Leaving school without qualifications and mental health problems to age 30

David M Fergusson

Geraldine FH McLeod

L John Horwood

Christchurch Health and Development Study, Department of Psychological Medicine, University of Otago, Christchurch. PO Box 4345, Christchurch 8140, New Zealand.

Corresponding author: Professor David Fergusson. Christchurch Health and Development Study. Tel +64 3 372 0406 dm.fergusson@otago.ac.nz
Abstract

Purpose To examine the associations between leaving school without qualifications and subsequent mental health to age 30, using data gathered over the course of a 30 year longitudinal study.

Methods Data were gathered over the course of a 30 year study (Christchurch Health and Development Study (CHDS)) of a birth cohort of 1265 children, born in Christchurch in 1977. This cohort has been studied on 22 occasions from birth to age 30. As part of this study, information was gathered on: (a) school leaving qualifications, (b) mental health problems from 18 to 30; and (c) prospectively assessed childhood and adolescent factors including: child and family background; family violence and child abuse; and adolescent mental health problems.

Results Leaving school without qualifications was associated with increased risks of subsequent: major depression (OR=1.37 at 95% CI: 1.05-1.78, p = 0.019); anxiety disorder (OR=1.99 at 95% CI: 1.55-2.57, p < 0.001); suicidal ideation/attempt (OR=1.60 at 95% CI: 1.15-2.36, p = 0.005); alcohol abuse/dependence (OR=1.54 at 95% CI: 1.20-1.98, p < 0.001); and illicit substance abuse/dependence (OR=2.97 at 95% CI: 2.16-4.07, p < 0.001). Adjustment for the covariate factors above (family social background; family violence; child abuse and adolescent mental health problems) reduced these associations substantially and to the point of statistical non-significance.

Conclusions The findings of this study suggest that there was no direct causal association between leaving school without qualifications and subsequent mental health problems. Associations were explained by the linkages between leaving school without qualifications and: child and family social background; and mental health around the point of school leaving.

Key words: Longitudinal; Mental health; High school dropout; Educational qualifications
Introduction

There is a large body of evidence which suggests that young people who leave school without qualifications are an at-risk population for later mental health disorders [1-4]. These consistent linkages between educational achievement and later mental health raise important and interesting questions about the pathways and processes involved in the associations between leaving school without qualifications and later mental health [1,5-7].

In a review of the associations between education and health, including mental health, Eide and Showalter [5] outline three generic explanations of the associations. The first explanation is that there is a general causal association between education and health outcomes, in which increasing educational attainment is associated with improvements in health. Specifically, it may be suggested that leaving school without qualifications sets in train a series of processes that increase individual vulnerability to mental health problems. These processes may include increased risks of: poverty [1,8,9], limited social support [1,8,9], adverse peer networks [10], greater risk-taking behaviors [2,9], limited use of preventive medical care [1,2,8,9] and higher exposure to life-course stressors such as unemployment [1,2]. All of these factors are known to be related to mental health risks and it may be suggested that the accumulation of adversity faced by those with limited educational achievement increases their risks of mental disorder [3,11]. These findings are also consistent with a number of theoretical frameworks which have examined the ways in which limitations in human capital may lead to increased risks of mental disorders and other adverse outcomes. These theoretical frameworks include: the ecological–development model developed by Bronfenbrenner [12,13], General Strain Theory [14,15], and Bandura’s Social Learning Theory [16].

The second explanation proposed by Eide and Showalter [5], is that the association between educational achievement and mental health arises from a reverse causal process, in which poor mental health leads to educational underachievement.

The third explanation proposed by Eide and Showalter [5], is that the associations arise as a result of third or confounding factors; which are associated with both educational underachievement and mental health and are causally antecedent to these outcomes. Specifically, it has been well-documented that a constellation of social, economic and family-factors are related to educational underachievement and mental health. These factors include: socioeconomic disadvantage, limited parental education, poverty, single parenthood, larger family size, exposure to family violence and child abuse, all of which are associated with both decreased educational opportunities and increased risks of mental health problems [3,6,17]. In general, it may be
conjectured that the apparent associations between education and mental health outcomes arise because both of these outcomes are endpoints of the effects of social, economic and childhood disadvantage.

The issue of the association between educational achievement and mental health in adulthood has been examined in a number of studies [2,9,11,17-26]; with the majority of these studies concluding that the association persists after control for confounding factors. However, research in this area has a number of limitations including:

1. Limited control of confounding factors. While most studies have controlled for a number of confounders, this control has typically been limited to measures of socioeconomic background and consideration has not been given to other key predictors of mental health including childhood maltreatment, childhood sexual abuse, and family dysfunction. All of these factors are known to be associated with childhood educational underachievement and are also associated with later mental health. Furthermore, only a minority of studies have controlled the associations between leaving school without qualifications and later outcomes for covariate factors assessed contemporaneously with school leaving, or prior to school leaving [11,19,20,23].

2. Limited measurement of outcomes. Most studies have focused only upon a limited number of outcomes (such as depression and anxiety [2,9,24]). These studies have used a range of methods for assessing mental health outcomes but to date no study has assessed these outcomes using standardized DSM criteria.

3. Limited duration of follow-up. In most longitudinal studies, associations between educational achievement and mental health have been conducted in adolescence and early adulthood [11,18,19]. Few studies have considered the longer term consequences of educational under-achievement on mental health in mature adulthood [2,17].

Against this background, this paper reports the findings of a 30 year longitudinal study of the associations between leaving school without qualifications and mental health outcomes (major depression, anxiety disorder, suicidal ideation/attempt, alcohol abuse/dependence and illicit substance abuse/dependence) at ages 18-30 (assessed using DSM criteria). This study also gathered extensive prospective assessments of childhood, family, social and economic background. The aims of this study were as follows:

1. To estimate the size of association between leaving school without qualifications and rates of mental disorder assessed at ages 18, 21, 25 and 30 years.
2. To adjust any associations between leaving school without qualifications and mental health for a series of potentially confounding social, family and childhood factors.

3. To examine the extent to which associations between leaving school without qualifications and subsequent mental health reflect a reverse causal process in which childhood mental health problems lead to both educational underachievement and later mental health problems.

What this study provides is well-collected evidence on the associations between leaving school without qualifications and mental health outcomes, taking into account a wide range of prospectively assessed covariates.

Methods

Participants

Participants were members of the Christchurch Health and Development Study (CHDS) birth cohort. The CHDS is a longitudinal study of 1,265 children born in the Christchurch (New Zealand) urban region over a 4-month period during 1977. This cohort has been studied at regular intervals from birth until age 30 [27]. All phases of the study have been subject to ethical approval by the Canterbury Regional Health and Disabilities Ethics Committee. All data were collected with the signed consent of the study participants.

A description of the sample at age 30 in terms of ethnicity, educational attainment, socioeconomic status, and marital status is presented in Online Resource 1.

Measures

Leaving school with/without formal educational qualifications

At the 18 year assessment, participants were questioned about their educational attainment history. In New Zealand, at the time the cohort received its secondary school education, the initial series of national examinations in which a formal educational qualification could be obtained, was known as School Certificate. School Certificate examinations were usually undertaken when children were in their third year of secondary education (high school) at approximately 15 or 16 years of age. In these examinations, a student could obtain a grade ranging from A (highest) to E (lowest); a pass grade was a C or higher. Participants who had left school by age 18 and had failed to achieve at least one C pass in a School Certificate subject were classified as having attained no secondary school qualifications. Using this classification, 19.2% of the sample left school without qualifications.
Mental health outcomes

At ages 18, 21, 25, and 30 years, participants were questioned about their experience of the following mental health problems during the previous 12 months.

Major depression and anxiety disorder

Participants were questioned about symptoms of major depression and a range of anxiety disorders (generalized anxiety disorder, panic disorder, agoraphobia, social phobia, specific phobia) in the previous 12 months. Questioning was based on the relevant components of the Composite International Diagnostic Interview [CIDI: 28] and DSM-IV criteria [29]. Using this information, dichotomous measures were constructed to reflect whether the participant met diagnostic criteria for a diagnosis of a major depressive episode or any anxiety disorder in each of the intervals studied.

Suicidal ideation/attempt

Participants were questioned using custom-written survey items about the occurrence of suicidal thoughts (contemplating/considering or planning suicide) and/or attempts in the previous 12 months in each of the intervals studied.

Substance abuse/dependence

Participants were questioned about problems associated with their use of alcohol or illicit drugs in the previous 12 months, using CIDI items to assess DSM-IV symptom criteria for abuse/dependence. Using this information, participants were classified on dichotomous measures reflecting whether they met diagnostic criteria for alcohol abuse/dependence or illicit substance abuse/dependence in each of the intervals studied.

Covariate factors

The covariate factors used in the analyses spanned a number of domains which are known to be associated with either educational attainment and/or mental health problems in adolescence and adulthood. All of these covariates were correlated with educational attainment (see Table 2).

Child and family background
Family type. Whether the child was born into a single- or two-parent family was recorded at birth.

Maternal age at birth of child. Maternal age (years) was assessed at the birth interview.

Maternal formal educational qualifications at birth of child. Maternal education was assessed using a three-point scale of: mother lacked educational qualifications; mother had secondary (high school) qualifications; and mother had tertiary (college) qualifications.

Family socioeconomic status at birth of child. Family socioeconomic status was assessed using the Elley and Irving [30] scale of socioeconomic status for New Zealand.

Averaged family standard of living (0-10 years). Interviewer ratings of family living standards were obtained at every year from 1 year to 10 years. In these ratings, the family’s living standards were assessed on a 5-point scale that ranged from very good to very poor. These ratings were summed over the 10-year period and averaged.

Parental history of illicit drug use (11 years). When participants were aged 11, parents were questioned about their history of illicit drug use.

Parental history of alcohol problems or criminal offending (15 years). At the age 15 assessment, parents were questioned regarding whether any parent had a history of alcohol problems or criminal offending.

Parental attachment score (15 years). At age 15, participants were interviewed about the quality of their relationship with their parents using the parental attachment scale of the Inventory of Parent and Peer Attachment (IPPA) [31]. The internal consistency of the scale was $\alpha = 0.87$.

Parental educational expectations (16 years). When participants were aged 16 years, their parents were questioned about their expectations of their child’s future educational attainment, in terms of attainment of high school qualifications and enrolment in various types of tertiary education. This information was used to construct a parent-report measure of the young person's highest anticipated level of educational achievement.

Family violence and child abuse

Interparental violence (<16 years). The experience of interparental violence during childhood was assessed via participant self-report at age 18, through a series of eight items derived from the Conflict Tactics Scale [32]. An overall measure was created by summing the responses for both father- and mother-initiated violence. The internal consistency of this scale was $\alpha = 0.88$.

Childhood physical punishment (<16 years). Exposure to childhood physical punishment was assessed at ages 18 and 21. This information was used to create a 4-point scale of physical punishment/maltreatment: parent(s)
never used physical punishment; parent(s) seldom used physical punishment; parent(s) regularly used physical punishment; and parent(s) used frequent or severe punishment or treated the participant in a harsh/abusive manner [33].

Childhood exposure to sexual abuse (<16 years). At ages 18 and 21, participants were questioned about their exposure to any forms of childhood sexual abuse prior to age 16. This information was used to create a 4-point scale of exposure to childhood sexual abuse: no childhood sexual abuse; non-contact childhood sexual abuse; contact childhood sexual abuse not involving attempted or completed sexual penetration; and severe childhood sexual abuse involving attempted or completed sexual penetration including vaginal, oral and anal intercourse [34,35].

Adolescent mental health problems (14-16 years)

At age 15 and 16 years, participants and their parents were interviewed about the participants’ mental health over the preceding 12 months using the Diagnostic Interview Schedule for Children (DISC) [36] and the Diagnostic Interview Schedule [37]. These measures were supplemented by additional items designed to meet DSM-III-R criteria for major depression, anxiety disorder, conduct/oppositional defiant disorder and ADHD. Suicidal behaviors and illicit substance abuse were assessed with custom-written items. For the participants, these questions were also supplemented by the Self-Report Early Delinquency Inventory [38] to assess conduct disorder and Rutgers Alcohol Problems Index [39] to assess alcohol abuse problems. For the parents, additional questions were asked to also assess: conduct disorder using the parent version Self-Report Early Delinquency Inventory [38] and oppositional defiant disorder and attention deficit hyperactivity disorder (ADHD) using the Revised Behavior Problem Checklist [40]. Further information is reported in Fergusson, Horwood and Lynskey [41].

Statistical analysis

The first phase of the analysis examined the unadjusted associations between leaving school with/without qualifications and the dichotomous mental health and substance abuse/dependence outcomes. For each outcome, the analysis pooled the repeated observations at ages 18, 21, 25 and 30 to obtain an estimate of the population-averaged associations between leaving school with/without qualifications and subsequent mental health outcomes. These associations were analyzed using a general estimating equation (GEE) modeling approach [42] to fit a series of logistic regression models in which log odds of each outcome was modeled as a function of leaving school with/without qualifications and age at assessment. The models were of the form:
\[ \text{Logit}(Y_{it}) = B_0 + B_1X_i + B_2\text{Age}_{it} \] (equation 1)

where \( \text{Logit}(Y_{it}) \) was the log-odds of each outcome reported by the \( it \)th respondent at each assessment age \( t \); \( X_i \) was the measure leaving school with/without qualifications; and \( \text{Age}_{it} \) represented the age of the cohort member at time \( t \) (shown in Table 1 and Online Resource 2). The analyses were extended to include multiplicative age by leaving school with/without qualifications interactions, and gender by leaving school with/without qualifications interactions.

The second phase of the analysis aimed to identify potential covariates. To achieve this, the associations between leaving school with/without qualifications and a series of measures of: child and family background; family violence and child abuse; and adolescent mental health problems (14-16 years) were examined. These associations were tested for statistical significance using the chi-square test for independence for dichotomous outcomes and the t-test for independent samples for continuous outcomes (shown in Table 2).

The third phase of the analysis adjusted the associations between leaving school with/without qualifications and mental health outcomes for the child and family background; family violence and child abuse; and adolescent mental health problems (14-16 years) variables. Table 3 shows the odds ratios (95% confidence intervals) and p-values for leaving school with/without qualifications and mental health problems to age 30: (a) adjusted for child and family background; family violence and child abuse; and (b) further adjusted for adolescent mental health problems (14-16 years) of major depression, anxiety disorder, suicidal ideation/attempt, alcohol abuse/dependence, illicit substance abuse/dependence, conduct and oppositional defiant disorder and ADHD. To adjust the associations, the equation in Table 1 was extended to include the covariate factors, assessment age and gender. The fitted models were of the form:

\[ \text{Logit}(Y_{it}) = B_0 + B_1X_i + B_2\text{Age}_{it} + \sum B_j Z_{ij} \] (equation 2)

where \( Z_{ij} \) represents the covariates of: child and family background; family violence and child abuse; and adolescent prior mental health problems. Online Resource 3 shows the fitted regression models of the associations between leaving school with/without qualifications and each outcome, adjusted for all covariates in Table 2.
Sample size and sample bias

The present analysis is based on 1025 sample members (81% of the initial cohort) for whom information was available on both leaving school with/without qualifications and the outcome measures for at least one assessment period between 18 and 30 years. The number of observations available for each assessment was: 1025 (18 years), 983 (21 years), 978 (25 years) and 960 (30 years). Sample sizes for leaving school with/without qualifications by mental health outcome analyses are reported in Online Resource 2. The numbers in these analyses vary slightly due to sample attrition and small amounts of missing data.

The level of sample attrition raises issues of the extent to which the results may have been influenced by sample selection bias resulting from selective sample attrition. To examine this issue, all analyses were repeated using the techniques described by Carlin, Wolfe, Coffey and Patton [43]. These methods involved a two-stage process. In the first stage, a sample selection model was constructed by using data gathered at birth to predict inclusion in the analysis sample. In all cases, this analysis showed that there were statistically significant ($p < 0.05$) tendencies for the analysis sample to under-represent children from more socially disadvantaged backgrounds (low parental education, low socioeconomic status, single parent family). On the basis of the fitted selection model, the sample was then post-stratified into a series of groups and the probability of inclusion in the analysis sample estimated for each group. In the second stage of the analysis, the data were reanalyzed with the observations for each individual weighted by the inverse of the probability of sample inclusion. In all cases, the weighted analyses produced essentially identical conclusions to the results reported here, suggesting that the effects of missing data and possible sample selection bias on the results were likely to be minimal.

Results

Associations between leaving school with/without qualifications and mental health problems at 18, 21, 25 and 30 years

Table 1 shows the population-averaged associations between leaving school with/without qualifications and risks of mental health problems assessed in the 12-month period prior to 18, 21, 25 and 30 years. Population-averaged estimates were obtained by pooling the data over these time-periods (Online Resource 2 shows the information used to compute these pooled estimates). Table 1 shows statistically significant ($p < 0.05$) associations between leaving school with/without qualifications and the outcome measures. The odds ratios associated with leaving school without qualifications ranged from 1.37 to 2.97, suggesting that the effect sizes
ranged from small to moderate [44]. The analyses were extended to consider interactions between leaving school with/without qualifications and: gender, and age of assessment. No statistically significant interactions \((p < 0.05)\) were found.

**Insert Table 1**

Associations between leaving school with/without qualifications and covariate factors

Table 2 shows the associations between leaving school with/without qualifications and a series of covariates: child and family background; family violence and child abuse; and adolescent mental health problems assessed prior to school leaving age (16 years). The table shows that there were pervasive associations between leaving school without qualifications and a broad range of factors spanning: child and family background; family violence and child abuse; and adolescent prior mental health problems \((p < 0.005)\).

**Insert Table 2**

Covariate adjustment

Table 3 shows the associations between each mental health outcome and leaving school with/without qualifications: (a) after adjustment for child and family background; family violence and child abuse factors; and (b) after additional adjustment for adolescent mental health. Online Resource 3 shows the fitted regression models that are summarized in Table 3.

Table 3(a) shows that adjustment for child and family background, family violence and child abuse factors reduced the associations between leaving school with/without qualifications and mental health outcomes substantially. Following these adjustments, the odds ratios were reduced to between 1.00 and 1.71, with only two associations (anxiety disorder, \(p = 0.011\); and illicit substance abuse/dependence, \(p = 0.006\)) remaining statistically significant. In these regression models, statistically significant \((p < 0.05)\) covariates included: gender, maternal educational attainment at the birth of the child, family type, averaged family living standards (0–10 years), parental history of illicit drug use, parental history of criminal offending, parental attachment score, exposure to interparental violence, regular/severe childhood physical punishment, and childhood sexual abuse.
Table 3(b) shows that additional adjustment for adolescent mental health problems further reduced the odds ratios, with no associations between leaving school with/without qualifications and the mental health outcomes remaining statistically significant. In these regression models, statistically significant adolescent mental health factors (14-16 years) included: major depression, anxiety disorder, suicidal ideation/attempt, alcohol abuse, illicit substance abuse, conduct and oppositional defiant disorder and ADHD.

In general, the findings above suggest that most of the associations between leaving school with/without qualifications and mental health problems were explained by the confounding effects of a series of child and family background; family violence and child abuse factors. After adjustment for adolescent prior mental health, all of the associations between leaving school with/without qualifications and mental health problems were explained.

Insert Table 3

To assess the generality of the results, the analyses were extended to examine the relationship between mental health and a more comprehensive measure of educational achievement. This measure classified the highest educational achievement of participants into 4 categories (1=no educational qualifications; 2=secondary school qualifications; 3=trade or technical qualifications; 4=tertiary degree). This analysis produced similar findings to the results for leaving school without qualifications. However, for the more comprehensive measure, illicit substance abuse/dependence remained statistically significantly associated ($p < 0.001$) with educational achievement even after control for child and family background; family violence and child abuse; and adolescent mental health.

Discussion

This paper has examined the associations between leaving school without qualifications and subsequent mental health problems using data gathered over a 30 year longitudinal study. The purpose of this study was to examine the extent to which leaving school without qualifications was a risk factor for mental health problems when due allowance was made for a wide range of potentially confounding covariates. In comparison to previous research into this area, the present study has three methodological advantages:
1. This study was based on a representative cohort with high rates of sample retention to age 30. In contrast, most studies in this area have used cross-sectional designs and/or retrospective reporting of childhood circumstances [2,9,17,21,22,24-26].

2. Mental health outcomes were assessed over the period from 18-30 years. In contrast, most studies in this area have either assessed outcomes at a single time-point or during adolescence [9,11,18,19,21,22,24,25].

3. The study design made it possible to control the association between educational achievement and mental health for a wide range of covariates which included: child and family background; family violence and child abuse; and adolescent mental health problems. No study to date has included such a comprehensive set of prospectively collected control factors.

These methodological features provide considerable reassurance about the validity of the study findings. Specifically what this research suggests is that leaving school without qualifications is unlikely to make a causal contribution to later mental health. Rather, the findings suggest that the apparent associations between educational non-achievement and later mental health arise from social and contextual factors related to educational achievement. This conclusion is inconsistent with the findings of the majority of studies in this area that have concluded leaving school without qualifications is associated with increased risks of subsequent mental health problems after control for confounding factors [2,11,17-26]. It is likely that this discrepancy arises because of the greater statistical control of confounding that was possible for this study.

It could be suggested that the inclusion of adolescent mental health factors as covariates may have led to over-control of the association since these factors may mediate the association between leaving school without qualifications and mental health outcomes. While this remains possible, it is important to note that most of the association between school achievement and mental health was explained by childhood and family factors that were present prior to school leaving. The exception to this trend was for anxiety and illicit substance abuse where the association with school achievement remained statistically significant after adjustment for child and family factors. These findings clearly suggest that any role of adolescent mental health variables in mediating the association is likely to be small.

Finally, it has been well established that educational achievement is strongly related to socioeconomic status in adulthood and it has also been found that socioeconomic status in adulthood is related to major mental disorders [45]. These findings raise the interesting conjecture that the associations between socioeconomic status and major mental disorders are explained by a similar set of processes to those found in this paper, for the relationship between mental health and educational attainment.
In summary, the findings of this analysis show that most of the associations between leaving school without qualifications and later mental health were explained by the common effects of childhood adversity (low maternal educational attainment, low family standard of living, single parent family type, parental history of criminal offending and substance use, low parental attachment, low educational aspirations by parents, and childhood exposure to family violence, regular/severe physical punishment and sexual abuse) on both outcomes.

Possible limitations of the research relate to the fact that the cohort was studied in a particular social setting over a specific time period using interview based methods. The extent to which these findings generalize to other cohorts assessed at different times and places using different methods remains to be assessed. Notwithstanding these reservations, the findings of this 30 year study strongly suggest that the well-established correlation between leaving school without qualifications and subsequent mental health is non-causal, and explained by a range of social and contextual factors that are associated with both leaving school without qualifications and subsequent mental health.

Finally, the study has a number of important implications to the extent that it highlights the importance of addressing various forms of childhood adversity in order to maximize later healthy adjustment. The present paper clearly supports the development of a wide range of both home and school-based interventions designed to: mitigate childhood disadvantage; address childhood behavioral problems; and provide family support and assistance. These interventions include: evidence based home visiting programs [46,47]; home and school-based programs for children with early onset behavioral problems [48] and mental health problems [49]; and community based programs for parents with substance use and related problems [50]. In general, the weight of the evidence suggests that continued investments in interventions that act to mitigate the consequences of exposure to adverse childhood environments offer the greatest promise of reducing the associations between educational disparities and later mental health problems.

Acknowledgements

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Conflict of interest

The Authors declare no conflict of interest.
References


Table 1. Rates (%) of mental health outcomes by leaving school with/without qualifications (pooled over observations at ages 18, 21, 25 and 30).

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Left school with qualifications</th>
<th>OR (95% CI)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Mental health (past 12 months 18, 21, 25, 30)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major depression (%)</td>
<td>19.7</td>
<td>15.2</td>
<td>1.37 (1.05-1.78)</td>
</tr>
<tr>
<td>Anxiety disorder (%)</td>
<td>22.1</td>
<td>12.5</td>
<td>1.99 (1.55-2.57)</td>
</tr>
<tr>
<td>Suicidal ideation/attempt (%)</td>
<td>10.1</td>
<td>6.6</td>
<td>1.60 (1.15-2.36)</td>
</tr>
<tr>
<td>Alcohol abuse/dependence (%)</td>
<td>21.0</td>
<td>15.0</td>
<td>1.54 (1.20-1.98)</td>
</tr>
<tr>
<td>Illicit substance abuse/dependence (%)</td>
<td>19.0</td>
<td>7.9</td>
<td>2.97 (2.16-4.07)</td>
</tr>
<tr>
<td>Any of the above problems (past 12 months 18, 21, 25, 30)</td>
<td>50.1</td>
<td>36.4</td>
<td>1.78 (1.44-2.19)</td>
</tr>
</tbody>
</table>
Table 2. Associations between leaving school with/without qualifications and covariate factors of: child and family background; family violence and child abuse; and adolescent mental health factors.

<table>
<thead>
<tr>
<th>Covariate factors</th>
<th>Left school with qualifications</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No (N=197)</td>
<td>Yes (N=828)</td>
<td>p</td>
<td></td>
</tr>
<tr>
<td><strong>Child and family background</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD) Maternal age at birth of child</td>
<td>23.9 (4.7)</td>
<td>26.4 (4.7)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>% Mother lacked formal educational qualifications at birth of child</td>
<td>72.6</td>
<td>43.4</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>% Child of single parent family</td>
<td>14.2</td>
<td>4.2</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Mean (SD) Family socioeconomic status at birth of child</td>
<td>4.4 (1.2)</td>
<td>3.4 (1.4)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Mean (SD) Averaged family living standards (0–10 years)</td>
<td>3.1 (0.4)</td>
<td>2.8 (0.4)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>% Parental history of illicit drug use (11 years)</td>
<td>35.5</td>
<td>21.8</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>% Parental history of criminality (15 years)</td>
<td>26.3</td>
<td>9.2</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>% Parental history of alcohol problem (15 years)</td>
<td>22.4</td>
<td>9.4</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Mean (SD) Parental attachment score (15 years)</td>
<td>69.2 (11.0)</td>
<td>73.8 (8.6)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Mean (SD) Childhood number of parental changes (&lt; 16 years)</td>
<td>2.8 (3.6)</td>
<td>0.90 (1.9)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Mean (SD) Level of educational expectations for child (16 years)</td>
<td>0.8 (0.9)</td>
<td>1.8 (1.1)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td><strong>Family violence and child abuse</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD) Level of interparental violence (&lt;16 years)</td>
<td>9.9 (2.0)</td>
<td>9.1 (3.3)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>% Regular/severe childhood physical punishment (&lt;16 years)</td>
<td>29.4</td>
<td>14.4</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>% Any childhood sexual abuse (&lt;16 years)</td>
<td>20.3</td>
<td>12.6</td>
<td>0.005</td>
<td></td>
</tr>
<tr>
<td><strong>Adolescent mental health (14-16 years)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Major depression</td>
<td>20.2</td>
<td>10.9</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>% Anxiety disorder</td>
<td>25.3</td>
<td>15.4</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>% Suicidal ideation/attempt</td>
<td>30.0</td>
<td>11.2</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>% Alcohol abuse/dependence</td>
<td>25.3</td>
<td>7.1</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>% Illicit substance abuse/dependence</td>
<td>14.0</td>
<td>1.8</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>% Conduct and oppositional defiant disorder</td>
<td>44.9</td>
<td>9.3</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>% ADHD</td>
<td>21.4</td>
<td>2.6</td>
<td>&lt;.001</td>
<td></td>
</tr>
</tbody>
</table>
Table 3. Odds ratios (95% confidence intervals) and p-values for leaving school without qualifications and mental health problems to age 30: (a) adjusted for child and family background; family violence and child abuse; and (b) adjusted for child and family background; family violence and child abuse; and adolescent mental health problems.

| Outcome                      | (a) Adjusted for child and family background; family violence and child abuse | Significant covariates (p<.05)
|------------------------------|------------------------------------------------------------------------------|-------------------------------|
|                              | OR (95% CI)                     | p                             | OR (95% CI)                     | p                             | Significant covariates (p<.05)
<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Major depression</td>
<td>1.00 (0.72-1.37)</td>
<td>0.984</td>
<td>1.00 (0.72-1.37)</td>
<td>0.984</td>
<td>1,6</td>
</tr>
<tr>
<td>Anxiety disorder</td>
<td>1.50 (1.09-2.04)</td>
<td>0.011</td>
<td>1.35 (0.95-1.90)</td>
<td>0.090</td>
<td>1,6, 12, 13</td>
</tr>
<tr>
<td>Suicidal ideation/attempt</td>
<td>1.11 (0.74-1.65)</td>
<td>0.612</td>
<td>0.86 (0.56-1.33)</td>
<td>0.494</td>
<td>2, 6, 8, 13, 14</td>
</tr>
<tr>
<td>Alcohol abuse/dependence</td>
<td>1.21 (0.91-1.64)</td>
<td>0.189</td>
<td>0.88 (0.64-1.19)</td>
<td>0.403</td>
<td>1, 7, 12, 14, 15, 17</td>
</tr>
<tr>
<td>Illicit substance abuse/dependence</td>
<td>1.71 (1.17-2.51)</td>
<td>0.006</td>
<td>1.35 (0.90-2.02)</td>
<td>0.153</td>
<td>1-3, 6, 8-10, 15, 16</td>
</tr>
<tr>
<td>Any mental health problem</td>
<td>1.27 (0.98-1.63)</td>
<td>0.067</td>
<td>1.02 (0.78-1.33)</td>
<td>0.911</td>
<td>1-4, 6, 13-15, 17</td>
</tr>
</tbody>
</table>

1 Statistically significant covariates (p<.05): gender=1; parental history of illicit drug use (11 years)=2; parental attachment score (15 years)=3; exposure to interparental violence (<16 years)=4; childhood physical punishment (<16 years)=5; childhood sexual abuse (<16 years)=6; averaged family living standards (0–10 years)=7; maternal education at birth of child=8; family type=9; parental history of criminal offending (15 years)=10; educational aspirations=11.

2 Statistically significant adolescent mental health factors (14–16 years) (p<.05): major depression=12; anxiety disorder=13; suicidal ideation/attempt=14; alcohol abuse=15; illicit substance abuse=16; conduct and oppositional defiant disorder=17; ADHD=18.