

A Systematic Review of Depressed Mood and Anxiety by SES in Youth Aged 10-15 Years

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ABSTRACT

Objectives: A majority of population-based studies suggest prevalence of depressed mood and anxiety is most common during late adolescence to early adulthood. Mental health status has been linked previously to socio-economic status in adults. The purpose of this systematic literature review is to clarify if socio-economic status (SES) is a risk indicator of depressed mood or anxiety in youth between the ages of 10 to 15 years old.

Methods: We performed a systematic literature review to identify published or unpublished papers between January 1, 1980 and October 31, 2006 that reviewed depressed mood or anxiety by SES in youth aged 10-15 years.

Synthesis: We found nine studies that fulfilled our inclusion criteria and passed the methodological quality review. The prevalence of depressed mood or anxiety was 2.49 times higher (95% CI 2.33-2.67) in youth with low SES in comparison to youth with higher SES.

Discussion: The evidence suggests that low SES has an inverse association with the prevalence of depressed mood and anxiety in youth between the ages of 10 to 15 years old. Higher rates of depressed mood and anxiety among lower socio-economic status youth may impact emotional development and limit future educational and occupational achievement.

Conclusion: Lower socio-economic status is associated with higher rates of depressed mood and anxiety in youth.

Key words: Depressive disorder; anxiety disorders; mental health; socioeconomic factors; youth

La traduction du résumé se trouve à la fin de l'article.

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The mental health of children and youth is an area warranting continued scientific and public health attention.¹ The World Health Organization predicts that by the year 2020, childhood and adolescent mental health problems will become one of the leading causes of morbidity, mortality and disability among children worldwide.²

A majority of population-based studies suggest prevalence of depressed mood is most common during late adolescence to early adulthood. A national survey from Canada determined that prevalence of depression was highest in the 15-19 age group (9.2%; 95% CI 7.1-11.3) with a prevalence rate of 2.7% in the 12-14 age group.³ A review of three American population-based studies suggests that most depressive symptoms start at approximately age 12 and peak between the ages of 15 and 17.⁴ Regrettably, first-onset depression is being manifested at a younger age than observed previously.⁵ The prevalence of depressed mood in youth is higher than depressive disorder, with prevalence rates of depressed mood among youth ranging from 21% to 50%.^{6,7}

Depression has a wide array of symptoms affecting somatic, cognitive, affective, and social processes. The consequences of depression include academic failure, poor peer relations, behavioural problems, conflict with parents and authority figures, low self esteem, substance abuse and interruption in development.^{5,8-11} Up to 41% of youth with depressive disorder report suicide ideation and 21% of depressed youth attempt suicide.⁶ The Ontario Child Health Study found that only 16.1% of children with mental health disorders receive mental health or social service attention.¹²

The identification of anxiety disorders, and how they influence children and adolescence, has been very much undervalued.¹³ In children and youth, approximately 20% of youth suffer from at least one anxiety disorder.⁶

Given that youth onset of depression and anxiety disorders are major risk factors for adult disorder, and that life events experienced in youth are associated with depression in adulthood, it is important to understand risk indicators of mental health status in youth.¹⁴⁻²⁰ Socio-economic status is believed to be a key risk indicator, although some authors suggest the findings are inconsistent.^{1,6,21}

The objective of this systematic literature review was to determine the association between socio-economic status and depressed mood or anxiety in youth aged 10-15 years old.

METHODS

An epidemiologist and a senior librarian performed a systematic literature review utilizing the databases PubMed, PsycINFO, CINAHL, EMBASE, and HealthSTAR from January 1980 to October 2006. Subject descriptors included the MeSH terms: depressive disorder, depression, long term depression, depressive disorder major, depression chemical, adjustment disorders, anxiety, anxiety disorders, mental health, socio-economic factors, social class, health behavior, population characteristics, poverty, poverty areas, educational status, employment and occupations. Limits terms included: child 6-12 years, youth 13-18 years, humans and English language.

We also sought information pertaining to governmental or non-published papers (grey literature). In total, 261 e-mail requests were sent out to all relevant health, mental health, social science and education department heads of Canadian universities, urban Health Regions, provincial and federal ministries, Canadian Mental Health Associations and independent research agencies (i.e., Statistics Canada). Each of the contacts was asked to forward the e-mail request to any colleague who worked within the area of mental health and youth. The original e-mails were sent out in October of 2006. From this process, 23 responses were received.

Two epidemiologists independently screened titles and abstracts of published and unpublished literature for relevance. The following inclusion and exclusion criteria were used.

Inclusion criteria:

1. Published or unpublished literature that examined depressed mood or anxiety by SES in youth between the ages of 10 and 15 years old. Studies were accepted if the age range crossed an age period that included, but was not exclusive to, youth between the ages of 10 to 15 years old (e.g., 15 to 17 years old).

TABLE I
Methodological Evaluation Criteria²²

1. Research question is well stated.
2. Source population is identified and appropriate.
3. Inclusion criteria are described and appropriate.
4. Exclusion criteria are described and appropriate.
5. Participation rate is reported and appropriate.
6. Sample size is preplanned and provides adequate statistical power.
7. Baseline comparability of various groups is reported.
8. Same data collection method is used for all respondents.
9. Important baseline variables are measured, valid, and reliable.
10. Outcome is defined and measurable.
11. Outcome measure is validated.
12. Outcome assessment was blind or free from bias.
13. Statistical analysis is appropriate.
14. Adjustment is made for important covariates.
15. The results are verifiable from the baseline data.

TABLE II
Flow Chart Describing the Systematic Literature Review and Selection of Articles

	PubMed	PsycINFO	CINAHL	EMBASE	HealthSTAR	Grey Literature	Total
	2284	953	2752	853	2343	9	9194
	Titles	Titles	Titles	Titles	Titles		
Screen 1- Review of Abstracts:	246	161	77	30	37	9	560
Screen 2- Review of Full Articles:	93	83	27	13	6	9	231
Screen 3- Met Inclusion Criteria and Passed Methodological Review:	4	3	0	0	0	2	9
Statistical Pooling of nine papers.							

2. Population-based cross-sectional surveys or cohort/longitudinal studies.
3. Use of a validated screening scale for depressed mood or anxiety (e.g., CES-D).
4. Defined SES as parental income, education, employment status or occupational classification.
5. Data from Canada, United States, Western Europe, Australia or New Zealand.
6. Articles published in English language.

Exclusion criteria:

1. Opinion papers, letters to the editor, case reports, case studies or natural experiments.
2. Randomized trials or clinical settings.
3. Any paper where the baseline data were not presented or available upon request.

Articles were reviewed in full when criteria within the abstract did not provide enough detail to make a decision. Reference lists of articles were examined. Full articles were reviewed independently by a panel of three reviewers consisting of two epidemiologists and a medical health officer. The panel independently appraised the methodological quality of a study with pre-established criteria in two stages: 1) assess the presence of selection, information or confounding bias, and 2) review the study design, study population, variable definition, participation rate, sample size, measurement technique, and analysis strategy (Table I).²² Except for major violations, a study required an overall score of at least 10 out of 15 to be accepted, as well as agreement between all three reviewers.

The statistical basis for the meta-analysis was taken from Fleiss, with the statistical assumptions that data analysis included the total number of studies found in comparison to a sample and that the sample sizes from each of the reviewed studies were assumed to be large.²³ A computer program was built that utilized the following formulas:²³

The fixed effects model was chosen with:

$$\bar{Y} = \frac{\sum W_c Y_c}{\sum W_c} \quad SE(\bar{Y}) = (\sum W_c)^{-1/2} \quad Y - z_{\alpha/2} / \sqrt{\sum W_c} \leq \psi \leq \bar{Y} + z_{\alpha/2} / \sqrt{\sum W_c}$$

effect size standard error and 95% confidence interval (ψ)

The meta-analytic approach took a weighted average of each study result (slope or β). The study weight (W) was the inverse of the variance computed from the estimated stan-

TABLE III
Summary of Results of Meta-Analysis

Study	RR (95% CI)	In (RR)	Relative Weight	Sample Size	Country of Origin	Study Design	Geographical Coverage	Scale	Outcome Measure	SES Indicator
Bergeron L (2000) ²⁵ M/F age 12-14	3.72 (1.65, 8.50)	1.31	0.01	741	Canada	Cross-sectional	Provincial	Dom	Dep/Anx	Income
StatCan NPHS (1999) ²⁶ Female age 12-14	5.24 (1.96, 14.02)	1.66	0.00	1847	Canada	Cross-sectional	National	CES-D	Dep	Income
Female age 15-19	6.11 (2.59, 14.42)	1.81	0.01							
Male age 12-19	3.71 (0.93, 14.73)	1.31	0.00							
StatCan NLSCY (2006) ^{*3} M/F age 12-18	1.22 (0.75, 1.69)	0.20	0.04	1401	Canada	Longitudinal	National	CES-D	Dep	Income
Goodman E (2003) ²⁷ M/F age 12-19	2.07 (1.73, 2.47)	0.73	0.14	14,500	USA	Longitudinal Cohort	National	CES-D	Dep	Income
Roberts R (1997) ²⁸ M/F age 12-14	5.17 (4.46, 5.88)	1.64	0.26	4456	USA	Cohort	Regional	DISC	Dep	Income
Hammack P (2004) ²⁹ M/F age 13-18	2.14 (1.81, 2.47)	0.76	0.21	1704	USA	Cohort	Regional	CES-D	Dep	Income
Kubic M (2003) ³⁰ Female age 12 & 13	1.90 (1.44, 2.50)	0.64	0.06	3621	USA	Cross-sectional	Regional	CES-D	Dep	Employment status/education
Male age 12 & 13	1.77 (1.33, 2.33)	0.57	0.06							Income
Costello E (1996) ³¹ M/F age 9, 11, & 13	3.20 (2.30, 4.40)	1.16	0.04	4500	USA	Cohort	Regional	CAPA	Dep	Income
Undlheim A (2005) ³² Female age 12-15	1.06 (0.50, 1.63)	0.06	0.02	1982	Norway	Longitudinal	National	MFQ	Dep	Occupational classification
Male age 12-15	1.07 (0.80, 1.34)	0.07	0.08							
POOLED ESTIMATE	2.49 (2.33, 2.67)	0.91223	1.00	34,752						

* N.B. all studies were published papers except for StatCan NLSCY (2006), where data were requested.³
The overall pooled variance of the log of the Rate Ratios was 0.91223

standard error or $SE(\beta)$ as $1/SE(\beta)^2$ and where Y was the effect size. Weighted slopes were calculated by weighting each β as follows:

$$\beta_w = \frac{\sum[\beta^* 1/\text{var}(\beta)]}{\sum 1/\text{var}(\beta)} \quad \text{where} \quad \text{var}(\beta) = SE(\beta)^2$$

The pooled estimate of the $SE(\beta_w)$ was: $1/\sqrt{\sum W_i}$

The pooled estimate of the 95% confidence interval of β_w was: $\beta_w \pm 1.96^* SE(\beta_w)$.

Because the rate ratio is less prone to artificial appearance of inter-study heterogeneity, the adjusted rate ratio is presented with 95% confidence intervals.²³

The assumption of homogeneity of variance is given by: $\chi^2 = \sum W (\beta - \beta_w)^2$ which, if the studies are estimating the same value for the effect, has a chi square distribution with degrees of freedom one less than the number of studies.²⁴

Sensitivity analysis was reviewed by looking at the individual influence of a study and then repeating the analysis without studies with the largest weights. If this produced little change in inference (less than 15% change in rate ratio), it was determined that inclusion of the study would not warrant caution in the interpretation.²⁴ The point estimates of individual studies were plotted against the inverse of their variance or sample size in order to visualize a funnel shape scattered around the true value of the point estimate.²⁴ This funnel plot was used to assess publication bias.²⁴

RESULTS

The results of the systematic literature review are summarized in Table II. Pubmed, PsycINFO, CINAHL, EMBASE and HealthSTAR identified 9,185 titles which were screened for relevance. The grey literature search resulted in an additional 9 titles. From the total of 9,194 titles screened for relevance, the overall search yielded 560 abstracts. Of the 560 abstracts, 231 articles were selected for full review including reference sections. Out of the 231 articles selected for review, 9 met the inclusion criteria and passed the methodological quality review. These 9 studies were forwarded for statistical pooling.

Of the 9 pooled studies, 5 were American, 3 were Canadian, and 1 was European (Table II).^{3,25-32} Four studies were national samples and 5 were provincial/state or regional. All

studies used depressed mood as an outcome measure and 1 study also included anxiety. Parental income was used as the socio-economic indicator in 7 studies and employment status and occupational classification were used in the other 2 studies. Two studies also included parental education as a secondary SES indicator. Sample sizes varied from 741 to 14,500.

In total, the overall sample size used for the meta-analysis was 34,752 youth (Table III). The statistical pooling of the 9 studies resulted in an overall rate ratio of 2.49 with a 95% confidence interval of 2.33 to 2.67. All 9 studies and 13 results (additional stratifications by gender) reported an inverse association between socio-economic status and depressed mood or anxiety. The rate ratios ranged from a low of 1.07 to a high of 6.11. Only 4 individual results out of 13 had lower confidence limits that crossed 1.^{3,26,32} The result of the overall test of homogeneity of variance was $p < 0.001$, suggesting highly significant heterogeneity between studies. Stratification by gender on 3 studies revealed no statistically significant difference between male and female youth (Table II).^{26,30,32} No other stratification was able to fully reveal the source of heterogeneity. Sensitivity analysis individually removed 2 studies with relative weights of 0.26 and 0.21.^{29,30} The changes in the rate ratio and 95% confidence intervals

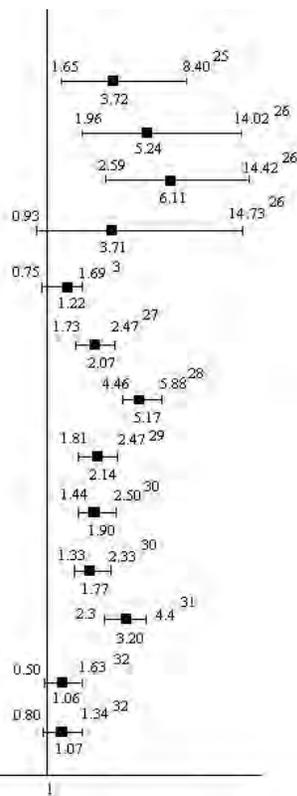


Figure 1. Rate ratios and confidence intervals for nine studies forwarded for statistical pooling

were not statistically significant. There were not enough studies accepted in order to visualize a funnel shape to the data to assess publication bias.

The results are presented schematically in Figure 1.

DISCUSSION

The Minister of National Health and Welfare for Canada reported in *Mental Health for Canadians: Striking a Balance* that social and economic conditions are contributing factors to mental health and that social and economic inequity between groups would be one of three main central challenges to policy development.²¹ The Canadian Senate Committee on Transforming Mental Health, Mental Illness and Addiction Services in Canada reported that social factors were the most important determinants associated with mental illness.³³ This systematic literature review found that youth with low socio-economic status are approximately two and a half times more likely to suffer from

depressed mood or anxiety than other youth with higher socio-economic status.

Of the 9 studies that were forwarded for statistical pooling, 4 studies had rate ratios greater than 3.0, 2 studies had rate ratios between 2.0 and 3.0 and the remaining 3 studies had rate ratios between 1.0 and 2.0. The discrepancies between the higher and lower rate ratios may be due to differences in methodology or the characteristics of the various populations surveyed. As reported, gender is a not a likely explanation for heterogeneity. This finding is important because gender differences in rates of depressed mood emerge around the age of 13 years.⁶ Stratifications by study design, year of publication, geographical coverage, scale to measure depressed mood or anxiety, construct used to measure parental socio-economic status did not significantly explain heterogeneity between studies. However, the two smallest rate ratios are from Europe where SES was measured in terms of occupational class.³² This finding might suggest cross-Atlantic differences in magnitude of inequalities or it might suggest that occupational class is somewhat different from other constructs to measure SES.

There are several limitations to discuss. First, the review of the grey literature is mainly influenced by contact with Canadian researchers. Second, publication bias is suspected but we were unable to formally test this assumption due to a limited number of accepted studies. The rate ratio from the only unpublished study (1.22) was much smaller than the rate ratios from the other North American studies that were published.³ Third, there were 4 studies that included ages above the age range of 10 to 15 years old. The authors were unable to separate age groupings. Fourth, the authors did not examine causation or selection. Fifth, only 1 study was found that addressed anxiety, and as such, caution is recommended in interpretation.

Socio-economic status is one variable that should be further explored as a risk indicator for increased depressed mood or anxiety among youth. The identification of pathways, and how socio-economic status impacts mental health status in youth, should become an important public health priority in Canada.

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RÉSUMÉ

Objectifs : Selon la majorité des études représentatives sur le sujet, la prévalence de l'humeur dépressive et de l'anxiété est plus courante entre la fin de l'adolescence et le début de l'âge adulte. L'état de santé mentale a déjà été lié au statut socioéconomique (SSE) chez les adultes. Au moyen d'une enquête bibliographique systématique, nous avons voulu déterminer si le SSE est aussi un indicateur du risque d'humeur dépressive ou d'anxiété chez les jeunes de 10 à 15 ans.

Méthode : À l'aide d'une enquête bibliographique systématique, nous avons répertorié les études publiées ou inédites menées entre le 1^{er} janvier 1980 et le 31 octobre 2006 portant sur l'humeur dépressive ou l'anxiété selon le SSE chez les jeunes de 10 à 15 ans.

Synthèse : Neuf études correspondaient à nos critères d'inclusion et de qualité méthodologique. La prévalence de l'humeur dépressive ou de l'anxiété était 2,49 fois supérieure (IC de 95 % = 2,33-2,67) chez les jeunes ayant un faible SSE que chez les jeunes ayant un SSE élevé.

Discussion : Ces données laissent croire que le faible SSE est inversement proportionnel à la prévalence de l'humeur dépressive et de l'anxiété chez les jeunes de 10 à 15 ans. Les taux plus élevés d'humeur dépressive et d'anxiété chez les jeunes au statut socioéconomique faible pourraient se répercuter sur leur développement affectif et limiter leurs résultats scolaires et professionnels futurs.

Conclusion : Un faible statut socioéconomique est associé à des taux élevés d'humeur dépressive et d'anxiété chez les jeunes.

Mots clés : trouble dépressif; trouble anxieux; santé mentale; facteurs socioéconomiques; jeunes



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