**Association of hyperactivity-impulsivity and inattention symptoms profiles with suicide attempt: A 18-year population-based cohort study**

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**Word count**: 3360; 4 tables/figures

**ABSTRACT**

**Aims**. Attention-deficit/hyperactivity disorder (ADHD) symptomatology in childhood is associated with a high risk of suicide attempt later in life. However, symptoms presentation in ADHD is heterogeneous, and little is known about how suicide risk varies according to different profiles of ADHD symptoms and sex. The aim was to investigate the longitudinal associations between childhood profiles of ADHD symptoms (i.e., hyperactivity-impulsivity and inattention) and youth suicide attempt in males and females, separately.

**Methods.** This population-based cohort study used data from three longitudinal cohorts: the Quebec Longitudinal Study of Child Development the Quebec Longitudinal Study of Kindergarten Children, and the Quebec Newborn Twin Study for a total of 4,399 participants (1490 from the QLSCD, 2134 from the QLSKC, and 775 from the QNTS; 50% females) followed up from age 6 to age 23 years. Symptoms of hyperactivity-impulsivity and inattention were assessed by teachers 5 times from ages 6 to 12 years. **S**uicide attempt in adolescence and young adulthood (by age 23) was self-reported. Multi-trajectory modelig was used to identify profiles of ADHD symptoms, and regression analysis was used to test their association with suicide attempt, adjusting for childhood socioeconomic and clinical characteristics.

**Results**. We identified four ADHD symptoms profiles with distinct associations with suicide attempt for males and females. Compared with those with persistently low symptoms, females with persistently high inattention and hyperactivity-impulsivity (OR: 2.54, CI 1.39-4.63) or high inattention and low hyperactivity-impulsivity (OR: 1.81, CI 1.21-2.70) were at higher risk of suicide attempt, while, among males, only those with decreasing hyperactivity-impulsivity and inattention over time (OR: 2.23, CI 1.20-4.13) were at higher risk of suicide attempt.

**Conclusions**. Suicide risk in children with ADHD symptoms varies according to both symptoms profile and sex, the highest risk being for females with high inattention symptoms (with or without hyperactivity), and males with decreasing symptoms. Accounting for these differences may be relevant to more accurately identify and manage suicide risk in individuals with ADHD.

**INTRODUCTION**

Attention-deficit/hyperactivity disorder (ADHD) is a common neurodevelopmental disorder, affecting 5–7% of school-aged children (Thomas et al. 2015, Faraone et al. 2021). It is characterised by developmentally inappropriate and impairing levels of inattention and/or hyperactivity-impulsivity, usually emerging in early childhood (Thomas et al. 2015, Faraone et al. 2021). ADHD has been associated with poor physical and mental health, substance misuse, as well as academic, relational, and socioeconomic difficulties (Arnold et al. 2020, Galera et al. 2023). Previous research also reported that children with ADHD are at increased risk of attempting suicide in adolescence (Huang et al. 2018, Forte et al. 2020, Garas & Balazs 2020, Commisso et al. 2021). A meta-analysis has shown that, in cross-sectional and longitudinal studies, the risk of suicide attempt is more than two fold higher in children with high ADHD symptoms compared to their peers (Septier et al. 2019). Understanding the risk of suicide attempt among children with ADHD symptoms is therefore crucial to inform suicide prevention.

In this regard, it is crucial to consider two aspects of ADHD. First, ADHD is a heterogeneous condition from a clincial and neurobiological standpoint. Children with ADHD may exhibit predominantly hyperactivity-impulsivity symptoms, predominantly inattentive symptoms, or a combination of both. Imaging and genetic studies have shown important brain network and genetic differences across such ADHD profiles (Larsson et al. 2006, Saad et al. 2020). Furthermore, previous studies have shown that these ADHD symptoms profiles were associated with distinct correlates and long-term outcomes. Children with combined hyperactivity-impulsivity and inattention symptoms had higher scores of externalizing symptoms compared with children with other profiles, while children with predominantly inattentive symptoms had higher in internalizing symptoms (de Nijs et al. 2007). Longitudinally, compared to children with high hyperactivity-impulsivity symptoms only, those with both inattentive and hyperactive-impulsive symptoms were more likely to meet criteria for externalizing and bipolar disorders, while those with inattention symptoms only were more likely to meet criteria for major depression (Willcutt et al. 2012). Children with a profile predominantly characterised by inattention, rather than hyperactivity-impulsivity symptoms, were also more likely to have poorer educational outcomes (Pingault et al. 2011). Yet, it is unclear if the risk of suicide attempt varies across distinct ADHD symptoms profiles (Grizenko et al. 2010, Balazs & Kereszteny 2017, Galera et al. 2021).

Second, significant sex differences have also been reported in the ADHD symptoms presentation. Typically, males present with more hyperactivity symptoms than females, and females with more inattention symptoms than males (Quinn 2008, Mowlem et al. 2019b). Females with ADHD symptoms are also more likely than males to experience comorbid internalizing symptoms (e.g., anxiety/depression) than males, while males are more likely to experience externalizing symptoms (e.g., conduct problems).(Rucklidge 2008) It is thus important to consider sex differences in ADHD symptoms, especially when investigating associations with suicidal behaviour, which is twice more likely among females than males (Forte et al. 2020). Overall, given the substantial heterogeneity of ADHD, understanding the characteristics of individuals with ADHD symptoms who are at high risk of suicide attempts is critical to identify individuals at risk and inform clinical management programmes.

Relying on longitudinal analyses of three population-based cohorts we investigated associations between distinct profiles of ADHD symptoms in childhood and later suicide attempt in adolescence and young adulthood among males and females separately.

**METHODS**

**Participants**

We drew from three longitudinal population-based cohorts from the province of Quebec, Canada. The Quebec Longitudinal Study of Child Development (QLSCD) is a representative sample of 2120 infants born in 1997/98 (Orri et al. 2021). The original QLSCD sample was selected from the Quebec Birth Registry using a stratified procedure based on living area and birth rate, and data were collected yearly during childhood and biyearly during adolescence by the *Institut de la Statistique du Québec* (ISQ). The Longitudinal Study of Kindergarten Children (QLSKC) is a longitudinal cohort of 3017 children attending kindergarten in Quebec’s French-speaking public schools between 1986 and 1987.(Rouquette et al. 2014) The QLSKC includes 2000 participants that were selected using a random sampling procedure stratified by administrative region, school board size, and sex to be representative of the population, plus an additional sample of 1017 participants that exhibited disruptive behaviours in kindergarten. The Quebec Newborn Twin Study (QNTS) is an ongoing prospective longitudinal cohort of twins born between 1995 and 1998.(Boivin et al. 2019) Recruitment for QNTS was initiated with the Quebec Newborn Twin Registry, which identified all twin births in Quebec between 1995 and 1998, of which a total of 662 families of twins were initially assessed. Due to attrition, we included in the study sample 4,399 participants (1490 from the QLSCD, 2134 from the QLSKC, and 775 from the QNTS, respectively 70.3%, 70.1%, and 58.5% of the initial samples), with information on hyperactivity-impulsivity and inattention symptoms from 6 to 12 years of age and suicide attempt self-reported by youths themselves by age 23 years.

The different data collections of the included cohorts received approval by the ethic committees of the ISQ, Sainte-Justine University Hospital Centre, McGill University, Montreal West Island Integrated University Health and Social Services Centre, Université Laval, and Université de Montreal. This specific study was approved by McGill University’s Faculty of Medicine and Health Sciences Institutional Review Board (#A02-B07-24B).

**Measures**

***Teacher ratings of hyperactivity-impulsivity and inattention symptoms***

For each cohort, behavioural ratings of hyperactivity-impulsivity and inattention were obtained from teacher reports at ages 6, 7, 8, 10, and 12 years. Symptoms in the previous 6 months were rated from five items of the Social Behavior Questionnaire (SBQ)(Collet et al. 2023). Hyperactivity–impulsivity items were: “Can’t sit still” and “is restless or hyperactive”. Inattention items were: “cannot pay attention for long”; “Is inattentive”; and “easily distracted”. Items were answered on a three-point Likert-type scale (never/not true, sometimes/somewhat true, often/very true). Hyperactivity-impulsivity and inattention scores were created by averaging the respective items at each time point. Cronbach’s alphas ranged from 0.78 to 0.90 for hyperactivity-impulsivity and from 0.83 to 0.90 for inattention.

***Self-reported suicide attempt in adolescence and young adulthood***

Within the QLSCD cohort, suicide attempt was measured at ages 13, 15, 17, 20, and 23. Adolescents were asked, “In the past 12 months, did you ever seriously think of attempting suicide?” and if so, “How many times did you attempt suicide?” dichotomised as no (never attempted suicide) or yes (≥1 suicide attempts). At ages 20 and 23, participants were asked if they “Ever went to the emergency department for a suicide attempt” and if they “Have ever been hospitalised for a suicide attempt”. Suicide attempt was then defined as reporting ≥1 suicide attempts (and/or self-reported hospitalization/emergency visit for a suicide attempt) at any age between 13 and 23 years (coded as 1) or never reporting it (coded 0). Similarly, within the QLSKC cohort, structured interviews assessed suicide attempt at ages 15 and 22 using the Diagnostic Interview Schedule for Children and Adults, respectively.(Robins et al. 1981, Shaffer et al. 1996) At age 15, participants and their parents were asked: “Have you/your child tried to kill yourself/themselves?”. The same question was assessed at age 22 to the participants only. A variable for lifetime suicide attempt was derived, coded 1 if the participant or his/her parent reported a suicide attempt at either age 15 or 22 years, and 0 if not. For QNTS, adolescents at age 19 were asked “Have you ever attempted suicide?”, answered as no (0) or yes (1).

***Covariates***

The following covariates were a-priori selected for the multivariable models based on the literature.(Galéra et al. 2011, Franklin et al. 2016)

Background, child, and family characteristics: sex of the child; maternal age of the mother at time of first survey administration; highest education obtained by the mother when the child is 6 years old (a proxy for family socioeconomic status); family structure at age 6 (a categorical variable differentiating between intact, single-parent, and blended families); positive (e.g., calming discussing a problem with the child) and harsh (e.g., hitting the child when they were difficult) parenting behaviours at age 6 reported by the person most knowledgeable about the child (the mother in >95% of the cases) using the Strayhorn and Weidman’s Parent Practices Scale in the QLSCD,(Strayhorn & Weidman 1988) Emotional Climate for Children Scale(Falender & Mehrabian 1980) in the QLSKC and the Parental Cognitions, and Conduct Towards the Infant Scale in both QLSCD and QNTS.(Boivin et al. 2005) To harmonise these varables, they were z-score transformed in each cohort so that a 1-SD unit increase in the score would indicate higher levels of positive/harsh parenting behaviours with respect to the average of the specific cohort. Baseline (age 6 years) mental health symptoms and ADHD medication use: internalizing (e.g., anxious/depressive) and externalizing (e.g., conduct problems) symptoms of the child were measured with teacher-reported items from the SBQ; ADHD medication used during middle childhood was assessed by reports from the person most knowledgeable of the child at age 6, 7, 8, 10, and 12 in the QLSCD, 9, 10, 11, 12, 13, and 15 in the QLSKC, and 15 the QNTS. We created a variable corresponding to any use of ADHD medication during the assessed period.

**Data Analysis**

***Identifying childhood profiles of ADHD symptoms***

We jointly estimated developmental trajectories of hyperactivity-impulsivity and inattention (ADHD) symptoms from 6 to 12 years of age using parallel process latent growth modelling in Mplus. This longitudinal data-driven analysis technique allowed us to joint model the trajectories of hyperactivity-impulsivity and inattention from age 6 to age 12. It resulted in the identification of different profiles characterised by distinct developmental patterns of both hyperactivity-impulsivity and inattention. We estimated models with 1 to 6 latent profiles, and the selection of the best model was based on methodological considerations. These included need for the model to minimise the Bayesian Information Criterion, and the accuracy of the classification of the individuals in the different classes (entropy, ranging from 0 to 1, with 1 indicating perfect classifications), and the interpretability of the model. ADHD symptoms profiles were derived on the whole sample in the main analysis, then on males and female sub-samples separately as sensitivity analysis.

***Longitudinal associations between childhood ADHD symptoms profiles and youth suicide attempt***

Associations between ADHD symptoms profiles and suicide attempt was investigated using binary logistic regression, with robust standard errors to account for the non-independence of the twins in QNTS. The model estimated the odds ratio (OR) of reporting suicide attempt for each of the ADHD symptoms profiles compared with the profile exhibiting the lowest level of symptoms. Given the probabilistic nature of the model classifying the participants in the different profiles, estimates were adjusted to take into account the uncertainty of classification using the predicted probabilities of class membership. We fitted three models with different adjustment levels: (1) only accounting for cohort effect, (2) further adjusted for sociodemographic and family characteristics, (3) further adjusted for baseline mental health symptoms and ADHD medication use. We ran multivariate multiple imputations with the Amelia package in R (Zhang 2016) to account for missing data in the covariates, therefore models were estimated across 20 imputed datasets and then pooled. Models were fitted for the whole sample and separately for males and females. We a-priori decided to estimate models for males and females separately. However, to statistically test sex differences, we also estimated the interaction between ADHD symptoms profiles and sex on the additive scale, and computed the interaction contrast ratio (ICR), quantifying the excess risk due to interaction, that is how much the combined effect of two factors (e.g., a given profile of ADHD symptoms and female sex) exceeds the sum of their individual effects. Values >0 indicate positive interaction (i.e., synergy: the joint effect of both factors exceeds the sum of their individual effects), values <0 indicate negative interaction (i.e., antagonism: the joint effect is less than the sum of the individual effects), and 0 indicates no interaction (i.e., the effects of the two factors are additive). We also calculated the attributable proportion (AP), quantifying the proportion of the combined (synergic/antagonist) effect of two factors that can be attributed to their interaction (as opposed to their independent effects), that in this context represents the propotion of the putative effect on the outcome due to the combination of a given ADHD symptom profile (compared to the profile with lowest symptoms) and female sex (compared to male sex)(VanderWeele & Knol 2014).

**RESULTS**

We included 4,399 children who were followed up for 8-12 years, of which 2,195 (49.9%) were male, and 2,204 (50.1%) were female (**Table 1** and **Table S2**). The best model identified the following four profiles (**Figure 1,** see also **Table S3** and **Table S4**): (1) *Low hyperactivity-impulsivity and low inattention* (2,475 [56.3%]), including participants with persistently low symptoms from six to 12 years of age; (2) *Low hyperactivity-impulsivity and high inattention* (919 [20.9%]), including participants with low symptoms of hyperactivity-impulsivity but high inattention symptoms during the follow-up period; (3) *High hyperactivity-impulsivity and high inattention* (491 [11.2%]), including participants with persistently high symoptom of both hyperactivity-impulsiviy and inattention (4) *Decreasing hyperactivity-impulsivity and decreasing inattention* (514 [11.7%]), including participants with initially high symptoms of both hyperactivity-impulsivity and inattention at the beginning of the follow-up, then decreased (especially for inattention) over middle childhood. Sensitivity analyses for males and females separately resulted in consistent classification of participants in the ADHD symptoms profiles (**Table S5**). Characteristics of children belonging to each profile are reported in **Table 1**, showing significant differences across ADHD symptoms profiles on all the covariates, except for positive parenting (p = 0.121), while **Table 2** shows the rate of suicide attempt for each ADHD symptoms profile, stratified by sex. Females were more likely to report suicide attempt than males (n=238, 10.4% *vs.* n=119, 5.6%).

**Table 3** displays the odds ratio (OR [95% CI]) for the association between ADHD symptoms profiles and suicide attempt. Within the entire sample, the risk of suicide attempt was significantly higher in the *High hyperactivity-impulsivity and inattention* (OR: 1.77; 95% CI, 1.16-2.70), Low *hyperactivity and high inattention* (OR: 1.67; CI 1.20-2.32), and *Decreasing hyperactivity-impulsivity and inattention* (OR: 1.80; CI 1.20-2.71) profiles compared to the *Low hyperactivity-impulsivity and inattention* profile, even after adjusting for all the covariates (**Table 3, Figure 2A**). Interaction analyses suggested thatrisks of suicide attempt for females in the *High hyperactivity-impulsivity and high inattention*, and *Low hyperactivity-impulsivity and high inattention* profiles were significantly higher than for males, with ICR of 2.88 (CI: 0.004-5.75, p=0.025; AP=0.42), and ICR of 1.30 (CI: 0.07-2.53, p=0.019; AP=0.34). Although no clear evidence for an interaction was found for the *Decreasing hyperactivity-impulsivity and inattention* profile, the ICR pointed towards a lower risk for females in this profile relative to males (0.38, CI -1.38-2.15, p=0.336; AP=0.11). Estimates were broadly similar for the adjusted model, although the confidence intervals crossed the null, suggesting that covariates partially explain this interaction (**Figure 2B**).

In analyses stratified by sex (**Table 3**, **Figure 2A**), compared to those in the *Low hyperactivity-impulsivity and inattention* profile, the risk of suicide attempt was significantly higher for females in the *High hyperactivity and inattention* (OR: 2.54; CI 1.39-4.63) and *Low hyperactivity-impulsivity and high inattention* (OR: 1.81; CI 1.21-2.7) profiles even after accounting for all the covariates, but not for females in the *Decreasing hyperactivity-impulsivity and inattention* profile (OR: 1.38; CI 0.78-2.45). Conversely, the risk of suicide attempt was significantly higher for males in the *Decreasing hyperactivity-impulsivity and inattention profile* (OR: 2.23; CI 1.20-4.13) even after accounting for all the covariates, but not for males in the *High hyperactivity-impulsivity and inattention* (OR: 1.31; CI 0.70-2.44) and in the *Low hyperactivity and high inattention* (OR: 1.41; CI 0.78-2.56) profiles.

 Sensitivity analyses using ADHD symptom profiles derived separately for males and females (**Figure S1**; **Tables S3**), and using a hard-coding classification of the individulas in the profiles instead of weighting for their estimated posterior probability (**Table S7**), yielded consistent results.

**DISCUSSION**

This large longitudinal population-based study explored the risk of suicide attempt in individuals with ADHD symptoms according to symptoms profile and sex. We found that primary school children presenting with ADHD symptoms were at higher risk of suicide attempt in adolescence and young adulthood, and that this association varied according to both sex and profile of ADHD symptoms. Specifically, females with a symptoms profile characterised by elevated inattention symptoms, with or without hyperactivity-inattention symptoms, were at higer risk of suicide attempt by young adulthood than those with low symptoms, while no higher risk was found for males with such symptoms profiles. Among males, only those with a symptoms profile characterised by initially high but then decreasing hyperactivity-impulsivity and inattention symptoms across middle childhood were at higher risk of subsequent suicide attempt.

We identified four distinct ADHD symptoms profiles in the population in line with clinical literature based on diagnostic interviews and clinical assessments (Elia et al. 2009). Contrary to some previous studies, we did not find a group characterised solely by high hyperactivity-impulsivity symptoms. However, such a symptom profile has not been consistently identified in previous studies based on data-driven approaches (Milich et al. 2001). Furthermore, prior research mostly used cross-sectional designs or focused on relatively narrow development periods, in contrast with our longitudinal approach spanning six years of data collection. This allowed us to capture patterns of symptoms over a long period, accounting for developmental changes. Importantly, our study is the first to model the longitudinal course of hyperactivity-impulsivity and inattention symptoms jointly in the same statistical model. The higher proportion of males in the profile with high hyperactivity-impulsivity and inattention symptoms, and of females in the profile with high inattentive symptoms, is consistent with prior literature, including studies focusing on diagnoses of ADHD in clinical populations (Tandon et al. 2016, Murray et al. 2019, Slobodin & Davidovitch 2019).

Consistent with previous studies (Huang et al. 2018, Septier et al. 2019, Forte et al. 2020, Garas & Balazs 2020, Commisso et al. 2021), we found that children with high symptoms of hyperactivity-impulsivity and/or inattention were at higher risk of suicide attempt regardless of the specific symptom presentation and sex. However, by disentangling the heterogeneity in both symptom presentation and sex, this study uncovered important differences in suicide attempt risk in children with ADHD symptoms. These differences would have gone unnoticed if we had overlooked these sources of heterogeneity. Specifically, we found that for females, only those with symptoms profiles characterised by the presence of high inattention (i.e., the high hyperactivity-impulsivity and inattention, and the high inattention profiles) had a higher risk of suicide attempt compared with those with low symptoms, while no higher risk was found for males with these same patterns of symptoms. A likely explanation for these sex differences is the underdetection of females with severe ADHD symptoms. Further studies are necessary to understand these sex differences. A possible mechanism may implicate the emergence of adolescent depressive symptoms. Studies have shown that patterns of comorbidity between ADHD and other symptoms differ by sex, with females being more prone to develop depressive symptoms.(Mowlem et al. 2019a) This is particularly the case for profiles of ADHD symtptoms characterized by high inattention, most common in females (de Nijs et al. 2007). Thus, female in our sample may have developed depressive symptoms in adolescence, that may have acted as more proximal risk factors for suicide attempt.(Levy et al. 2020) The fact that females are more likely than males to develop depressive symptoms in adolescence, increases the plausibility of this explaination (Orri et al. 2020, Geoffroy et al. 2021). Future study conducting are needed to confirm this possible explaination.

For males, the only profile associated with an increased risk of suicide attempt was the decreasing symptoms profile. This profile may cluster children whose hyperactive and impulsive behaviour in early childhood are prodromic of later conduct or emotional regulation problems (Retz et al. 2021, Sultan et al. 2021) - rather than ADHD itself- which in turn may have increased their risk of suicide attempt.(Forte et al. 2020) This is in line with other studies that have shown more important comorbidity between ADHD and conduct problems in males than females (Hinshaw et al. 2022), as well as findings suggesting that hyperactivity in males precedes later conduct problems (Babinski et al. 1999, Gustafsson et al. 2018). Additionally, adolescence and early adulthood are periods of significant developmental change, encompassing changes in emotion, cognition, behavior, and social behavior, which are concomitantly associated with psychophysiological changes. Neuronal and neuroendrcrine alterations associated with these changes could partially explain the higher risk-taking and impulsive behavior,(Romer 2010) which are associated to increased risk of suicide attempt (Abdoli et al. 2022). Empirically testing these mechanisms in future studies is critical to pave the way to new potential avenues for suicide prevention.

**Limitations**

First, this study relied on tachers’ dimensional assessment of ADHD symptoms, and not on clinical assessments. However, dimensional assessment of symptoms is highly relevant in population-based studies, and teachers are considered objective evaluator since they can compare the child with several other children. Second, information on medication reported by parents was likely affected by recall bias. Official prescriptions data should be used in future studies. Third, as in all longitudinal studies, attrition affected the initial representativeness of the sample, limiting the generalizability of the finding to the population. Finally, our data-driven strategy to derive ADHD symptoms profiles would benefit from replication in independent samples, especially those with diverse sociodemographic characteristics.

**Conclusions**

This study found that the association between ADHD symptoms and suicide attempt is heterogeneous and varies according to both child sex and ADHD symptoms profiles. While for females this risk is associated with profiles characterized by high inattention symptoms (with or without hyperactivity-impulsivity symptoms), for males is only associated with profiles characterized by initially elevated ADHD symptoms that decrease over the course of middle childhood. Taking into account these differences in assessment and clinical care may help optimise suicide prevention for children with ADHD symptoms.

**Funding:** Drs. Orri, Geoffroy, Turecki, Côté, Ouellet-Morin et Boivin are supported by the Canada Research Chair program. Dr. Spodenkievicz was supported by the Fonds de Recherche du Québec - Société et Culture via the Youth Suicide Prevention Research Team (FRQSC, grant #260098). Dr. Orri is also supported by the Fonds de Recherche du Québec Santé (FRQS) via le Réseau Québecois sur le Suicide, les Troubles de l’Humeur et les Troubles Associés (grant #268065). The Québec Longitudinal Study of Child Development was supported by funding from the ministère de la Santé et des Services sociaux, le ministère de la Famille, le ministère de l’Éducation et de l’Enseignement supérieur, the Lucie and André Chagnon Foundation, the Institut de recherche Robert-Sauvé en santé et en sécurité du travail, the Research Centre of the Sainte-Justine University Hospital, the ministère du Travail, de l’Emploi et de la Solidarité sociale and the Institut de la statistique du Québec. Additional funding was received by the FRQS, the FRQSC, the Social Science and Humanities Research Council of Canada (SSHRC), the Canadian Institutes of Health Research (CIHR). Funding for the primary school data collections of the Quebec Newborn Twin Study comes from Social SSHRC grant 410-2001-1475, while funding for the age 20 data collection comes from SSHRC grant 435-2014-1536. Dr. Cortese, NIHR Research Professor (NIHR303122) is funded by the NIHR for this research project. The views expressed in this publication are those of the author(s) and not necessarily those of the NIHR, NHS or the UK Department of Health and Social Care. Dr. Cortese is also supported by NIHR grants NIHR203684, NIHR203035, NIHR130077, NIHR128472, RP-PG-0618-20003 and by grant 101095568-HORIZONHLTH- 2022-DISEASE-07-03 from the European Research Executive Agency. The Institut de la Statistique du Québec collected data. The sponsors had no role in the design and conduct of the study; management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

**Conflict of interest:** Prof. Cortese has declared reimbursement for travel and accommodation expenses from the Association for Child and Adolescent Central Health (ACAMH) in relation to lectures delivered for ACAMH, the Canadian AADHD Alliance Resource, the British Association of Psychopharmacology, and from Healthcare Convention for educational activity on ADHD, and has received honoraria from Medice.

**Contributions:** Dr Spodenkievicz and Dr Orri conceptualised the study. Dr Spodenkievicz, Dr Orri, and Ms Inja wrote the initial draft. Ms. Inja conducted the statistical analyses. Dr. Orri conceptualised the study and supervised the study including statistical analyses. All authors contributed to data interpretation and drafting of the final manuscript. 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.

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**Table 1.** Sociodemographic, family and clinical characteristics

|  |  |  |  |
| --- | --- | --- | --- |
|  | Overall sample |  | By ADHD symptoms profile |
|  |  |  | Low hyperactivity-impulsivity and inattention | Low hyperactivity-impulsivity and high inattention | High hyperactivity-impulsivity and low inattention | Decreasing hyperactivity-impulsivity and inattention | p-value |
| n | 4399 |  | 2475 (56.3%) | 919 (20.9%) | 491 (11.2%) | 514 (11.7%) |  |
| Male sex, n (%) | 2195 (49.9) |  | 1044 (42.2) | 497 (54.1) | 349 (71.1) | 305 (59.3) | <0.001 |
| Cohort, n (%) |  |  |  |  |  |  | <0.001 |
| - QLSCD | 1490 (33.9) |  | 843 (34.1) | 317 (34.5) | 185 (37.7) | 145 (28.2) |  |
| - QLSKC, representative sample | 1460 (33.2) |  | 923 (37.3) | 265 (28.8) | 121 (24.6) | 151 (29.4) |  |
| - QLSKC, disruptive sample | 674 (15.3) |  | 291 (11.8) | 139 (15.1) | 105 (21.4) | 139 (27.0) |  |
| - QNTS | 775 (17.6) |  | 418 (16.9) | 198 (21.5) | 80 (16.3) | 79 (15.4) |  |
| Maternal age, mean (SD) | 28.33 (4.97) |  | 28.61 (4.87) | 28.20 (4.97) | 27.39 (5.08) | 28.13 (5.19) | <0.001 |
| Low maternal education, n (%) | 1693 (39.5) |  | 842 (34.7) | 428 (47.9) | 205 (43.8) | 218 (43.6) | <0.001 |
| Positive parenting, z-score, mean (SD) | 0.00 (1.00) |  | 0.00 (0.99) | 0.05 (1.01) | -0.09 (1.05) | -0.01 (0.96) | 0.121 |
| Harsh parenting, z-score, mean (SD) | 0.00 (1.00) |  | -0.12 (0.97) | 0.06 (1.02) | 0.31 (1.06) | 0.19 (0.96) | <0.001 |
| Non-intact family (%) | 1235 (33.3) |  | 623 (29.3) | 295 (38.5) | 162 (41.2) | 155 (36.6) | <0.001 |
| Internalizing symptoms at age 6, mean (SD) | 2.04 (2.22) |  | 1.57 (1.88) | 2.62 (2.53) | 2.90 (2.54) | 2.45 (2.27) | <0.001 |
| Conduct problems symptoms age 6, mean (SD) | 1.14 (1.87) |  | 0.60 (1.23) | 1.31 (1.91) | 2.91 (2.63) | 1.81 (2.18) | <0.001 |
| ADHD medication use, n (%) | 275 (7.1) |  | 42 (1.9) | 78 (9.60) | 114 (27.5) | 41 (8.8) | <0.001 |

Data were for the Québec Longitudinal Study of Child Development were compiled from the compiled from the final master file of the (1998–2023), ©Gouvernement du Québec, Institut de la statistique du Québec.

**Table 2.** Rate of suicide attempt, by sex and ADHD profiles

|  |  |  |  |
| --- | --- | --- | --- |
|  | Females |  | Males |
|  | Yes | No | Rate |  | Yes | No | Rate |
| Overall | 238 | 2049 | 10.4% |  | 119 | 1993 | 5.6% |
|  |  |  |  |  |  |  |  |
| ADHD symptoms profiles |  |  |  |  |  |  |  |
| * Low hyperactivity-impulsivity and inattention
 | 134 | 1451 | 8.5% |  | 37 | 853 | 4.2% |
| * Decreasing hyperactivity-impulsivity and inattention
 | 25 | 161 | 13.4% |  | 27 | 301 | 8.2% |
| * Low hyperactivity-impulsivity and high inattention
 | 57 | 349 | 14.0% |  | 28 | 485 | 5.5% |
| * High hyperactivity-impulsivity and inattention
 | 22 | 88 | 20.0% |  | 27 | 354 | 7.1% |

P-values from chi-square tests were p<0.001 for females, and p=0.025 for males.

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**Table 3.** Association between ADHD symptoms profiles and suicide attempt

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | Model 1 | Model 2 | Model 3 |
| All | Highhyperactivity-impulsivity and inattention | 1.60 (1.12-2.29) | 2.05 (1.39-3.04) | 1.77 (1.16-2.70) |
|  | Lowhyperactivity-impulsivity and highinattention | 1.63 (1.20-2.23) | 1.85 (1.34-2.55) | 1.67 (1.20-2.32) |
|  | Decreasinghyperactivity-impulsivity and inattention | 1.64 (1.11-2.42) | 2.01 (1.34-3.00) | 1.80 (1.20-2.71) |
|  |  |  |  |  |
| Females | Highhyperactivity-impulsivity and inattention | 3.50 (2.04-6.00) | 2.79 (1.59-4.88) | 2.54 (1.39-4.63) |
|  | Lowhyperactivity-impulsivity and highinattention | 2.11 (1.44-3.08) | 2.00 (1.36-2.95) | 1.81 (1.21-2.70) |
|  | Decreasinghyperactivity-impulsivity and inattention | 1.69 (0.97-2.93) | 1.54 (0.88-2.71) | 1.38 (0.78-2.45) |
|  |  |  |  |  |
| Males | Highhyperactivity-impulsivity and inattention | 1.86 (1.07-3.26) | 1.63 (0.92-2.89) | 1.31 (0.70-2.44) |
|  | Lowhyperactivity-impulsivity and highinattention | 1.66 (0.93-2.96) | 1.57 (0.87-2.83) | 1.41 (0.78-2.56) |
|  | Decreasinghyperactivity-impulsivity and inattention | 2.63 (1.44-4.78) | 2.45 (1.34-4.50) | 2.23 (1.20-4.13) |

Model 1 presents associations only adjusted for cohort membership, model 2 is further adjusted for sociodemographic and family characteristics, model 3 is further adjusted for internalizing and conduct problems at age 6 and ADHD medication use. Model were adjusted to take into account the uncertainty of classification using the predicted probabilities of class membership, so that individuals are weighted so that those that are more accurately classified to their classes contribute more to the estimates than those classified less accurately.

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**Figure 1.** Profiles of ADHD symptoms



The figure shows the observed (dots) and estimated (lines) course of hyperactivity-impulsivity (red) and inattention (blue) symptoms (y-axis) over the course of middle childhood (x-axis) for the four identified ADHD symptoms profiles. The model was estimated using Mplus version 8.11. We used 20 initial stage random starts and retained 4 for final stage optimizations. The best log-likelihood value was replicated 2 times.

Data were for the Québec Longitudinal Study of Child Development were compiled from the compiled from the final master file of the (1998–2023), ©Gouvernement du Québec, Institut de la statistique du Québec.

**Figure 2.** Adjusted estimates for the associations between ADHD symptoms profiles and suicide attempt (A) and interaction metrics (B)



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