

Adolescent Depressive Symptomatology: Improve Schools or Help Students?

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Despite the increasing interest in programs designed to improve the social ecology of schools, surprisingly little is known about whether differences between schools influence student mental health. This 3-year prospective, naturalistic study examines the school effect on adolescent depressive symptomatology (measured by the Center for Epidemiological Studies Depression Scale, CES-D) among 2,489 students from 25 Australian high schools. Multilevel modelling techniques (HLM) formed the basis of the statistical analyses. There were statistically significant school effects on students' depressive symptomatology; however, these were much smaller than expected. Nearly all of the variation in CES-D depression scores was found to be at the student level, indicating that the potential mental health gains from reducing risk factors in school social environments may be extremely limited and have little effect on student depressive symptomatology.

Adolescent depression is recognised as a major public health problem in westernised nations. Large-scale studies have found prevalence rates of between 0.4% and 8.3% for clinical depression (Birmaher et al., 1996) and much higher rates (up to 50%) for adolescents reporting high levels of depressive symptomatology (Roberts, Andrews, Lewinsohn, & Hops, 1990). The burden of psychological distress associated with these high prevalence rates is sufficient reason for the increasing clinical and research attention directed towards adolescent depression. Other major problems associated with the early onset of depression include the increased risk of suicide, the costs to social and cognitive development, and finally the possibility that the first depressive episode may sensitise children and adolescents to future episodes (Kovacs, 1997). Importantly, the incidence and prevalence of adolescent depression may be increasing during this century (Lewinsohn, Rohde, Seeley, & Fischer, 1993), and since the genetic make-up of the population has not altered substantially (Birmaher et al., 1996), there is an urgent need to know how the social environment influences depression in young people.

Schools have a unique role in the lives of children and adolescents, and it is commonly assumed that the school social environment plays a major role in shaping student mental health (Booth & Samdal, 1997). This assumption, for example, is reflected in material produced from a current national Commonwealth-funded mental health initiative titled "MindMatters": "During adolescence, the social environment of the school plays an important role in shaping current and future health" (Sheehan, Marshall, Cahill, Rowling, & Holdsworth, 1999, p. 47). In reality, however, there is very little research to gauge the importance of the social context in general for mental health in either young people or adults (Taylor, Repetti, & Seeman, 1997), and we are unaware of published literature specifically addressing the possibility of school effects on student levels of depression. This is surprising, given the apparently obvious role of schools and the large number of mental health studies carried out with high school students. Only two studies (Larson, Raffaelli, Richards, Ham,

& Jewell, 1990; Sawyer, Sarris, Baghurst, Cornish, & Kalucy, 1990) have examined school differences with internalising problems. Both showed higher rates of depression and emotional disorder in children attending schools of lower average socioeconomic status. These two studies, however, did not attempt to control for differences in student background characteristics, and because students are not randomly allocated to schools, this means that no firm conclusions about school effects on student mental health can be drawn from these results.

No doubt the lack of attention to depression is attributable to the relative difficulty of detecting internalising mental health concerns compared with the more obvious problems created by externalising disorders. School effects research carried out by educationalists has focused on students' academic achievements (see Bosker & Witziers 1995 for a meta-analysis), disruptive behaviours such as absenteeism (Bryk & Thum, 1989), and "dropping out" (Rumberger, 1995). These studies of the school effect on mean educational achievement and behavioural problems have reported statistically significant variation between schools. Typically, the background characteristics of students explain a considerable proportion of this variation, but independent school effects (although usually fairly modest in size) have also been evident. School factors for educational achievement and behavioural problems have included the social composition of schools, the organisational effectiveness of the school, and the quality of the social relationships in the school. It needs to be remembered that schools may have only modest effects, but they act on very large populations. School effects become important because they produce differential effects across an entire population of children and younger adolescents (Bosker & Witziers, 1995).

The broad aim of the current study was to determine the extent to which schools vary with respect to average levels of student depressive symptomatology. International studies have found high levels of depressive symptoms in high school students (Garrison, Schluchter, Schoenbach, & Kaplan, 1989; Roberts et al., 1990), and adolescent depressive symptomatology

is a risk factor for clinical depression in later adolescence and adulthood (Weissman, Fendrich, Warner, & Wickramaratne, 1992). In pioneering work, Rutter, Maughan, Mortimore, Ouston, and Smith (1979) described differences between schools that influence student mental health and have the potential to affect levels of student depressive symptomatology. The effect of school characteristics on internalising symptoms remains to be studied, but speculatively schools may contain both risk and protective factors. Examples of possible protective factors include supportive relationships with peers, counselling and pastoral care, structured sporting and academic activities offering opportunities for pleasure and mastery, and, overall, a sense of belonging to the school community. Levels of bullying and drug use, on the other hand, would be possible risk factors. The present study did not directly examine these potential mediators but rather takes the preliminary step of examining the combined effect of all school factors in creating differences in student depressive symptomatology between school cohorts.

A major difficulty arising from previous cross-sectional studies of school effectiveness is the problem of having to adjust adequately for differences in the background characteristics of students prior to estimating the magnitude of school effects. The data reported in the current study were collected as part of a longitudinal research program that followed a cohort of students (from 25 schools) for their first 3 years (Years 8, 9, and 10) of high school. Each year, the students completed a self-report questionnaire comprising psychological scales and other questions: once in first year (Year 8), once in second year (Year 9), and once in third year (Year 10) of high school. In this study, schools will be used as their own controls and no attempt will be made to statistically adjust for student background factors. School variation from data provided by the Year 8 students will be assumed to reflect differences in the characteristics of students at intake. At Year 9 and Year 10, school variation will reflect both differences between student background characteristics and between schools (e.g., the school effect). Specifically, the study sought to answer the following questions:

- How much do high schools vary in their mean level of student depressive symptomatology at intake to the school?
- Does the variation between school mean levels of student depressive symptomatology increase during the first 3 years of high school, consistent with a school effect on student depressive symptomatology?

METHOD

The data reported in this study were collected during the Early Detection of Emotional Disorders (EDED) program, carried out by the Southern Child and Adolescent Mental Health Service (CAMHS) in South Australia (for details, see Martin, Roeger, Dadds, & Allison, 1997). In 1994, 25 state-funded high schools within the catchment area of CAMHS were approached to participate in the EDED program and, of these, 15 agreed to participate. They comprise students drawn from lower to upper middle socioeconomic areas. In 1995, funding became available to conduct the program in Independent School Board schools. Expressions of interest were sought from 85 schools, and 10 private schools took part in the program. Three of the private schools were single-sex schools (two boys-only, one girls-only). The private schools include some of South Australia's most expensive schools, with tuition fees in the order of A\$10,000 per annum. One private school withdrew in the third year of the program. The final sample of schools at Year 8 and Year 9 therefore comprises 15 public and 10 private totalling 25 schools and, at Year 10, 24

(15 public and 9 private) schools. The size of schools (in terms of total number of students) can be roughly approximated by multiplying by five the number of students in Year 8 (as shown in Table 1).

All parents of students participating in the study each year received a written explanation of the study and its purpose. A withdrawal form was enclosed, to be returned if consent was not granted. Using this recruitment process, high participation rates of about 85% of eligible students were achieved. The program was approved by the Committee on Clinical Investigation (Ethics) of Flinders Medical Centre, based on guidelines developed by the National Health and Medical Research Council of Australia. In longitudinal studies, some attrition of subjects is typical. Students for the first 3 years of high school (before they reach the legal school leaving age, which in South Australia is 15), however, are a relatively stable population. The total number of students completing questionnaires was as follows: Year 8 2,489; Year 9 2,404; Year 10 2,284. Although some attrition is evident, it is relatively minor. Students at Year 8 (first year of high school) were, on average, 13 years of age.

Depressive symptomatology was measured with the widely used Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977). This is a 20-item self-rating scale in which respondents indicate the frequency of particular depressive systems (e.g., feeling sad, lonely, fearful) in the past week, using a 4-point scale ranging from *rarely or none of the time* to *most or all of the time*. The CES-D has respectable validity and reliability in use with adolescents (Roberts, Lewinsohn, & Seeley, 1991). Scores were summed using the method outlined by Garrison, Addy, Jackson, McKeown, and Waller (1991), and ranged between 0 and 60, with higher scores indicating higher levels of depressive symptomatology.

In this study, multilevel modelling techniques specifically developed for hierarchical or clustered data form the basis of the statistical analysis. For material covering the statistical theory and principles of estimation, interested readers are referred to one or other of the standard multilevel analysis textbooks, particularly Bryk and Raudenbush (1992). Multilevel analyses were performed using the Hierarchical Linear and Nonlinear Modelling software package (HLM for Windows version 4.03; Bryk, Raudenbush, & Congdon, 1996) for two-level models, with students at Level 1 nested within schools at Level 2.

The HLM models estimated in this paper treat the data as if it had been collected from three separate cross-sectional studies, and the sample sizes correspond to the total number of students at each time period (before subtracting for missing data). For each year-level cohort, a two-level, fully unconditional hierarchical model was estimated. This model is referred to as a null model because predictors are not specified at either the student or school level. It is the simplest possible hierarchical model, and is equivalent to a one-way ANOVA with random effects. The results from this model provide the foundation for examining the amount of variability associated with the two levels: between students within schools (Level 1) and between schools (Level 2).

RESULTS

Overall mean student CES-D scores were Year 8 12.07 ($SD = 9.82$), Year 9 11.43 ($SD = 9.44$), Year 10 11.28 ($SD = 9.61$). Table 1 shows average CES-D depression scores for each school (in order of their Year 8 score) across the three year-level cohorts. Variability among school average CES-D depression scores is evident, with school average scores ranging from 8.9 to 14.5. Of note are the relatively high

Table 1
Individual School Mean (Standard Deviation) CES-D Depression Scores

School	N (Year 8)	Year 8		Year 9		Year 10	
		8	SD	8	SD	8	SD
1	33	9.21	7.98	12.19	9.27	13.42	12.36
2	103	9.81	8.50	11.31	8.94	12.22	10.90
3	42	10.93	7.69	14.19	11.82	14.28	10.73
4	62	10.95	6.76	10.57	8.27	8.92	6.78
5	111	11.26	10.02	11.84	9.56	13.07	10.95
6	88	11.35	9.92	14.66	10.46	13.10	10.50
7	31	11.39	4.77	17.59	13.22	11.50	8.46
8	47	11.47	11.04	11.71	9.55	12.32	10.34
9	89	11.51	10.77	9.72	8.20	9.26	6.87
10	200	11.59	9.51	11.36	10.08	11.16	8.69
11	146	11.64	8.91	10.85	10.16	10.34	9.01
12	72	11.68	8.81	13.22	10.63	11.58	9.78
13	32	12.06	11.40	14.03	9.54	13.70	9.89
14	101	12.31	10.24	14.34	11.00	14.02	10.31
15	52	12.40	10.45	11.38	10.28	13.85	10.60
16	49	12.53	9.51	13.10	8.80	9.30	9.25
17	184	12.67	10.23	10.10	7.96	10.97	9.47
18	64	12.78	8.86	10.57	7.76		
19	200	12.83	10.32	11.63	9.54	10.54	9.39
20	108	13.19	12.35	11.20	8.15	13.83	10.58
21	175	13.88	10.73	10.76	9.36	11.63	9.92
22	43	14.35	10.58	11.92	8.96	11.58	8.59
23	114	14.68	11.57	14.11	11.31	13.78	11.56
24	53	14.85	11.95	14.50	11.75	14.13	11.05
25	119	14.88	10.11	12.39	9.30	10.14	8.73

Note. School 18 did not participate in the third year of the study.

standard deviations for each school. The ratio of standard deviation to mean, known as the coefficient of variation, for the majority of schools across the three time points was around 0.70. This high coefficient of variation indicates a high level of variability within schools with respect to student CES-D depression scores.

Figure 1 plots the raw mean level of student depressive symptomatology across the three year-levels for each of the 25 schools. For the majority of schools, no clear pattern of change is evident. A horizontal line denoting the overall school mean across the 3 years (estimated from a HLM analysis) of 12.12 is also shown.

Table 2 presents the results from three separate HLM analyses for each of the three year-levels. Taking Year 8 by way of example, the results are interpreted as follows. The grand mean estimate for CES-D scores was 12.35, with a standard error of 0.29, indicating a 95% confidence interval of 11.78 to 12.94. The estimated variance of the true school means around the grand mean was 0.87, and at the student level it was 100.76. These estimates show that most variation in CES-D scores is at the student level. The intra-class correlation coefficient (ICC) representing the proportion of variance in CES-D scores between schools was calculated as 0.0086 ($0.87 / (0.87 + 100.76)$) or 0.86%. This indicates that, at Year 8, under 1% of variation in CES-D scores was at the school level, with the vast majority at the student level. The overall reliability

of school sample means as estimates of true school means was 0.41, indicating that sample means are only moderately reliable as indicators of true school means. The hypothesis that all schools have the same mean was rejected ($\chi^2 = 41.81$, $p = 0.01$), providing evidence of statistically significant variation among school CES-D scores.

The ICCs for the three year-levels were as follows: Year 8 0.86%, Year 9 1.48%, Year 10 1.73%. The ICC at Year 8 indicates the variation between high schools at intake resulting from differences between students. The increased ICC found across the Year 9 and Year 10 cohorts reflects the school effect on CES-D depression scores. An overall school effect can be approximated by subtracting the Year 10 ICC from the Year 8 ICC to give an estimated school effect of 0.87 — just under 1%. The ICCs calculated from the three year-levels represent the theoretically maximal amount of the total variation in CES-D depression scores that is explainable by *all* school factors. In other words, all possible school level variables, such as size of school, school environment, or educational leadership, in total in the present study cannot account for any more than 2%, and more likely only 1% of variation in levels of student depressive symptomatology.

HLM analyses are relatively new, and there are few studies investigating the consequences of violating model assumptions (Bryk & Raudenbush, 1992). In this study, the distribution CES-D scores, consistent with those obtained from other community-

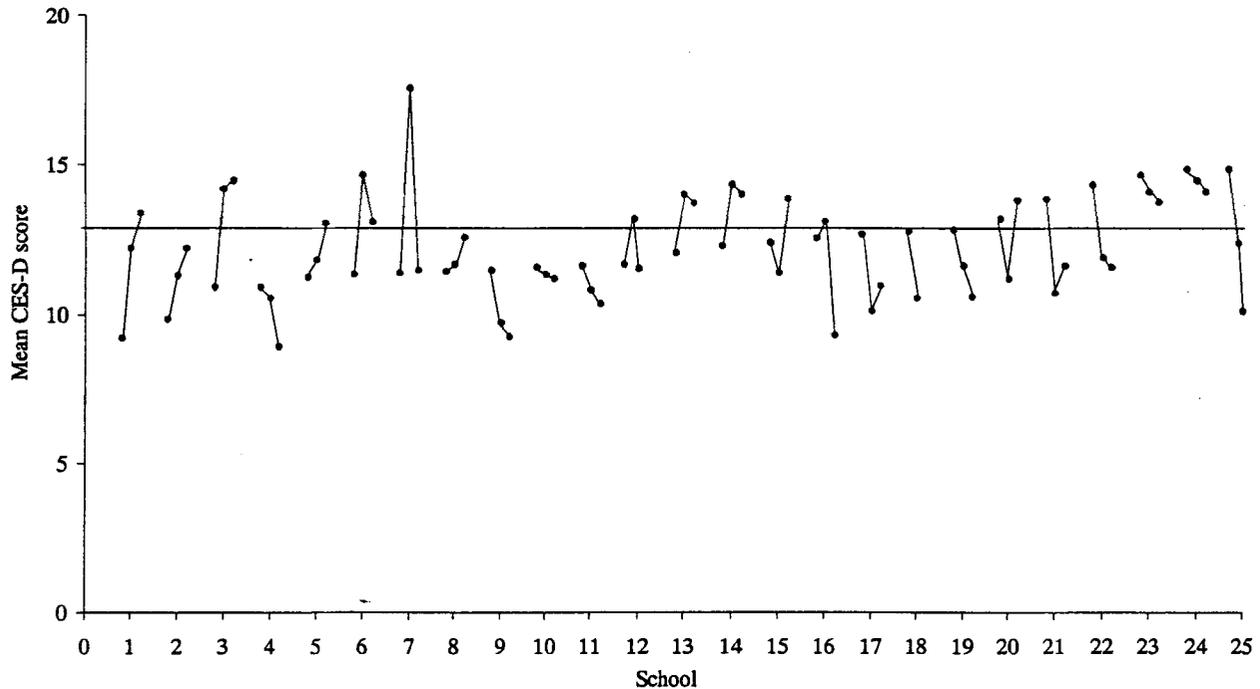


Figure 1
Individual school mean CES-D depression scores at Year 8, 9, and 10.

Table 2
HLM Fully Unconditional Models for CES-D Depression Scores

	Year 8	Year 9	Year 10
Grand mean	12.35	12.10	11.92
Std. error	0.29	0.33	0.35
95% CI	11.78–12.94	11.45–12.75	11.23–12.61
Level-2 variance (τ_{00})	0.87	1.40	1.67
Level-1 variance (σ^2)	100.76	93.01	94.60
ICC	0.0086	0.0148	0.0173
Reliability	0.41	0.53	0.57
χ^2	41.81	57.47	57.67
Probability	0.01	< 0.01	< 0.01

based samples (e.g., Hertzog, Van Alstine, Usala, Hultsch, & Dixon, 1990), showed values for skewness of around 1.50 and kurtosis between 2.0 and 3.0. Given these high values, additional analyses were undertaken, using a log transformation of CES-D scores. The analyses (results available from first author) produced substantially similar results (e.g., ICCs all under 2%) to those using the untransformed data.

DISCUSSION

This study found statistically significant differences between school mean levels of student depressive symptomatology. Overall, however, the school differences were less than expected, and were small by comparison with the variation found between students. The absence of substantial differences between schools, and the high student variation within schools, were apparent from the results of basic descriptive statistics. From the results of the HLM analyses, it is clear that the size of the variation in average student CES-D depression scores between the high schools in the sample was small at intake

(Year 8) and, although the variation increased consistent with a school effect over Year 9 and Year 10, and was statistically significant at each time point, the size of the school effect is certainly not more than 2% and more likely is around 1%. This suggests that the combined effect of intake differences between schools and the school effect for adolescent depressive symptomatology is modest. The results are consistent with the view that adolescent depressive symptomatology is largely driven by individual-level psychological factors, and contrary to the assumption that differences between school environments exert large impacts on student mental health.

This result can be contrasted with studies of school effects on academic achievement, which have provided larger estimates than in the current study for student depressive symptomatology. In a recent systematic meta-analysis of Dutch, British, and American school achievement studies, Bosker and Witziers (1995) estimated the true net (adjusted for student background characteristics) school effect to be approximately 6%. Our considerably lower estimate for student depressive symptomatology indicates that schools are very similar in their effects on student mood. Obviously, schools focus their attention on educational goals, and their outcomes depend partly on how well these teaching programs are implemented in a given school context. In contrast, while nearly all schools will seek to provide protective and enriching environments for students, the prevention of student depression is not a primary goal. Nonetheless, the result is contrary to our expectation that the variation in protective and risk factors between schools would produce a much larger school effect. These factors were not directly examined in the present study, but it is clear that they were not producing large differential effects across schools that could be detected with a commonly used screening instrument for depressive symptomatology.

Several limitations to the current study need to be acknowledged. The number of schools is relatively small, and it is known that estimates of the proportion of variance at the school level may be underestimated in small samples using multilevel

techniques (Draper, 1995). On the other hand, schools from both the public and private sectors were included in the study, and this would normally be expected to increase the estimate of between school variation. Depressive symptomatology was analysed as a continuous variable, and it is possible that school effects might be more pronounced for severe depressive symptomatology. This could have been explored by using cut-points to categorise students as either "not depressed" or "depressed", but, at the time of writing, variance estimates could not be calculated for HLM models with dichotomous outcome variables. The school sample comprised a nonrandom sample of schools from one Australian state, and although we have no reason to doubt that the result would be generalisable to other similar samples of schools, caution is required. The magnitude of the Australian school effect for academic achievement is similar to other western developed countries (Peaker, 1975; Rowe et al., 1995) and, by analogy, the results for mental health constructs such as depressive symptomatology may also be similar.

A strength of the current study is the longitudinal design, using repeated measures of a cohort of students nested within schools. This design allows students and schools to be used as their own controls and avoids the need to rely on statistically controlling for student background factors (Rowe, Hill, & Holmes-Smith, 1995). It is important to remember, however, that students in the study were not randomly allocated to the 25 schools; rather, the design is best conceptualised as a quasi-experiment, where each school is seen as a treatment group (Bryk & Raudenbush, 1992). In addition, classroom data were not collected, and some recent research evidence suggests that, for student achievement (particularly perhaps when measured by teacher ratings rather than standardised tests), the variation between classes may be very much larger than the variation between schools. Although the studies examining this issue have yielded contradictory findings (see discussion by Hill & Rowe, 1996) it is possible that, in the present sample, the classroom level may have been associated with quite large variation in student depressive symptomatology.

From a methodological perspective, the study contributes to an improved understanding of the extent of clustering in student mental health data and the reliability of a widely used instrument (the CES-D) when used as an aggregate measure of school-level student depressive symptomatology. In the present sample of schools, the ICCs were very small, indicating that traditional statistical procedures (which do not take into account clustering effects) could have been applied without serious error for the analysis of student (Level 1) background factors. For the future, however, the ease of use and wide availability of multilevel statistical software places an onus on researchers to consider the improvements offered by this approach for the analysis of school-clustered child and adolescent mental health data. The estimates of school depressive symptomatology were only modestly reliable: around 0.50 overall across the three year-levels. This reliability is a function of both the psychometric properties of the CES-D and the number of students sampled from each school. Given that the CES-D demonstrates good psychometric properties, further research examining school effects on student depressive symptomatology therefore may need to sample larger numbers of students per school than was the case in the present study.

As the individual and social costs of the under-treatment of childhood depression are being delineated, the need for effective prevention programs for depression is becoming increasingly apparent (Kovacs, 1997). Schools are places where whole populations of young people can be accessed easily, and present ideal opportunities for preventative mental

health programs. For these reasons, schools are assuming greater prominence for the delivery of child and adolescent mental health services. Given the critical importance of these efforts, schools need to be offered programs with a high likelihood of success. The findings from this naturalistic study suggest that there may be severe limitations on the amount of improvement possible from "whole of school" interventions. This is because school-level characteristics appear to have only very weak effects on student depressive symptomatology. Individual-level psychological factors, on the other hand, were found to have by far the greatest influence on depressive symptomatology. On this basis, programs directed towards individual-level factors (e.g., those that teach cognitive and behavioural skills in the classroom) have much greater potential for alleviating depressive symptomatology.

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