



Original article

Social, Demographic, and Health Outcomes in the 10 Years Following Adolescent Depression

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A B S T R A C T

Purpose: Little attention has been paid to the sociodemographic profiles of depressed youth during the vulnerable transition from adolescence to early adulthood. This study aimed to determine and describe the social, demographic, and health outcomes of adolescent depression during a 10-year period of transition into early adulthood, using a population-based cohort of Canadian teenagers.

Methods: Depression status on 1,027 adolescents aged 16–17 years was ascertained from the National Population Health Survey. Social and health outcomes (i.e., employment status, marital status, personal income, education, social support, self-perceived stress, heavy drinking, smoking, migraine headaches, adult depression, antidepressant use, self-rated health, and physical activity) were measured every 2 years until the ages of 26–27 years. Logistic regression was combined with a generalized linear mixed-model approach to determine the odds of health and social outcomes in depressed versus nondepressed adolescents.

Results: Proximal effects of adolescent depression were observed (at ages 18–19) on all outcomes with the exception of physical activity. Significant effects that persisted after 10 years included depression recurrence, higher severity of symptoms, migraine headaches, poor self-rated health, and low levels of social support. Adolescent depression did not appear to significantly affect employment status, personal income, marital status, or educational attainment.

Conclusions: The transition from adolescence to adulthood is a particularly vulnerable period due to educational, employment, and social changes that may be occurring. The results of this study indicate that the onset of depression during adolescence may be indicative of problems of adaptation that persist at least a decade into early adulthood.

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IMPLICATIONS AND
CONTRIBUTION

Adolescent depression may predict specific long-term difficulties during an individual's transition into adulthood. Using repeated measures over 10 years and a large, population-based cohort, this study is among the first to document early adulthood consequences (i.e., heavy drinking, migraine headaches, smoking, high stress, and low social support) of adolescent depression.

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Depression is a highly prevalent disorder estimated to affect 8%–20% of adolescents globally before the age of 18 [1–3]. Affective problems during the adolescent years have long been implicated in adverse behavioral and health outcomes, including academic difficulties, suicidal behavior, social impairment, and substance abuse [4–6]. While the social and economic impact of

adult depression is well-documented (costing over \$14 billion annually in Canada alone [7]), little research has attempted to adequately document the consequences of the earlier onset forms of this disorder and their accrual throughout the life course.

A small, but growing number of longitudinal studies have endeavored to determine the effects of child and adolescent depression on future mental health by following a range of clinical [8,9] and population-based [10,11] cohorts through to adulthood. These studies highlight a strong continuity between adolescent depression and the onset of adult disorders such as major depression, anxiety disorder, and alcohol abuse or dependence. Combined with the increasing rates of adolescent depression in developed countries [12], these findings indicate a sizeable and growing contribution of adolescent depression towards psychiatric morbidity in the general adult population [13]. However, as the future psychiatric profiles of these youth are growing ever clearer, a paucity of research still exists that examines the broader long-term social, demographic, and health consequences of adolescent depression.

During the transitional period of emerging adulthood, a host of individual life changes are occurring in financial, residential, romantic, and family formation domains [14]. Young adults are often subjected to a series of upheavals, which may be particularly difficult to manage for affectively disordered youth. Although traditionally conceptualized as exposures rather than outcomes, many of the identified social and health risk factors implicated in the development of depression (e.g., work stress, educational attainment, alcohol abuse) may in turn be mediated by the presence of the disease itself. Evidence exists for the negative impact of adolescent depression on future social functioning [15,16], employment [17], and educational attainment [18]. Research on the long-term physical health consequences of early depression has, however, yielded mixed results. One 6-year follow-up study of adolescent girls found depression to be predictive of more chronic illness in adulthood, but not of self-rated health [15]. In contrast, a similar-length prospective study of over 700 adolescents reported adolescent depression to be associated with poorer self-rated and interviewer-rated health [19]. Other correlates of depression have received growing attention for their bidirectional relationships in adult populations (i.e., cigarette smoking [20], migraine headaches [21] and alcohol abuse [22]), but remain understudied in this capacity in younger age groups.

This study aimed to determine and describe the sociodemographic and health outcomes of adolescent depression every 2 years throughout a 10-year period of transition to early adulthood, using a population-based cohort of Canadian youth.

Methods

Study sample

The National Population Health Survey (NPHS) is a prospective cohort study administered by Statistics Canada, consisting of a group of 17,276 Canadians aged 12 years or older who joined the study in 1994. Participants were randomly selected using a stratified two-stage design and comprise a representative sample of the general Canadian population. Detailed information on health, behavior, and a variety of other factors has been collected in the NPHS every 2 years, with the most recent available data collected in 2008/2009 (Cycle 8). The first cycle of

interview in 1994/1995 (Cycle 1) had a response rate of 83.6%, while the response rate in 2008/2009 (Cycle 8) was 84.9% of the original cohort [23]. The sample for this study included 1,027 individuals aged 12–17 years in 1994/1995 (Cycle 1). Of these, 997 were followed up at age 18/19, 916 were followed up at age 20/21, 832 were followed up at age 22/23, 730 were followed up at age 24/25, and 681 remained at 26/27. Depression status was ascertained when these participants turned 16–17 years (in Cycle 1 for 16–17 years, in Cycle 2 for those aged 14–15 years at baseline, and in Cycle 3 for those aged 12–13 years at baseline). The social and health outcomes described below were measured every 2 years until participants reached 26–27 years old (Cycle 6 to 8, depending on age at baseline).

Adolescent depression

Major depressive episodes are assessed in the NPHS using the Composite International Diagnostic Interview Short Form for Major Depression (CIDI-SFMD) [24]. The CIDI-SFMD inquires about symptoms of depression, as defined by the Diagnostic and Statistical Manual of Mental Disorders IV [25] during the preceding 12 months. Individuals who have five or more symptoms during a single 2-week period are considered to have a 90% probability of being depressed [26], corresponding to DSM-IV criteria for a major depressive episode [25]. All participants achieving a symptom score of 5 or higher on the CIDI-SFMD were classified as depressed for this study, with assessments occurring every 2 years from 16–17 to 26–27 years of age.

Demographic, health, and social outcomes

Individuals in the NPHS provide a detailed record of many demographic, physical health, and mental health factors. We investigated the following demographic outcomes: current employment status (job vs. no job), personal income (above vs. below \$20,000/year) and highest level of education achieved (completion of any postsecondary training/certification/degree vs. none completed).

Health and social outcomes included migraine headaches within the previous 12 months, as well as self-rated health status (poor/fair vs. good/very good/excellent) and physical activity level (inactive vs. moderate/active). In addition, we examined heavy drinking (defined as consumption of >16 drinks/wk for males and >11 drinks/wk for females), and/or consuming 5+ drinks in one sitting at a frequency greater than once a month [27]; self-reported smoking (at least once per day); antidepressant use (within the previous month); and psychological distress (measured by the Kessler K6 Psychological Distress Score) [28]. Marital status (married vs. unmarried) and perceived social support (a scale out of 4, which measures social support in four key functional domains, and is determined using the Medical Outcomes Study social support scale) [29] were also assessed, as was self-perceived stress (a scale out of 5, based on five “true/false” items in which a higher score indicates greater stress level).

Outcomes were measured every 2 years from ages 18–19 to ages 26–27, with the following exceptions: data on social support and personal stress were only available from 2000/2001 (Cycle 4) onwards. In addition, employment status; marital status; personal income; and highest level of education achieved were measured only at 26–27 years (measurements made prior to this were deemed to be premature given the age range).

Data analysis

We determined odds ratios for each health and social outcome in depressed adolescents compared with nondepressed adolescents using logistic regression models with health and social outcomes as the dependent variables. In the first stage of analysis, odds ratios were calculated separately for each age group. Following this, the Generalized Linear Mixed Model (GLMMIX) with logit link for binary outcomes was used to determine the odds ratio of experiencing each outcome over the entire 10-year period. Individuals were considered as random effects, and time was considered a fixed effect. The mixed model accommodates missing data (due to attrition or missed assessments) under the missing at random assumption. Each model was adjusted for sex and household income during adolescence.

The NPHS used a multi-stage sampling design with unequal selection probabilities. To account for the complex survey design, normalized sampling weights provided by Statistics Canada were included in the logistic regression and mixed models. The standard errors for all estimates were calculated using the bootstrap method [30]. All analyses were performed using STATA 10 (StataCorp LP, College Station, TX) and SAS 9.2 (PROC GLIMMIX) (SAS Institute Inc., Cary, NC).

Results

Our sample consisted of 1,027 16–17 year old adolescents, 71 (6.9%) of whom were depressed at baseline (a prevalence in the range of previous findings). Of our sample, 50.4% were female, 85.2% came from middle-to-high income homes, and 19% smoked on a daily basis at baseline. Migraine headaches were reported in 5.2% of the overall sample and 20.6% reported abusive levels of alcohol consumption. Among self-reports of health status, 3.3% rated their health as poor or fair, as opposed to good, very good, or excellent. Inactivity was reported in 38.8%, with 17.8% moderately active and 43.5% active. At baseline, depressed adolescents had a higher prevalence of daily smoking (49.8% vs. 16.7%), migraine headaches (9.8% vs. 4.9%), and poor self-rated health (21.4% vs. 1.9%) than their nondepressed counterparts (Table 1). Participants who were lost to follow-up by age 26/27 were similar overall in all baseline characteristics (Table 2), but displayed a higher

Table 1

Baseline social, demographic, and health characteristics of participants, by depression status

% Prevalence at 16–17 years			
	Depressed adolescents (n = 71)	Nondepressed adolescents (n = 956)	All (N = 1,027)
Sex (female)	70.3%	48.9%	50.4%
Household income (low adequacy)	12%	15%	14.8%
Antidepressant use	14.9%	.9%	1.9%
Daily smoking	49.8%	16.7%	19%
Heavy drinking	26.4%	20%	20.6%
Migraine headaches	9.8%	4.9%	5.2%
Physical activity level			
Active	47.2%	43.2%	43.5%
Moderate	20%	17.6%	17.8%
Inactive	32.8%	39.2%	38.8%
Self-rated health (poor)	21.4%	1.9%	3.3%
Race (Non-white)	8%	13.8%	13.4%

Table 2

Baseline social, demographic, and health characteristics of participants lost to follow-up by age 26/27 years, by depression status

% Prevalence at baseline (Subjects lost to follow-up by age 26/27)			
	Depressed adolescents (n = 32)	Nondepressed adolescents (n = 349)	All (N = 381)
Sex (female)	63.7%	44.7%	46.2%
Household income (low adequacy)	8.1%	18.9%	18.1%
Antidepressant use	15.3%	.2%	1.4%
Daily smoking	58%	19.6%	22.7%
Alcohol abuse	42.7%	23.5%	25.1%
Migraine headaches	13.8%	4%	4.8%
Physical activity level			
Active	21.6%	41%	39.4%
Moderate	24%	21.4%	21.6%
Inactive	54.4%	37.6%	39%
Self-rated health (poor)	26.5%	2.9%	4.7%
Race (Non-white)	19.5%	15.7%	16%

prevalence of adolescent depression (8.4%) than those who remained in the study. Initially depressed youth who were lost to follow-up displayed slightly higher prevalences of smoking (58.0%), heavy drinking (42.7%), migraine headaches (13.8%), physical inactivity (54.4%), and ethnic minority status (19.5%).

Of the outcomes measured at 18–19 years of age, all but physical activity were significantly associated with adolescent depression at age 16–17 years (Table 3). Depression, migraine headaches, antidepressant use and psychological distress were the outcomes across the age groups in early adulthood most consistently associated with adolescent depression (Table 3). Self-perceived stress and social support were both measured only from 2000/2001 onwards, and each showed selective significant associations in the remaining cycles. Employment status, marital status, personal income, and highest education level attained were ascertained once at age 26–27; none of these were significantly associated with depression during adolescence.

Results of the mixed model were very similar to those seen at 18–19 years. Depressed adolescents had 4.91 times the odds (95% CI: 3.10, 7.77) of experiencing depression during the follow-up period, and were more likely to be experiencing psychological distress (OR = 3.02, 95% CI: 2.01, 4.54) and taking antidepressants (OR = 3.74, 95% CI: 2.01, 6.97). They also had 1.78 times the odds (95% CI: 1.10, 2.87) of abusing alcohol and 2.89 times the odds (95% CI: 1.53, 5.45) of smoking daily during the transition to adulthood than did adolescents who were not depressed at age 16–17. Adolescent depression was strongly predictive of migraine headaches in early adulthood (OR = 2.76, 95% CI: 1.43, 5.33), as well as low levels of social support (OR = 1.63, 95% CI: 1.01, 2.64), low self-rated health (OR = 2.33, 95% CI: 1.26, 4.29), and high levels of self-perceived stress (OR = 2.53, 95% CI: 1.51, 4.25). Adolescent depression did not predict employment status, personal income, marital status, or educational attainment at age 26–27.

Discussion

This study demonstrated a significant association between teenaged depression and later social and health outcomes in a cohort of young Canadians as they made the transition to adulthood. Proximal relationships (i.e., to ages 18–19) were

Table 3
Associations between adolescent depression (at ages 16–17) and early adult outcomes, by age

Outcome	Odds ratios [95% CI] by age of assessment ^a						Mixed model
	Age 18–19 (n = 997)	Age 20–21 (n = 916)	Age 22–23 (n = 832)	Age 24–25 (n = 730)	Age 26–27 (n = 681)		
Adult depression	4.60 [1.84–11.57] ^c	7.62 [3.16–18.41] ^c	4.7 [1.34–16.42] ^b	6.25 [1.89–20.68] ^c	4.46 [1.60–12.47] ^c	4.91 [3.10, 7.77] ^c	
Alcohol abuse	2.70 [1.20–6.07] ^b	1.47 [.67–3.25]	1.39 [.46–4.21]	2.14 [.72–6.44]	1 [1.33–3.1]	1.78 [1.10, 2.87] ^b	
Smoking	2.16 [1.03–4.51] ^b	1.23 [.55–2.78]	2.81 [1.23–6.42] ^c	3.13 [1.31–7.49] ^b	1.56 [.57–4.30]	2.89 [1.53, 5.45] ^c	
Antidepressant use	9.31 [2.27–38.28] ^c	5.33 [1.14–24.92] ^b	5.33 [1.25–22.7] ^b	4.33 [1.13–16.63] ^b	2.48 [.87–7.03]	3.74 [2.01, 6.97] ^c	
Migraines	3.70 [1.40–9.73] ^c	2.55 [.78–8.30]	5.19 [2.14–12.6] ^c	3.30 [1.20–9.09] ^b	5.34 [1.84–15.53] ^c	2.76 [1.43, 5.33] ^c	
Poor self-rated health	11.14 [2.74–45.34] ^c	1.12 [.37–3.33]	2.06 [.57–7.40]	6.96 [2.10–23.09] ^c	6.63 [1.71–25.06] ^c	2.33 [1.26, 4.29] ^c	
Physical inactivity	1.44 [.69–2.99]	.72 [.34–1.53]	1.02 [.46–2.27]	.62 [.27–1.45]	.72 [.28–1.87]	.89 [.59, 1.33]	
Psychological distress	4.58 [2.12–9.91] ^c	2.28 [1.02–5.13] ^b	3.15 [1.37–7.24] ^c	2.07 [.86–4.98]	3.50 [1.23–9.93] ^b	3.02 [2.01, 4.54] ^c	
High self-perceived stress	d	d	3.22 [1.47–7.06] ^c	3.96 [1.09–14.34] ^b	1.31 [.54–3.2]	2.53 [1.51, 4.25] ^c	
Low social support	d	d	1.59 [.66–3.80]	.59 [.23–1.52]	4.86 [1.47–16.02] ^c	1.63 [1.01, 2.64] ^b	
Unemployment	d	d	d	d	.98 [.45–2.15]	d	
Low personal income	d	d	d	d	1.28 [.42–3.94]	d	
Unmarried	d	d	d	d	.83 [.33–2.09]	d	
Postsecondary education not completed	d	d	d	d	.76 [.23–2.53]	d	

^a Adjusted for gender and adolescent socioeconomic status.

^b Significant at $p < .05$ level.

^c Significant at $p < .01$ level.

^d Outcome not measured in this cycle.

observed between adolescent depression and all outcomes with the exception of physical activity. We also observed significant associations that persisted after 10 years of follow-up, specifically in relation to depression recurrence, severity of symptoms (i.e., psychological distress), migraine headaches, poor self-rated health, and low levels of social support. Adolescent depression was not significantly related to employment status, personal income, marital status, or educational attainment in the late twenties.

These findings underscore the well-supported relationship between adolescent depression and depressive symptom severity, ongoing depression, and antidepressant use in later life [31]. Our results also add to a growing body of evidence linking depression and cigarette smoking in adolescents [32,33]. Although there may be a bidirectional relationship between smoking and depression, the trend observed here has been observed in another study that found a community sample of adolescents who experienced and recovered from a first episode of major depression were more likely than their peers to smoke after the incident, but not before [34]. The association we observed between adolescent depression and subsequent alcohol abuse is not well-established in the literature. Three community-based cohorts have found no association between adolescent depression and early adulthood substance abuse [15,35]. Those studies, however, used clinical diagnostic criteria to identify alcohol abuse, while in our study we identify only potentially problematic drinking levels. It may be that depressed youth turn to alcohol as a coping mechanism when they face the multiple stressors of early adulthood [36], while not consistently abusing alcohol to degrees that reach clinical significance.

We observed a strong association between adolescent depression and migraine headache in early adulthood in our sample. Headaches are the most frequent somatic symptom found in psychiatric settings among adolescents referred for emotional disorders, with a similar phenomenon witnessed in adults [37]. It is currently unclear whether there is a causal relationship between migraine and depression, or whether the association between the two over time is due to shared causal factors such as chronic stress; a recent meta-analysis estimates that individuals with migraine headaches have roughly two times the odds of experiencing depression than non-migraine-sufferers [21]. On other measures of self-rated health, depressed adolescents in our sample fared more poorly than nondepressed adolescents in early adulthood. Interestingly, other studies have observed that both before and after an episode of major depression, depressed adolescents reported a higher number of physical health problems than their never-depressed counterparts [34]. Notably, although the bidirectional relationships between depression and numerous chronic health conditions have been explored in adult populations, little consideration has been given to these relationships and their associated mechanisms during the distinctive teenaged years [19]. Despite the unclear direction of possible causal effects, these findings suggest a persistent negative effect of teenaged depression on various aspects of the mental and physiological health of emergent adults.

There was some indication in our study of a link between adolescent depression and low social support later in emerging adulthood. A study examining long-term trajectories of depression in emerging adults confirmed that when social support in this group is higher, self-esteem is also higher and

depressive symptoms are decreased [38]. Likewise, befriending interventions have been shown to have significant effects on reducing depressive symptoms in both the short- and long-term [39]. Our research indicates that early depression could play a role in diminishing future available sources of social support, perhaps through an alienation of friends and loved ones during the teen years, or an unwillingness to participate in social events, which persists into adulthood. Given the nonsignificant association between adolescent depression and social support at ages 22–23 and 24–25, it is important to note that the MOS scale used here measures only the existence of social support sources (i.e., “someone to confide in or talk to about your problems” or “someone to help you with daily chores if you were sick”). The scale does not assess whether these sources are accessed or the degree to which they are utilized. It is possible (and quite likely) that depressed youth who have access to a range of social support options may still choose not to engage in them. This could result in an underestimation of the association between real-life use of social support and adolescent depression, and points to the importance of further research investigating the association of adolescent depression and social support.

Unlike previous studies, which examined the outcomes of employment, income, marriage, and education in later adulthood, we did not find a significant relationship between adolescent depression and sociodemographic outcomes. A possible explanation for this may stem from the age of the cohort. These outcomes may be more meaningfully measured in individuals in their thirties, as recent cohorts of young adults have delayed marriage and career milestones. In line with this, a recent study has shown depression at age 18 to predict lower career satisfaction in women at age 32 [40].

Methodological considerations

Two potential limitations of this research should be noted. First, not all survey members completed the 10-year follow-up. Depressed adolescents appeared to have been slightly more likely to leave the study; however, it is likely that those adolescents with the most severe symptoms were also those who experienced the poorest outcomes in early adulthood, leading to results that are conservative. Secondly, the low proportion of non-white survey members precludes us from making meaningful conclusions about the effects of race on our observed outcomes. Thirdly, the NPHS does not use a clinical diagnosis of depression. However, the CIDI-SF has been found to have 90% sensitivity and 94% specificity in identifying a major depressive episode compared with a full diagnostic interview.

These limitations are offset by two notable strengths. First, we were able to use a large, nationally representative sample. Second, all data were collected prospectively, reducing the likelihood of selective recall effects. Finally, the data included repeated measures over 10 years on a variety of important domains of early adult life.

The transition from adolescence to adulthood is a particularly vulnerable period due to the uncertainties reflected in frequent educational, career, social, and residential changes. However, despite the broad range of role transitions and events experienced during emerging adulthood, general adaptation is the goal for most people [38]. The results of this study indicate that the onset of depression during adolescence may forecast problems in adapting during this key transitional phase leading into

adulthood. At this stage, where individuals are setting themselves up for their adult lives, the consequences may be long-term and have far-reaching implications; although we might not find immediate effects on employment or relationships, an increased propensity to drink heavily, smoke, feel less healthy, and live a stressful life is likely to impact the capacity of the individual to successfully navigate work and family challenges farther down the road.

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