Changes in the Prevalence of Child and Youth Mental Disorders and Perceived Need for Professional Help Between 1983 and 2014: Evidence from the Ontario Child Health Study

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Abstract

Objectives: To examine: 1) changes in the prevalence of mental disorders and perceived need for professional help among children (age 4 to 11) and youth (age 12 to 16) between 1983 and 2014 in Ontario, and 2) whether these changes vary by age and sex, urban-rural residency, poverty, lone-parent status, and immigrant background.

Methods: The 1983 (n = 2,836) and 2014 (n = 5,785) Ontario Child Health Studies are provincially representative cross-sectional surveys with identical self-report checklist measures of conduct disorder, hyperactivity, and emotional disorder, and perceived need for professional help, assessed by integrating parent and teacher responses (age 4 to 11) and parent and youth responses (age 12 to 16).

Results: The overall prevalence of perceived need for professional help increased from 6.8% to 18.9% among 4 to 16 year olds. An increase in any disorder among children (15.4% to 19.6%) was attributable to increases in hyperactivity among males (8.9% to 15.7%). Although the prevalence of any disorder did not change among youth, conduct disorder decreased (7.2% to 2.5%) while emotional disorder increased (9.2% to 13.2%). The prevalence of any disorder increased more in rural and small-medium urban areas versus large urban areas. The prevalence of any disorder decreased for children and youth in immigrant but not non-immigrant families.

Conclusions: Although there have been decreases in the prevalence of conduct disorder, increases in other mental disorders and perceived need for professional help underscore the continued need for effective prevention and intervention programs.

(Abstract 243 words)

Keywords Epidemiology, Ontario, Child mental health, Prevalence, Time trends

Introduction

Current epidemiological evidence indicates that the prevalence of child and youth mental disorders in Canada is high: the 2014 Ontario Child Health Study (OCHS) reports past 6-month prevalence rates of any mental disorder from 18% to 22% depending on age and informant.[1] The extent to which the prevalence of child and youth mental disorders has changed in recent decades is a subject of ongoing debate[2] with limited evidence available in Canada. As a sequel to the 1983 OCHS with identical measurement approaches, the 2014 OCHS provides an opportunity to assess changes in the prevalence of child (age 4 to 11) and youth (age 12 to 16) mental disorders over a 30-year period.

Recognizing the challenge of defining mental health need in the population, we report on changes in conduct disorder, hyperactivity, and emotional disorder, and perceived need for professional help, consistent with the typology of health need proposed by Bradshaw.[3] In this typology, the classification of mental disorder based on standard nosology represents 'normative' need, whereas the subjective perception of a mental health problem and need for professional help, assessed independently of 'normative' need, represents 'felt' need. Changes in the prevalence of mental disorders over time can improve our understanding of changes in the burden and distribution of disorder in the population. In contrast, changes in the prevalence of perceived need for professional help may provide insight into whether there have been changes in mental health literacy, the stigma associated with disclosing mental health problems, attitudes toward help seeking, and expectancies and concerns for child and youth mental health.[4]

Secular Changes in the Prevalence of Child and Youth Mental Disorders

A recent systematic review of studies from several high-income countries reported increases in the clinical diagnosis and treatment of child and youth mental disorders, increases in the prevalence of emotional disorder, particularly among youth, and decreases in conduct disorder.[2] Comparable evidence in Canada is limited by the time interval in which changes were assessed or the restricted age range of children and youth included in studies. For example, one study of 4 to 11 year olds found no evidence of changes in emotional-behavioural problems between 1994 and 2000.[5] Another study from 1994 to 2007 reported increases in parent ratings of physician diagnosed hyperactivity among children aged 6 to 9.[6] Yet another study from 1996 to 2008 that focused on 10 to 15 year olds found increases in hyperactivity, and decreases in emotional and conduct disorder.[7] This latter finding was consistent with decreases in self-reported antisocial behaviour, violent behaviour, and bullying since the 1990s among grade 7 to 12 students participating in the Ontario Student Drug Use and Health Survey (OSDUHS).[8] However, the OSDUHS also revealed increases in the percentage of students with self-reported attention-deficit hyperactivity disorder, and symptoms of anxiety and depression. With respect to subjective perceptions of mental health need, the OSDUHS found increases in the percentage of students who rated their mental health as fair/poor, but we are unaware of any studies that assess changes in the prevalence of perceived need for professional help.

Socio-demographic Correlates

The 1983 OCHS found associations between several important socio-demographic variables and child and youth mental disorders. For example, children and youth living in urban versus rural areas were at increased risk for mental disorders.[9] A number of variables linked with socio-economic disadvantage were also associated with child and youth mental disorders, including poverty[10] and lone-parent status.[11] In contrast, the prevalence of child and youth mental disorders did not vary by immigrant background.[12]

Since the 1983 OCHS, there have been notable changes in these socio-demographic characteristics. The urban-rural settlement patterns of Ontario families have changed, with fewer families living in rural and small to medium sized urban areas, but more living in large urban areas.[13,14] Although the poverty rate in Ontario has been stable since the 1980s,[13,14] its distribution among families has changed. For example, a large increase in the percentage of lone-parent families in the population has been accompanied by decreases in levels of poverty among them. Levels of poverty have also decreased among Canadian-born families in Ontario (non-immigrant), but they have remained stable among immigrant families. Income partly accounts for the association between lone-parent status and child mental disorders,[15] and it is now well established that children in immigrant versus non-immigrant families have lower levels of mental health problems despite being disproportionately exposed to poverty.[16,17] Could secular changes in the distribution of poverty alter gradients of mental disorder among these family types?

The objectives of this study are to provide much needed epidemiological evidence on the extent to which the prevalence of child and youth mental disorders and perceived need for professional help in Ontario changed between 1983 and 2014, and whether these changes vary as a function of age and sex, urban-rural residency, household poverty, lone-parent status, and immigrant background.

Methods

Data

The 2014 OCHS is a stratified, random cluster sample of 10,802 children and youth aged 4 to 17 nested in 6,537 families and 484 neighbourhoods. The original 1983 OCHS enlisted 3,294 children and youth aged 4 to 16 and 1,869 families using a similar survey design. The response rate in the 1983 OCHS was 91%; and in the 2014 OCHS, 50.8%. Identical measurement was used in 1983 and 2014 for all concepts and scales in this study. Additional details on the methodologies used in the 1983[18] and 2014[19] OCHS are available elsewhere. The analyses are restricted to 4 to 16 year olds in 1983 (*n*=2,836) and 2014 (*n*=5,785) with assessments from parents and teachers (age 4 to 11) and parents and youth (age 12 to 16). Teacher response was much higher in 1983 (81.7%) than in 2014 (42.0%). Approximately 8.6% of children and youth in 1983 were missing information on at least one variable of interest in this study compared with 9.2% in 2014. Children and youth with missing data were more likely to live in a lone-parent family (20.1% vs. 15.0%), meet criteria for conduct disorder (6.2% vs. 4.4%) and emotional disorder (14.2% vs. 10.9%), and to perceive needing professional help for a mental disorder (19.9% vs. 12.9%). Missing data was addressed by age group separately in 1983 and 2014 using multivariate, multiple imputation by chained equations (MICE) in STATA.[20] Imputation models included all variables in the present study, sampling design variables, and auxiliary variables associated with missed responses. A total of 10 datasets were imputed and results were combined using Rubin's rules.[20,21] Results based on the imputed datasets did not differ from those based on a complete case analysis.

Concepts and Measures

MENTAL DISORDER

In both 1983 and 2014, identical checklist items were administered to the child or youth's parent (age 4 to 16) and teacher (age 4 to 11), and to youth (age 12 to 16) to classify conduct disorder (15 items), hyperactivity (6 items), and emotional disorder (depression and anxiety, 13 items) based on DSM-III criteria. The items were rated as (0) "never or not true", (1) "sometimes or somewhat true", and (2) "often or very true" over the last 6 months. They were summed to create individual scale scores and converted to binary classifications of disorder within age

groups for each informant at thresholds which maximized their joint agreement with child psychiatrist diagnoses. Disorders were classified as present if parent and/or teacher ratings were above threshold (age 4 to 11), and if parent and/or youth assessments were above threshold (age 12 to 16). The development and evaluation of our approach to classification are described in detail elsewhere.[9,18,22]

A multiple group confirmatory factor analysis[23] tested for measurement invariance of the 1983 OCHS scales between 1983 and 2014. Within informants over time, this testing involves a stepwise sequence of constraints to demonstrate that 1) items are associated with their hypothesized scales (configural invariance); 2) the strength and pattern of associations between items and their hypothesized scales are similar (metric invariance); and 3) there is no evidence of response bias—the tendency to respond positively or negatively, irrespective of item content (scalar invariance).[24] Comparing model fit at each step, all scales met the standard guidelines for testing measurement invariance except hyperactivity assessed by youth. Accordingly, with the exception of youth assessed hyperactivity, any changes in the prevalence of mental disorder assessed using the OCHS scales are not artifacts of changes in the interpretation of items or structure of the mental health constructs over time. Additional details and the results of our invariance testing appear in the Appendix.

PERCEIVED NEED FOR PROFESSIONAL HELP

Parents, teachers, and youth were asked whether they thought the child or youth had emotional-behavioural problems over the last 6 months and, if so, whether they thought professional help was needed for these problems. A 'yes' response to both questions identified children and youth with a perceived need for professional help. The same rule used to combine informant responses in classifying mental disorder was applied here.

SOCIO-DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS

Urban-rural residency consists of 3 categories based on population size and density: rural (<1,000 or <400 per square kilometer), small-medium urban (1,000-99,999), and large urban (100,000+).[25] Household poverty was classified using Statistics Canada's Low-Income Measure (LIM).[26] Adjusting for family size, this designation was applied if the total before-tax household income reported by the parent fell below the LIM (0 = income above LIM; 1 = income equal to or below LIM). A lone-parent family is one headed by a lone adult and an immigrant family is one in which one or both parents were born outside of Canada.

Statistical Analysis

Changes in the prevalence of child and youth mental disorders and perceived need for professional help were based on cross-tabulations by survey year. Changes in prevalence as a function of age and sex were tested using binary logistic regression models that included interaction terms between study year and age or sex. A significant interaction term indicated that changes in prevalence by age or sex were statistically significant. The extent to which changes in prevalence varied by urban-rural residency, lone-parent status, household poverty, and immigrant background were tested by estimating separate odds ratios (OR) in 1983 and 2014 then comparing them for statistically significant differences. To account for the OCHS complex survey design which includes the clustering of children and youth in families and neighborhoods, the test statistics for changes in prevalence between 1983 and 2014 and across groups were computed in STATA[27] using the second-order Rao-Scott correction to chi-squared tests (design based F statistic)[28] to produce accurate test statistics and associated P values. The false discovery rate method was employed to account for multiple comparisons.[29] The 1983 and 2014 data were weighted using their respective sampling weights provided by Statistics Canada to account for the probability of participation in each survey year.

Results

Table 1 presents characteristics of 1983 and 2014 OCHS participants and corresponding population estimates from the 1981 and 2011 census files. Both the 1983 and 2014 OCHS samples are representative of the Ontario population in the closest census years available; all differences are less than 5%. Two notable changes between census years were observed. First, there was an increase in lone-parent families from 12.2% to 22.8%. Second, while the percentage of families living in rural (21.2% to 13.7%) and small-medium urban areas (21.7% to 16.6%) decreased, it increased in large urban areas (57.1% to 69.7%).

Table 2 presents changes in the prevalence of mental disorders and perceived need for professional help between 1983 and 2014. Among 4 to 16 year olds, change in the prevalence of one or more disorders was not statistically significant. In contrast, there was a large increase in perceived need for professional help (6.8% to 18.9%) similar in magnitude for males and females.

The prevalence of one or more disorders increased among 4 to 11 year olds (15.4% to 19.6%)—a difference attributable to males (17.3% to 24.2%) and arising from proportionately greater increases in hyperactivity (8.9% to 15.7%).

Among 12 to 16 year olds, there were no changes in the overall prevalence of one or more disorders or hyperactivity. Emotional disorder increased from 9.2% to 13.2% and conduct disorder decreased from 7.2% to 2.5%. The reduction in conduct disorder is greater for males aged 12 to 16 (10.3% to 3.1%) compared to males or females aged 4 to 11.

Table 3 presents changes in the prevalence of one or more disorders and perceived need for professional help as a function of urban-rural residency, lone-parent status, household poverty, and immigrant background. The prevalence of any disorder and perceived need for professional help increased more in rural (any disorder: $F(1,5491) = 5.60$; $P \leq 0.05$; perceived need: $F(1,4877) = 43.36$; $P \leq 0.05$) and small-medium urban areas (any disorder: $F(1,5618) = 4.05$; $P \leq 0.05$; perceived need: $F(1,5625) = 40.27$; $P \leq 0.05$) compared to large urban areas. Relative increases in the prevalence of perceived need for professional help were lower among children in 2-parent families compared to their counterparts in lone-parent families ($F(1, 5423) = 7.77$; $P \leq 0.05$). There were no changes in the prevalence of any disorder as a function of household poverty, but relative increases in perceived need for professional help were lower in poor versus non-poor children ($F(1, 5472) = 10.99$; $P \leq 0.05$). In addition, the prevalence of any disorder decreased among children living in immigrant families but not non-immigrant families ($F(1, 5005) = 4.01$; $P \leq 0.05$) and relative increases in perceived need for professional help were lower among children in immigrant versus non-immigrant families ($F(1, 5376) = 11.91$; $P \leq 0.05$).

Discussion

This study provides evidence about changes in the prevalence of mental disorders and perceived need for professional help among Ontario children and youth over a 30-year period. The overall prevalence of mental disorders among 4 to 16 year olds did not change between 1983 and 2014, which is consistent with previous Canadian studies examining changes in child mental disorder of limited duration[5] and among older youth.[7,8]

The lack of change overall obscures age-specific changes in the prevalence of mental disorders. For example, we observe increases in the prevalence of any disorder among 4 to 11 year olds attributable to increases in hyperactivity among males. This finding contrasts with

previous reports that hyperactivity has remained stable[2] or decreased.[30] Notably, our classification of hyperactivity was based exclusively on symptom levels, unlike the study by Sawyer et al.[30] which also required impairment. Additional research is needed to better understand changes in the prevalence of hyperactivity in Ontario children when impairment is added to symptom scores. In contrast, we observe no changes in the prevalence of hyperactivity among 12 to 16 year olds. This finding should be interpreted with caution given the lack of measurement equivalence over time for youth assessed hyperactivity.

Among 12 to 16 year olds, we observed increases in the prevalence of emotional disorder consistent with previous research.[2,8] Whereas some studies report greater increases in emotional disorder among females versus males,[2,30,31] we did not observe any sex differences. Changes in the prevalence of emotional disorder among youth in Ontario occurred during a period when: socio-economic inequalities,[32] lone-parent families,[13,32] social media use,[8] expectations related to body image[8] and academic performance,[33] and perceived uncertainties among youth about future occupational prospects were increasing.[34] Given their salience to youth, how these multifaceted phenomena contribute to emotional disorders warrants further study.

In contrast to emotional disorder, the prevalence of conduct disorder decreased substantially among 12 to 16 year olds, particularly in males. In a number of high-income countries, there is evidence that conduct disorder peaked in the early 1990s and then decreased,[2] a trend that was also observed in Ontario among students in grades 7 to 12.[8] Over the past 50 years, large public investments were made in research on violence prevention programs. Many of these programs focused on at-risk children in the early years and successfully reduced serious behavioural problems, including criminal activity, arrests, and incarcerations.[35] Along with these prevention programs were large investments in the youth justice system and community programs for disadvantaged youth (e.g. Ontario's Youth Action Plan[36]), all of which may have contributed to the decrease in the prevalence of conduct disorder we observe.

We also observed large increases in perceived need for professional help for mental disorders. Evidence from our companion paper indicates that, at the service area level, the alignment between expenditures on child and youth mental health and perceived need for professional help is closer than the alignment between expenditures and the presence of disorder.[37] In this study, perceived need for professional help was assessed among children and youth independently of their mental health status or service contacts. Accordingly, we are unable to determine if this increase represents better mental health literacy, a greater willingness to disclose and seek help for mental health concerns, or more children and youth with mental disorders who are not in contact with mental health services. The growing prominence of anti-stigma and mental health awareness campaigns over the last 3 decades may have increased the likelihood that parents, teachers, and youth will recognize mental health symptoms and seek help for them. The extent to which this awareness has translated into the identification and use of mental health services is difficult to estimate. Our companion paper[1] reports that only 26% of children and 34% of youth with mental disorders had contact with a mental health provider.

Whereas our findings suggest that changes in the prevalence of any disorder did not vary as a function of poverty or lone-parent status, relative increases in perceived need for professional help were lower in poor versus non-poor children and youth and in 2-parent versus lone-parent families. This finding may suggest that the gradient in mental disorder associated with poverty and lone-parent status has decreased between 1983 and 2014 in Ontario. However, additional research is needed to better understand if classifications of mental disorder versus perceived need for professional help operate differently across the socioeconomic spectrum and

in different family contexts, or whether increases in perceived need for professional help is a phenomenon more likely in higher-income and 2-parent families. Given that perceived need for professional help was assessed independently of mental health status and service contacts, we are unable to determine whether this finding indicates that children and youth in poor or lone-parent families are less likely to identify mental disorders requiring professional help or have contacts with mental health service providers now compared to 30 years ago. Our companion paper[1] reports that mental health related service contacts were more likely among children in lone-parent versus 2-parent families, but they did not differ across poor versus non-poor families. How socioeconomic status and family context is associated with mental health service contacts now compared to 30 years ago warrants further research.

The 1983 and 2014 OCHS survey designs included stratification by urban-rural residency, enhancing our ability to examine changes in prevalence associated with this variable. We find a reversal in the distribution of disorder associated with residency: whereas the prevalence of disorder and perceived need for professional help was highest in large urban areas in 1983,[9] it is now more elevated in rural and small-medium urban areas compared to large urban areas. Our companion paper also observes higher prevalence of mental disorders in small-medium urban areas compared to large urban areas.[1] Additional research is needed to better understand family and community-related conditions in rural and small-medium urban areas and how they may have changed over time to influence child and youth mental health in these settings.

The prevalence of any disorder and perceived need for professional help was much lower for immigrant versus non-immigrant children and youth in 2014 compared to 1983. Our companion paper also reported lower prevalence of mental disorder in immigrant children and youth using the Mini International Neuropsychiatric Interview for Children and Adolescents.[1,38] The mental health advantage of immigrant children and youth in Canada may be due to immigrant selection policies, which result in healthier and better educated immigrant populations.[39] Importantly, previous research suggests that the relatively better health of immigrant versus non-immigrant populations decreases in relation to length of residence in Canada,[40] highlighting the need for longitudinal studies that follow immigrant children and youth over time to better understand if their mental health advantages persist into adulthood.

Limitations

Potential bias associated with the low response rate in 2014 is a concern which we trust has been addressed by the use of Statistics Canada's sample weights that include sample selection variables associated with non-response. Although changes in informant response patterns using behaviour checklists can account for changes in the prevalence of child and youth mental disorders,[2] we establish scalar invariance with the OCHS scales for all disorders except youth assessed hyperactivity, suggesting that the changes we observe are not attributable to response bias over time.

Conclusion

Although there have been decreases in the prevalence of conduct disorder, increases in other mental disorders and perceived need for professional help, particularly among children and youth in non-immigrant families and in rural and small to medium sized urban areas, underscore the continued need for effective and efficient prevention and intervention programs.

Data Access. Data access available through Statistics Canada Research Data Centres.

References

1. Georgiades K, Duncan L, Wang L, et al. Six-month prevalence of mental disorders and service contacts among children and youth in Ontario: Evidence from the 2014 Ontario Child Health Study. Can J Psychiatry. Forthcoming.

2. Collishaw S. Annual research review: Secular trends in child and adolescent mental health. J Child Psychol Psychiatry. 2015;56(3):370–393.

3. Bradshaw J. Taxonomy of social need. In: McLachlan G, editor. Problems and progress in medical care: Essays on current research. 7th series. London (UK): Oxford University Press; 1972. p. 71–82.

4. Gulliver A, Griffiths KM, Christensen H. Perceived barriers and facilitators to mental health help-seeking in young people: A systematic review. BMC psychiatry. 2010;10(1):113.

5. Boyle MH, Georgiades K. Perspectives on child psychiatric disorder in Canada. In: Cairney J, Streiner D, editors. Mental disorder in Canada: An epidemiological perspective. Toronto (ON): University of Toronto Press; 2010. p. 205–226.

6. Brault MC & Lacourse É. Prevalence of prescribed attention-deficit hyperactivity disorder medications and diagnosis among Canadian preschoolers and school-age children: 1994–2007. Can J Psychiatry. 2012;57(2):93–101.

7. McMartin SE, Kingsbury M, Dykxhoorn J, et al. Time trends in symptoms of mental illness in children and adolescents in Canada. CMAJ. 2014;186(18):E672–E678.

8. Boak A, Hamilton HA, Adlaf EM, et al. The mental health and well-being of Ontario students, 1991-2017: Detailed findings from the Ontario Student Drug Use and Health Survey (OSDUHS). Toronto (ON): Centre for Addiction and Mental Health; 2018. Research Document Series No. 47.

9. Offord DR, Boyle MH, Szatmari P, et al. Ontario Child Health Study: II. Six-month prevalence of disorder and rates of service utilization. Arch Gen Psychiatry, 1987;44(9):832–836.

10. Lipman EL, Offord DR, Boyle MH. What if we could eliminate child poverty? Soc Psychiatry Psychiatr Epidemiol. 1996;31(5):303–307.

11. Offord DR, Boyle MH, Fleming JE, et al. Ontario Child Health Study. Summary of selected results. Can J Psychiatry. 1989;34(6):483–491.

12. Munroe-Blum H, Boyle MH, Offord DR, et al. Immigrant children: Psychiatric disorder, school performance, and service utilization. Am J Orthopsychiatry. 1989;59(4): 510–519.

13. Statistics Canada. Census, 1981 Individuals File. Ottawa, (ON): Statistics Canada.

14. Statistics Canada. National Household Survey (NHS), 2011 Individuals File. Ottawa, (ON): Statistics Canada; 2014.

15. Lipman EL, Boyle MH, Dooley MD, et al. Child well-being in single-mother families. J Am Acad Child Adolesc Psychiatry. 2002;41(1):75–82.

16. Beiser M, Hou F, Hyman I, et al. Poverty, family process, and the mental health of immigrant children in Canada. Am J Public Health. 2002;92(2):220–227.

17. Georgiades K, Boyle MH, Duku E. Contextual influences on children's mental health and school performance: The moderating effects of family immigrant status. Child Dev. 2007;78(5): 1572–1591.

18. Boyle MH, Offord DR, Hofmann HF, et al. Ontario Child Health Study: I. Methodology. Arch Gen Psychiatry. 1987;44(9):826–831.

19. Boyle MH, Georgiades K, Duncan L, et al. The 2014 Ontario Child Health Study— Methodology. Can J Psychiatry. Forthcoming.

20. StataCorp. Stata: Release 13. Statistical Software. College Station (TX): StataCorp LP; 2013.

21. Rubin DB. Multiple Imputation for Nonresponse in Surveys. New York(NY): Wiley; 1987.
22. Boyle MH, Offord DR, Racine Y, et al. Evaluation of the revised Ontario Child Health Study scales. J Child Psychol Psychiatry. 1993;34(2):189–213.
23. Brown TA. Confirmatory factor analysis for applied research. In: Kenny DA, editor. Methodology in the social sciences. New York (NY): Guilford Press; 2012.
24. Van de Schoot R, Lugtig P, Hox J. A checklist for testing measurement invariance. EJDP. 2012;9(4):486–492.
25. Statistics Canada. Geographic Attribute File, Reference Guide, Census year 2011. Ottawa (ON): Statistics Canada; 2012. Statistics Canada catalogue no. 92-151-G.
26. Statistics Canada. Low Income Line, 2013-2014. Income Research Paper Series. Ottawa (ON): Statistics Canada; 2015. Statistics Canada catalogue no. 75F0002M–No. 001.
27. STATA 15.0 StataCorp. Stata Statistical Software: Release 14. College Station (TX): StataCorp LP; 2018.
28. Rao JNK, Scott AJ. On simple adjustments to chi-square tests with sample survey data. Ann Stat. 1987;15(1):385–397.
29. Benjamini Y, Hochberg Y. Controlling the false discovery rate: A practical and powerful approach to multiple testing. J R Stat Soc Series B Stat Methodol. 1995;57(1):289–300.
30. Sawyer MG, Reece CE, Sawyer ACP, et al. Has the prevalence of child and adolescent mental disorders in Australia changed between 1998 and 2013-14? J Am Acad Child Adolesc Psychiatry. 2018;57(5):343–350.
31. Bor W, Dean AJ, Najman J, et al. Are child and adolescent mental health problems increasing in the 21st century? A systematic review. ANZJP. 2014;48(7):606–616.
32. Uppal S, LaRochell-Côté S. Changes in wealth across the income distribution, 1999 to 2012. Insights on Canadian Society. Ottawa (ON): Statistics Canada; 2015. Statistics Canada catalogue no. 75-006-X. 2015.
33. Twenge JM. Generational differences in mental health: Are children and adolescents suffering more, or less? Am J Orthopsychiatry. 2011;81(4):469.
34. Lechner CM, Tomasik MJ, Silbereisen RK. Preparing for uncertain careers: How youth deal with growing occupational uncertainties before the education-to-work transition. J Voc Behav. 2016;95:90–101.
35. Waddell C, Schwartz C, Andres C, et al. Fifty years of preventing and treating childhood behaviour disorders: A systematic review to inform policy and practice. Evid Based Ment Health. 2018;21(2):45–52.
36. Hoskins E, Meilleur M. Ontario's Youth Action Plan. Toronto (ON): Ministries of Child and Youth Services & Community, Safety, and Correctional Services; 2012. http://www.children.gov.on.ca/htdocs/English/documents/youthandthelaw/youthactionplan/yap.pdf. (accessed 2018 Aug 15).
37. Duncan L, Georgiades K, Wang L, et al. The 2014 Ontario Child Health Study Emotional Behavioural Scales (OCHS-EBS) Part I: A checklist for dimensional measurement of selected DSM-5 disorders. Can J Psychiatry. 2018; https://doi.org/10.1177/0706743718808250
38. Sheehan DV, Sheehan KH, Shytle RD, et al. Reliability and validity of the Mini International Neuropsychiatric Interview for Children and Adolescents (MINI-KID). J Clin Psychiatry. 2010;71(3):313–326.

39. Knowles V. Strangers at our gates: Canadian immigration and immigration policy, 1540–2015. Toronto (ON): Dundurn Press; 2016.

40. Vang Z, Sigouin J, Flenon A, et al. The healthy immigrant effect in Canada: A systematic review. In: McQuillan K, Ravanera Z, editors. Population change and lifecourse strategic knowledge cluster, 3(1) Discussion Paper Series: 4; 2015. https://ir.lib.uwo.ca/pclc/vol3/iss1/4/ (accessed 2018 Aug 15).

Table 1. Socio-Demographic and Economic Characteristics of 1983 and 2014 OCHS Samples

| | % | | | |
Characteristics	1983 OCHS [95% CI] $n = 2,836$	1981 Census	2014 OCHS [95% CI] $n = 5,785$	2011 Census
Age				
4 to 11	59.0 [56.8-61.2]	58.7	54.3 [51.7-56.9]	58.9
12 to 16	41.0 [38.8-43.2]	41.3	45.7 [43.1-48.3]	41.1
Sex				
Male	51.6 [49.5-53.6]	51.3	51.4 [48.9-53.8]	51.5
Female	48.4 [46.4-50.5]	48.7	48.7 [46.2-51.1]	48.5
Poverty				
Yes	17.5 [15.2-19.8]	17.0	19.1 [17.1-21.1]	19.8
No	82.5 [80.2-84.8]	83.0	80.9 [78.9-82.9]	80.2
Lone-Parent				
Yes	10.5 [8.78-12.2]	12.2	20.2 [17.9-22.5]	22.8
No	89.5 [87.8-91.2]	87.8	79.8 [77.5-82.1]	77.2
Immigrant Background				
Immigrant	40.7 [37.7-43.6]	41.6	40.2 [37.2-43.2]	42.9
Non-immigrant	59.4 [56.4-62.3]	58.4	59.8 [56.8-62.8]	58.1
Urban-rural residency				
Rural	19.8 [17.4-22.1]	21.2	13.4 [11.5-15.4]	13.7
Small-medium urban	22.0 [19.7-24.3]	21.7	19.0 [16.1-22.0]	16.6
Large urban	58.3 [55.4-61.1]	57.1	67.5 [64.4-70.6]	69.7

CI=Confidence Interval

Table 2. Changes in the Prevalence of Mental Disorder and Perceived Need for Professional Help by Age and Sex, 1983 and 2014

	Total $n = 8,621$		Males $n = 4,347$		Females $n = 4,274$	
	1983	2014	1983	2014	1983	2014
Age 4 to 16						
Any disorder	15.99	18.39	17.05	19.87	14.90	16.86
Needs help	**6.76**	**18.92**	**8.43**	**20.19**	**5.04**	**17.61**
Age 4 to 11						
Disorder						
Conduct disorder	3.91	4.70[a]	6.24	7.19[c]	1.54	2.17[e]
Hyperactivity	**6.11**	**10.78**	**8.92**	**15.72**	3.28	5.75
Emotional disorder	9.97	11.93	9.12	12.01	10.84	11.85
One or more disorders	**15.37**	**19.57**	**17.28**	**24.17[i]**	13.45	14.90
Perceptions						
Needs help	**6.83**	**21.99**	**9.36**	**26.10**	**4.27**	**17.81[g]**
Age 12 to 16						
Disorder						
Conduct disorder	**7.18**	**2.52[b]**	**10.26**	**3.08[d,f]**	4.02	1.92
Hyperactivity	5.22	6.26	7.06	8.56	3.33	3.85
Emotional disorder	**9.23**	**13.17**	**4.70**	**8.59**	13.88	18.00
One or more disorders	16.68	16.79	16.52	14.44[j]	16.85	19.27
Perceptions						
Needs help	**6.00**	**15.05**	**5.87**	**12.90[h]**	6.14	17.31

Note: Age 4 to 11 based on parent and teacher reports. Age 12 to 16 based on parent and youth reports. Bold typeface denotes differences in prevalence between 1983 and 2014 at nominal *P* values <0.05. All associations are robust to False Discovery Rate correction. Prevalence estimates with different subscripts within disorders differ significantly at *P* <0.05.
[a,b] Total change in conduct disorder is greater for 12 to 16 year olds compared 4 to 11 year olds.
[c,d] Change in conduct disorder is greater for males aged 12 to 16 compared to males aged 4 to 11.
[e,f] Change in conduct disorder is greater for males aged 12 to 16 compared to females aged 4 to 11.
[g,h] Change in needs help is greater for females aged 4 to 11 compared to males aged 12 to 16.
[i,j] Change in one or more disorders is greater for males aged 4 to 11 compared to males aged 12 to 16.

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Table 3 Changes in the Prevalence of Any Disorder and Perceived Need for Professional Help by Urban-Rural Residency, Lone-Parent Status, Poverty, and Immigrant Background, 1983 and 2014

	Any Disorder			Perceived Need for Professional Help		
	1983	2014	*F* statistic (*P* value)	1983	2014	*F* statistic (*P* value)
Urban-Rural Residency, %						
Rural	12.1	18.5		3.9	18.1	
Small-medium urban	14.4	20.0		5.6	25.2	
Large urban	18.0	17.9		8.3	17.3	
OR [95% CI]						
Rural	0.63** [0.46-0.86]	1.03 [0.74-1.45]	5.60 (0.018)	0.44*** [0.27-0.71]	1.06 [0.76-1.48]	43.36 (<0.001)
Small-medium urban	0.76 [0.57-1.02]	1.16 [0.82-1.63]	4.05 (0.044)	0.65 [0.40-1.04]	1.67** [1.11-2.50]	40.27 (<0.001)
Lone-Parent, %						
Yes	22.8	23.8		15.9	26.4	
No	15.2	16.8		5.8	16.8	
OR [95% CI]	1.70*** [1.22-2.37]	1.55***[1.17-2.07]	0.02 (0.897)	3.02*** [1.90-4.80]	1.75*** [1.32-2.32]	7.77 (0.005)
Poverty, %						
Yes	23.1	21.9		13.1	23.7	
No	14.5	17.5		5.5	17.8	
OR [95% CI]	1.74*** [1.28-2.37]	1.33** [1.03-1.71]	0.10 (0.749)	2.51*** [1.61-3.91]	1.41** [1.08-1.85]	10.99 (0.001)
Immigrant Background, %						
Immigrant	15.2	11.7		5.6	11.1	
Non-immigrant	16.4	22.8		7.6	24.1	
OR [95% CI]	0.91 [0.71-1.17]	0.45*** [0.34-0.59]	4.01 (0.045)	0.72 [0.48-1.10]	0.39*** [0.29-0.52]	11.91 (0.001)

Note: The odds ratios represent the association between each socio-demographic characteristic and any disorder or perceived need for professional help separately in 1983 and 2014. The odds ratios are compared for significant differences using a Wald chi-square test.
CI=confidence interval, df = degrees of freedom, OR = odds ratio
*P <0.05; **P <0.01; ***P <0.001

Appendix

To ensure that the OCHS checklist items are interpreted the same way and that the underlying mental health constructs derived from these items are the same over time, a multiple group confirmatory factor analysis was used to test for measurement invariance of the conduct disorder, hyperactivity, and emotional disorder scales assessed by parents, teachers, and youth between 1983 and 2014.[1] We followed established guidelines for testing measurement invariance, which involved comparing model fit (e.g. chi-square [χ^2]; Root Mean Square Error of Approximation [RMSEA]; Comparative Fit Index [CFI]; Standardized Root Mean Square Residual [SRMR]) before and after imposing increasingly more stringent equality constraints between the 1983 and 2014 groups.[2] Specifically, configural invariance tests whether the factor loadings of the items are similar between groups. It suggests that the same number of factors or constructs is present in both groups and serves as the reference for subsequent tests with additional constraints. Metric invariance tests whether the magnitude of the factor loadings is similar between groups, whereas scalar invariance tests whether the magnitude of the factor loadings and intercepts are similar between groups. Finally, full measurement invariance is achieved when the aforementioned parameters and the residual variances of the items are constrained to be equal between groups. Previous research indicates that scalar invariance is a prerequisite for comparing summated scores or observed means between groups, with non-equivalence in item intercepts having large effects on the validity of group comparisons but non-equivalent residual variances having negligible effects.[3] We do not test for equality in the residual variances of the items across groups because it is difficult to achieve in practice and has minimal clinical relevance.

We begin by selecting a random sample of 2014 OCHS participants that is similar in size to our 1983 sample because chi-square difference tests are sensitive to imbalances in sample size (Parents: 1983 = 3,253, 2014 = 3,377; Teachers: 1983 = 2,493, 2014 = 1,059; Youth: 1983 = 1,265, 2014 = 1,273). Two criteria are required to establish measurement invariance. First, model fit in the models testing configural, metric, and scalar invariance must meet established criteria for adequate model fit[4] (χ^2 goodness-of-fit P >0.05; RMSEA <0.8 acceptable, RMSEA <0.6 excellent; CFI >0.9 acceptable, CFI >0.95 excellent; SRMR <0.08 acceptable, SRMR <0.05 excellent). Second, change in model fit from less to more constrained models must not exceed established criteria for statistical or practical significance[5] ($\Delta\chi^2$ P >0.05; ΔRMSEA $\geq$0.015; ΔCFI $\leq$-0.01; ΔSRMR $\geq$0.03 for loading invariance and $\geq$0.01 for intercept invariance). At least 2 of the following had to meet established criteria to support measurement invariance: chi-square, CFI, RMSEA, or SRMR.

Results from models testing configural, metric, and scalar invariance are presented in Table A1. All scales met the standard guidelines for testing measurement invariance except one—hyperactivity assessed by youth ($\Delta \chi^2$ = 336.74; df = 5; P <0.001; ΔRMSEA = 0.064; ΔCFI = -0.26; ΔSRMR = 0.06).

References

1. Brown TA. Confirmatory factor analysis for applied research. In: Kenny DA, editor. Methodology in the social sciences. New York (NY): Guilford Press; 2012.
2. Van de Schoot R, Lugtig P, Hox J. A checklist for testing measurement invariance. EJDP. 2012;9(4):486–492.
3. Steinmetz H. Analyzing observed composite differences across groups: Is partial measurement invariance enough? Methodology (Gott). 2013;9(1):1.
4. Hu LT, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Struct Equ Modeling. 1999;6(1):1–55
5. Chen FF. Sensitivity of goodness of fit indexes to lack of measurement invariance. Struct Equ Modeling. 2007;14(3):464–504.

Table A1. Confirmatory factor analysis testing measurement equivalence of the conduct disorder, hyperactivity, and emotional disorder scales assessed by parents, teachers, and youth between 1983 and 2014

	Scale	Δχ2	df	*P* value	ΔRMSEA	ΔCFI	ΔSRMR
Parent report							
Configural vs. Metric	Conduct Disorder	25.430	12	0.020	0	-0.005	0.010
	Hyperactivity	17.016	5	0.005	-0.003	-0.005	0.005
	Emotional Disorder	51.233	12	<0.001	0.001	-0.007	0.016
Metric vs. Scalar	Conduct Disorder	83.401	14	<0.001	0.002	-0.029	-0.001
	Hyperactivity	93.557	3	<0.001	0.005	-0.028	0.009
	Emotional Disorder	272.071	36	<0.001	0.007	-0.039	0.008
Teacher report							
Configural vs. Metric	Conduct Disorder	20.008	10	0.029	-0.003	0.002	0.012
	Hyperactivity	1.508	5	0.912	-0.010	0.001	0.001
	Emotional Disorder	11.592	9	0.237	-0.005	0.004	0.008
Metric vs. Scalar	Conduct Disorder	45.681	10	<0.001	0.002	-0.012	0.002
	Hyperactivity	11.872	5	<0.001	-0.005	-0.002	0.001
	Emotional Disorder	32.828	9	<0.001	-0.001	-0.008	0.003
Youth report							
Configural vs. Metric	Conduct Disorder	20.078	14	0.128	-0.001	-0.002	0.009
	Hyperactivity	22.475	5	0.001	0.004	-0.013	0.015
	Emotional Disorder	27.400	12	0.007	-0.002	-0.004	0.006
Metric vs. Scalar	Conduct Disorder	73.232	14	<0.001	0.004	-0.037	0
	Hyperactivity	336.74	5	<0.001	0.064	-0.260	0.059
	Emotional Disorder	183.699	12	<0.001	0.008	-0.045	0.015

Note. χ2=chi-square, df=degrees of freedom, CFI=Comparative Fit Index, RMSEA=Root Mean Square Error of Approximation, SRMR=Standardized Root Mean Square Residual