suicide attempts, and childhood adversity with suicide. \textsuperscript{2,4,13} Children presenting moderate irritability & low depressive/anxious mood were slightly at higher suicidal risk in adolescence than those with low symptoms. The corresponding NNE=48 suggested that the clinical importance of this association is modest. Children presenting depressive/anxious mood (but no irritability) showed a similar risk of later suicidality than those presenting neither depressive/anxious mood nor irritability. Additionally, children showing both irritability and depressive/anxious mood were 2 times more at risk of showing suicidal behaviors during their adolescence compared to children showing depressive/anxious mood only.

This study used an innovative person-centered approach, which described the joint course of irritability and depressive/anxious mood from 6 to 12 years. Previous studies using trajectory modeling only investigated the development of either depression/anxiety or irritability, \textsuperscript{28–31} or described depression phenotypes (depression only vs irritable depression) based on the cross-sectional presence of one or both symptoms. \textsuperscript{6,32} Instead, our multi-trajectory model captured the joint development of irritability and depressive/anxious mood throughout childhood. Such approaches are substantially different, as profiles identified here account for the correlation of irritability and depressive/anxious mood, both within the same subject and over time. We found rank stability in the developmental profiles of irritability and depressive/anxious mood; i.e., children with the highest level of symptoms at 6 years also exhibited the highest levels of symptoms at 12 years. Stability of these phenotypes has only been shown in one previous study among clinically depressed individuals. \textsuperscript{6} Therefore, our findings widen previous evidence by showing that irritability and depressive/anxious mood profiles are stable at the population level (i.e., considering sub-syndromic level of irritability and depressive/anxious mood), and detectable during middle childhood.
Another contribution of this study is the identification of a group of children (~25%) with moderate and stable levels of irritability (but low depressive/anxious mood) who are at elevated risk of suicidality in adolescence. Although previous studies reported associations between irritability in childhood/adolescence and later depression, anxiety,6,7,33–36 and suicidality,12,13 we found that even moderate levels of irritability may contribute to suicidal risk. The absence, in those children, of depressive/anxious symptoms may result in low treatment seeking. Such results indicate that children presenting with only irritability symptoms may benefit from a suicidal behaviors assessment. Note that the clinical relevance of this observation should take into account the high NNE (male NNE=22, female NNE=28). Thus, while screening for suicide may be indicated in presence of irritability even in the absence of depression/anxiety, additional studies are needed to quantify this finding in clinical samples before clinical recommendation can be formulated.

The comparison of our findings with previous studies is limited by the lack of longitudinal population-based study examining associations of childhood irritability and depression/anxiety with suicidality. However, our findings are consistent with those from the STAR*D study,37 the National Comorbidity Survey Replication,32 and the National Institute of Mental Health Collaborative Depression Study,38 reporting more severe symptomatology (e.g. comorbid disruptive disorders, poorer impulse control) along with a history of suicide attempt37 and suicidal ideation32,37 among adult participants with irritable depression compared to those with non-irritable depression. Our findings are also in accordance with previous studies showing that individuals with an increased suicidal risk experience both depressive and aggressive symptomatology,3 and that childhood symptoms related to externalizing problems better predict suicidal behaviors than childhood internalizing symptoms.5,39

Strengths and limitations

This study was conducted using a large representative cohort of children followed from 5 months to 17 years, as well as innovative joint trajectory modeling techniques, and behavioral assessments performed by 5 different teachers interacting daily with children and observing behaviors in a social setting (school). Despite these strengths, this study has limitations. First, as in other longitudinal population-based studies,29,33,35,40 the scales used to assess childhood symptoms are not clinical instruments assessing specific psychopathology. They rather assess behaviors/emotions along a continuum, with satisfactory psychometric proprieties and good construct validity.7 However, as our assessment of childhood symptoms are based on teacher only, it is possible that depressive-anxious mood might have been underrated compared to irritability, as internalizing symptoms may be more difficult to observe in a school-context than externalized symptoms.41 Second, due to sample attrition (e.g., emigration, lost to follow-up,
refusal), our analyses were conducted on 67% of the initial sample (without sampling weights). Included and excluded participants were broadly comparable, except for sex, SES, and IQ. To minimize attrition biases, analyses were repeated using sample weights accounting for the probability to be missing at follow up. Results with and without weights were similar (eTable 3), suggesting that bias due to attrition is rather minimal. Third, as we assessed past 12-month suicidality biannually, participants reporting suicidal ideation or suicide attempt in-between data collections may have been incorrectly classified in the not-at-risk group. This potential misclassification may underestimate the size of the associations.

**Conclusion**

In this population study, we described for the first time the joint development of irritability and depressive/anxious mood, showing stable profiles across mid-to-late childhood. Manifestations of irritability during childhood convey a significant risk for suicidal behaviors in adolescence. This was especially the case when high levels of irritability were accompanied by high levels of depressive/anxious mood, and particularly for females. The value of assessing irritability as part of the suicide risk assessment should be investigated in future population-based and clinical studies. As our findings are exploratory, further studies are needed to test the putatively causal role of irritability on suicidality. For instance, randomized intervention aiming at reducing childhood irritability, especially when accompanied by high depressive/anxious mood, should examine its impact on future suicidal symptoms.
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Funders have no role in study design, data analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication. Dr Orri had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Dr Côté and Dr Geoffroy shared senior authorships.
References


**Figure legend**

**Figure 1.** Multi-trajectories of childhood irritability and depressive/anxious mood

Each column represents a different profile in the multi-trajectory model, and is defined by the trajectory of irritability (upper panel) and depressive/anxious mood (lower panel) from 6 to 12 years of age (x-axes) of their member. Dots represent observed value, whether lines represent the fitted regression slopes. Fit indices of the model: Log-likelihood=-18246.25, BIC=-18323.91, Entropy=0.730 (i.e., quality of classification; adequate if >0.70), mean odds of correct classification=19.2 (i.e., the model classify the participants 19.2 times better than classification by chance; adequate if >5). Analyses were performed using the *traj* procedure in Stata 14.
Table 1. Comparison of included versus non-included participants on key variables (maximum available n)

| Table 1. Comparison of included versus non-included participants on key variables (maximum available n) |
|-------------------------------------------------|-----------------|-----------------|-----------------|
| **Child characteristics**                      | **Included** (N=1430) | **Non included** (N=690) | **Effect size (SRD)** |
| Sex male, No. (%)                              | 676 (47.3)       | 404 (58.7)       | -0.11***         |
| Low birth weight (<2500g), No. (%)             | 44 (3.1)         | 27 (3.9)         | -0.08            |
| Verbal IQ, 3½ years a                          | 30.43 (14.65)    | 28.80 (14.14)    | -0.09*           |
| Difficult temperament b                        | 2.71 (1.6)       | 2.72 (1.66)      | 0.00             |
| **Familial characteristics**                   |                  |                  |                  |
| Socioeconomic Status c                         | 0.06 (0.99)      | -0.15 (1.01)     | -0.19***         |
| Maternal no education beyond high school, No. (%) | 238 (16.6)      | 147 (21.3)       | -0.05            |
| Paternal no education beyond high school, No. (%) | 254 (17.8)      | 144 (20.9)       | -0.03            |
| Maternal age at child birth in years           | 29.32 (5.18)     | 29.25 (5.33)     | -0.10            |
| Paternal age at child birth in years           | 32.26 (5.46)     | 32.26 (6.00)     | 0.00             |
| Family dysfunction d                           | 1.71 (1.43)      | 1.71 (1.51)      | 0.00             |
| Non-intact family (single or blended), No. (%)  | 257 (18.0)       | 149 (21.6)       | -0.04            |
| Maternal smoking during pregnancy, No. (%)     | 351 (24.5)       | 182 (26.4)       | -0.02            |
| Maternal hostile-reactive parenting, 3½ years e | 3.34 (1.32)      | 3.24 (1.36)      | -0.06            |
| Paternal hostile-reactive parenting, 3½ years e | 2.72 (1.22)      | 2.70 (1.32)      | -0.01            |
| **Parental mental health**                     |                  |                  |                  |
| Maternal depression f                          | 1.38 (1.32)      | 1.45 (1.39)      | 0.04             |
| Maternal antisociality in adolescence $g$      | 0.81 (0.92)      | 0.81 (0.98)      | 0.00             |
| Paternal depression f                          | 1.00 (0.95)      | 1.00 (1.00)      | 0.00             |
| Paternal antisociality in adolescence $g$      | 0.68 (0.93)      | 0.64 (1.01)      | -0.03            |

Table 1 compared participants included in the study sample (n=1430) with those non-included (n=690) on key characteristics. Variables were measured when the child was 5 months of age and expressed as mean (standard deviation), if not otherwise specified. Effect sizes are Success Rate Difference (SRD). P-values are based on t-tests or Mann-Whitney U test for continuous variables, and chi-square tests for categorical variables. *P<0.05, **P<0.01, ***P<0.001

a Peabody Picture Vocabulary Test; b assessed with 7 items (e.g., “How easy or difficult is it for you to calm or soothe your baby when he/she is upset?”) from the Infant Characteristics Questionnaire, administered to the mother; c Aggregate of five items regarding parental education, parental occupation, and annual gross income, range -3 to 3, centered at 0; d assessed with 7 items (e.g. don’t get along well together) from McMaster Family assessment administered to the mother; e Assessed with 8 items (e.g., “When he/she broke the rules or did things that he/she was not supposed to, how often did you use physical punishment?”) administered to the parent; f Assessed using a short version of the Centre for Epidemiological Study Depression Scale; g Assessed with binary questions on 5 different conduct problems based on the DSM-IV criteria for conduct disorder and antisocial personality disorder.
Source: Data compiled by the authors from the final master file of QLSCD 1998-2015, © Québec Government, Québec Statistics Institute.
Table 2. Distribution of suicidal outcomes (13-17 years) by childhood profile of irritability & depressive/anxious mood, and Number Needed to be Exposed (NNE)

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<th>Cases by suicidality outcomes</th>
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<td>No (%)</td>
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<td></td>
<td>Suicidality</td>
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<tr>
<td>Low irritability &amp; depressive/anxious mood</td>
<td>91/831 (11.3)</td>
</tr>
<tr>
<td>Moderate irritability &amp; low depressive/anxious mood</td>
<td>46/353 (13.0)</td>
</tr>
<tr>
<td>High depressive/anxious mood only</td>
<td>10/94 (10.6)</td>
</tr>
<tr>
<td>High irritability &amp; high depressive/anxious mood</td>
<td>25/152 (16.5)</td>
</tr>
</tbody>
</table>

NNE=1/(Event Rate among not exposed – Event Rate among exposed)

Source: Data compiled by the authors from the final master file of QLSCD 1998-2015, © Québec Government, Québec Statistics Institute.
Table 3. Odds Ratio and 95% CI for suicidality outcomes (13-17 years) by childhood profile of irritability and depressive/anxious mood

<table>
<thead>
<tr>
<th></th>
<th>Sex combined</th>
<th>Females</th>
<th>Males</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (95% CI)</td>
<td>OR (95% CI)</td>
<td>OR (95% CI)</td>
</tr>
<tr>
<td>Low irritability &amp; depressive/anxious mood</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Moderate irritability &amp; low depressive/anxious mood</td>
<td>1.22 (0.83-1.78)</td>
<td>1.55 (1.05-2.29)</td>
<td>1.51 (1.02-2.25)</td>
</tr>
<tr>
<td>High depressive/anxious mood only</td>
<td>0.97 (0.49-1.93)</td>
<td>1.15 (0.57-2.33)</td>
<td>0.96 (0.47-1.97)</td>
</tr>
<tr>
<td>High irritability &amp; high depressive/anxious mood</td>
<td>1.60 (0.99-2.59)</td>
<td>2.43 (1.46-4.04)</td>
<td>2.22 (1.32-3.74)</td>
</tr>
</tbody>
</table>

*a* Unadjusted odds ratios  
*b* Odds ratios adjusted for child sex  
*c* Odds ratios adjusted for child sex, SES, child sex-by-SES interaction  
*d* Odds ratios adjusted for SES

Source: Data compiled by the authors from the final master file of QLSCD 1998-2015, © Québec Government, Québec Statistics Institute.
Table 4. Odds Ratio and 95% CI for suicidal ideation and suicide attempt (13-17 years) by childhood profile of irritability and depressive/anxious mood

<table>
<thead>
<tr>
<th></th>
<th>Suicidal ideation</th>
<th></th>
<th>Suicidal ideation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (95% CI) a</td>
<td>OR (95% CI) b</td>
<td>OR (95% CI) c</td>
<td>OR (95% CI) a</td>
</tr>
<tr>
<td>Low irritability &amp; depressive/anxious mood</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Moderate irritability &amp; low depressive/anxious mood</td>
<td>1.21 (0.73-2.02)</td>
<td>1.44 (0.85-2.41)</td>
<td>1.44 (0.85-2.43)</td>
<td>1.18 (0.70-2.01)</td>
</tr>
<tr>
<td>High depressive/anxious mood only</td>
<td>1.14 (0.47-0.74)</td>
<td>1.29 (0.53-3.13)</td>
<td>1.31 (0.53-3.13)</td>
<td>0.80 (0.28-2.26)</td>
</tr>
<tr>
<td>High irritability &amp; high depressive/anxious mood</td>
<td>1.56 (0.82-2.96)</td>
<td>2.07 (1.06-4.03)</td>
<td>2.07 (1.05-4.10)</td>
<td>1.53 (0.78-2.98)</td>
</tr>
</tbody>
</table>

a Unadjusted odds ratios
b Odds ratios adjusted for child sex
c Odds ratios adjusted for child sex, SES, child sex-by-SES interaction

Source: Data compiled by the authors from the final master file of QLSCD 1998-2015, © Québec Government, Québec Statistics Institute.
No irritability & low depressive/anxious mood (n=465, 35.5%)

Low irritability & low depressive/anxious mood (n=366, 25.6%)

Moderate irritability & low depressive/anxious mood (n=353, 24.7%)

High depressive/anxious mood only (n=94, 6.6%)

High irritability & depressive/anxious mood (n=152, 10.6%)