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The Effects of Single-Sex and Coeducational Secondary Schooling on Children's Academic  
Achievement

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## ABSTRACT

Using prospective data gathered over the course of an 18 year longitudinal study of a birth cohort of 668 New Zealand children, this paper examines the effects of single-sex and coeducational secondary schooling on children's academic achievement. This analysis showed a pervasive tendency for children attending single-sex schools to have greater success in the School Certificate examinations, higher Burt reading scores, greater school retention, less likelihood of leaving school without qualifications and less exposure to unemployment than children attending coeducational schools. These differences were evident for both boys and girls. However, a substantial amount of these differences were explained by pre-entry differences in children's academic, behavioural, social and family functioning. Nonetheless, even after control for selection processes, children attending single-sex schools tended to perform better than their coeducated peers across several educational outcomes, including School Certificate attainment, longer school retention and less exposure to unemployment. Possible explanations for these remaining differences are considered, including school gender composition, school climate and traditions, and the inadequate control for selection and confounding factors.

## INTRODUCTION

Over the past three decades, there has been ongoing debate about the advantages of coeducational and single-sex education for children's socio-emotional and educational development. The origins of this debate lie with the early British findings reported by Dale (1969; 1971; 1974) which suggested that coeducational schools were better placed to meet the social and educational needs of young people (Dale, 1974). Up until this time, there had been a strong tradition of single-sex schooling at the secondary level, with coeducational schools being less common (Cocklin, 1982). However in response to Dale's findings and increasing social concerns about the importance of cross gender socialisation, there was a movement within most Western countries away from single-sex secondary education towards a commitment to coeducational schooling for both boys and girls.

In response to changing patterns of school organisation and strong criticisms of the evidential basis upon which Dale based many of his assertions (Cocklin, 1982; Lee & Bryk, 1986; Marsh, 1989; Schneider, Coutts, & Starr, 1988), there has been renewed interest in the extent to which single-sex and coeducational schools affect children's academic development. Several studies are now available which compare the educational achievement of children attending single-sex and coeducational secondary schools. In general the results of these studies have been inconsistent, with some studies providing support for the benefits of coeducation (Marsh, 1989; Marsh, Smith, Marsh, & Owens, 1988), others supporting single-sex education (Astin, 1977; Lee & Bryk, 1986; Riordan, 1985), and yet others finding no achievement differences between children attending single-sex and coeducational schools (Miller & Dale, 1974; Rutter, Maughan, Mortimore, & Outson, 1979). This issue has been further complicated by claims that school type may have a differential effect on girls and boys achievement, with boys tending to perform better in a coeducational school environment, while girls tend to fare better in a single-sex school environment (Finn, 1980).

A central issue in this area concerns the extent to which reported associations between school type and subsequent attainment reflect a direct cause and effect association, or arise from the spurious effects of selection factors associated with school choice (Irving, 1976; Lee & Bryk, 1986; Marsh, 1989). In particular, it is likely that school choice represents a selective process, with children attending single-sex, and often privately funded schools, tending to be brighter, more motivated and from higher socio-economic backgrounds prior to secondary school entry. A key issue in this debate has therefore focused on the development of research methods that make it possible to estimate differences between single-sex and coeducational schooling after consideration of these selective processes influencing school choice (Irving, 1976; Lee & Bryk, 1986; Marsh, 1989). In the absence of controlled experimental designs in which children are randomly assigned to either single-sex or coeducational schooling, the best means of addressing the role of selection factors in explaining school differences is through the use of a longitudinal research design. Ideally this would involve: a) the long term follow-up of a large and representative sample of children; b) the prospective assessment of a comprehensive range of earlier child cognitive, behavioral and socio-familial factors that may influence school choice and later academic achievement; and c) the assessment of children's academic outcomes as they progress through secondary school. This design permits the estimation of school differences in academic achievement after adjustment for known differences in child, family and social background characteristics evident before secondary school entry (Marsh, 1989).

In this paper we report the results of an 18 year longitudinal study of the effects of school type on children's educational achievement. This study involves the prospective follow-up of an unselected birth cohort of New Zealand children from birth to the point of school leaving. The aims of the study were:

1. To document the effects of school type on a range of educational outcomes, spanning School Certificate attainment, reading performance, sixth form completion, early school leaving, school leaving without educational qualifications and unemployment.

2. To determine the extent to which associations between school type and educational achievement varied with child gender.

3. To fit statistical models to examine the extent to which associations between school type and educational achievement persisted when due allowance was made for a range of selection factors that were associated with school choice and academic achievement. Selection factors included: measures of intelligence, scholastic ability and behaviour problems prior to secondary school entry; measures of social background; measures of parenting and family functioning; and several school related measures.

## METHOD

The data described in this study were collected during the course of the Christchurch Health and Development Study (CHDS). The CHDS is a longitudinal study of an unselected birth cohort of 1,265 children (635 males; 630 females). This cohort comprised all children born in maternity units within the Christchurch urban region over a four month period during 1977. These children have been studied at birth, 4 months, 1 year and annual intervals to age 16 years, and again at 18 years. Data has been collected using a combination of sources, including parent interviews, teacher assessments, medical records, standardised tests and interviews with the children. The variables analysed in this report were measured in the following ways.

### **School Type**

In the New Zealand education system, children enter secondary school in their 9<sup>th</sup> year of school, at around the age of 13 years. Secondary education consists of five form levels (forms 3 to 7), with education being compulsory until 16 years of age.

At ages 14, 15 and 16, children were interviewed at school. For all sample members attending secondary school in the Canterbury region ( $N = 657$ ), the school attended was coded as either a single-sex or coeducational school on the basis of school gender composition. Children who had attended a single-sex school for the first three years (forms 3 to 5) of their secondary school education were classified as having attended a single-sex school (37.6%).

### **Measures of Educational Achievement**

To describe children's educational achievement between the ages of 15 and 18 years a range of outcome measures were identified. These included:

1. **School Certificate attainment.** At age 18, sample members were interviewed at home about the number of School Certificate subjects sat and the number for which an A, B or C grade was obtained. The School Certificate examinations consist of a series of national exams sat by all students in their third year of secondary school. Students typically sit between four and six exam subjects and receive a test score for each subject ranging from A to E. A measure of School Certificate achievement was constructed from the total number of subjects for which the sample member received an A, B or C grade.

2. **Reading ability.** To provide a measure of reading ability, sample members were assessed, at age 18, using a revised version of the Burt Word Reading Test (Gilmore, Croft, & Reid, 1981). Test scores were expressed as the total number of words correctly identified. Test reliability assessed using coefficient alpha was .96.

3. **Completion of the sixth form.** Sample members were interviewed, at age 18, about the highest form level completed at secondary school. Using this information a measure of sixth form completion at secondary school was constructed: 39.6% of the sample did not remain at school for the duration of their sixth form year.

4. **Leaving school before age 17.** Any sample member who had left school before the age of 17 was classified as an early school leaver: 24.2% of the sample had left school prior to age 17.

5. Leaving school without qualifications. Using data gathered at ages 16 and 18 years it was possible to identify sample members who had left school without formal educational qualifications. A total of 19.2% of the sample had left school with no school qualifications.

6. Unemployment for 3 months or longer. At age 16, sample members were also asked about the frequency and duration of any periods of unemployment during the last two years. A total of 12.5% of the sample had been unemployed for three months or longer since leaving school.

### **Selection Factors**

To assess the extent to which associations between school type and subsequent educational achievement could be explained by the effects of selection processes that may be related to both school choice and educational achievement, the following variables were included as covariates in the analysis. All covariate measures were assessed either prior to or at the time of secondary school entry.

#### Individual Factors

1. Scholastic ability. At age 13, children were administered the Test of Scholastic Abilities (TOSCA). The TOSCA is a general purpose test designed to assess “verbal and numerical reasoning abilities deemed to be requisite for success in academic aspects of the ... school curriculum.” (Reid, Jackson, Gilmore & Croft, 1981, p. 4). An account of the construction and validation of this measure has been provided by Reid et al. (1981). The reliability of the test, assessed using coefficient alpha, was .95.

2. Reading comprehension. At ages 10 and 12 years, children were given the Progressive Achievement Test (PAT) of reading comprehension. This test has been designed to provide a test of reading comprehension suitable for New Zealand children. An account of the construction and validation of this test has been given by Elley & Reid (1969). Test scores were expressed as the

number of correct responses made by the child. The reliability of these scores, assessed using coefficient alpha, ranged from .83 to .85.

3. Mathematical reasoning. At age 11, children were given the PAT of mathematical reasoning. This test is designed to provide a measure of the child's mathematical reasoning ability and facility with numerical concepts. An account of the construction and validation of this test has been given by Reid & Hughes (1974). Reliability, assessed using coefficient alpha, was .87.

4. Intelligence. At age 8, sample members were given the revised Wechsler Intelligence Scale for Children (WISC-R, Wechsler, 1974). The full scale was used in the present analysis. The reliability of this score, assessed using split half methods, was .93.

5. Behaviour problems. At age 8, the Rutter A (Rutter, Tizard & Whitmore, 1970) and the Conners (1969) Teacher Rating Scales were completed by each sample member's class teacher. Factor analyses of these scales indicate that they measure two correlated dimensions of child behaviour: a) conduct problems - the extent to which children exhibit antisocial, aggressive and oppositional behaviours in the classroom; and b) attentional problems - the extent to which children exhibit inattentive, hyperactive or distractible behaviours in the classroom (Fergusson, Horwood & Lloyd, 1991). Conduct problems and attentional problems scores were obtained using the unweighted sum of those items loading on each of these two factors. These scores have been shown to be of good reliability, with alpha coefficients ranging from .88 to .95.

### Social Background

1. Maternal age. This was assessed in whole years at the time of the survey child's birth.

2. Maternal education. This was assessed at the time of the child's birth using a three point scale that reflected the mother's highest level of educational attainment. This scale consisted of: 1 = mother lacked educational qualifications; 2 = mother had secondary (high school) qualifications; and 3 = mother had tertiary level (college) qualifications.

3. Family socio-economic status. Family socio-economic status at the time of the child's birth was assessed using the Elley and Irving (1976) scale of socio-economic status for New Zealand. This index ranks families into six levels on the basis of paternal occupation. For this analysis, the scale was collapsed into three levels as follows: 1 = Levels 1, 2 (professional, managerial); 2 = Levels 3, 4 (clerical, technical, skilled); and 3 = Levels 5, 6 (semi-skilled, unskilled, unemployed).

### Parenting and Family Functioning

1. Maternal avoidance of punishment. This index provided a measure of the frequency with which mothers were observed to make punitive responses to the child's behavior during the age 3 assessment interview. The measure was based on the HOME Inventory (Bradley & Caldwell, 1977).

2. Maternal emotional responsiveness. This index provided a measure of the frequency with which mothers were observed to make positive emotional responses to their child during the age 3 assessment interview. The measure was based on the maternal emotional responsiveness subscale of the HOME Inventory (Bradley & Caldwell, 1977).

3. Changes of parents. Comprehensive life history information was collected at annual intervals on changes of parents resulting from parental separation/divorce, death, remarriage or reconciliation (Fergusson, Horwood, & Lynskey, 1992). Information on family change and child placement was recorded for two monthly intervals from birth to 10 years of age. A parental change was counted if a parent left or entered the family home as a result of parental separation/divorce, death, remarriage or parental reconciliation.

4. Parental conflict. Parents were questioned annually on three items describing the quality of marital relations over the last 12 months. These items were: a) whether the parents had engaged in prolonged arguments; b) whether the child's mother reported being assaulted by her spouse; and c) whether the child's mother reported experiencing sexual difficulties. These items were combined

to produce a scale measure of the extent to which sample members were exposed to parental conflict in the period from birth to 10 years (Fergusson, et al., 1992).

### School Factors

1. Number of schools attended. At each assessment, mothers were questioned about the school their child was currently attending. On the basis of this information, a measure of the total number of schools attended between the ages of 5 and 10 years was constructed.

2. Source of school funding. At ages 14, 15 and 16 years, the type of secondary school attended was coded as either state funded or non-state funded (private). Non-state funded schools included both church and fully privately funded secondary schools.

### **Sample Attrition and Bias**

Although the CHDS is based on a birth cohort of 1,265 children, the analyses reported in this paper were based on a sample of 657 children. There were two reasons for the decrease in sample size. First, this analysis was confined to children attending a secondary school within the Canterbury region since school and educational testing data were only available for these children. Secondly, over the period of the study, there was some attrition as a result of subject refusal (N=83), outmigration from New Zealand (N=135), and death (N=20). By age 18, the original cohort was reduced to 1,025 subjects, with these subjects representing 81.0% of the original sample and 92.3% of the sample still resident in New Zealand.

The substantial reduction in sample size raises the possibility that the present results may have been influenced by the effects of non-random sample bias. A comparison of the family backgrounds of children included with those excluded from this study showed small but significant between group differences with respect to maternal age, socio-economic status, family type and ethnicity measured at birth. No significant between group differences were found for maternal education, birth order or child gender. In general, these results suggest that the present sample is

under representative of Maori and Pacific Island children, and children from disadvantaged family backgrounds. Previous evaluations of the effects of sample attrition on study findings using statistical correction methods have shown that these small biases do not materially threaten the validity of results (for example, Fergusson, Horwood & Lynskey, 1997; Fergusson & Lloyd, 1991).

## RESULTS

### **School Differences in Educational Achievement**

Table 1 shows the cohort divided into two groups: (1) children who attended a single-sex secondary school for at least 3 years (37.6%); and (2) children who attended a coeducational school for all or part of their secondary education (62.4%). These groups are compared on a series of educational outcomes including; the number of subjects passed in the School Certificate examination, reading ability, sixth form completion, early school leaving, leaving school without qualifications and exposure to unemployment following school leaving. Each comparison was tested for statistical significance using the chi squared test of independence for dichotomous variables and the t test for independent samples for continuously distributed variables.

The Table shows a pervasive tendency for children attending single-sex schools to attain higher levels of educational achievement than their coeducated peers. Specifically, children from single-sex schools had greater success in the School Certificate examinations ( $p < .0001$ ), obtained higher Burt reading test scores ( $p < .0001$ ), were less likely to leave school early ( $p < .0001$ ) or without qualifications ( $p < .0001$ ), and were less likely to have been unemployed by the age of 18 years ( $p < .001$ ) compared to children from coeducational schools. These achievement differences were evident for both boys and girls.

To examine possible gender differences in the effects of school type on academic achievement, the analyses in Table 1 were extended to include gender as a factor and tests of school

type by gender interactions were conducted. For continuous variables, a 2 x 2 analysis of variance was used, whilst for dichotomous variables logistic regression models were fitted. Across all educational outcomes, no significant interactions were found between school type and child gender.

INSERT TABLE 1 HERE

### **The Relationship between School Type and Measures of Scholastic Ability, Behaviour, Family Background and School Characteristics**

Although the results in Table 1 suggest that single-sex schooling was associated with improved educational outcomes for both boys and girls, it is possible that these differences may reflect selection processes associated with school choice and subsequent academic achievement. Table 2 shows the relationships between school type and a range of scholastic, behavioural, social background and family functioning factors measured prior to secondary school entry. Children attending single-sex and coeducational schools were also compared on two school related factors, including the number of school changes experienced in their primary school years and the source of secondary school funding (state funded or privately funded).

The Table shows that school choice was associated with a wide range of pre-entry academic, behavioural, social and family functioning factors. Specifically, compared to children entering coeducational schools, single-sex school children:

a) Performed consistently better across a wide range of intelligence and scholastic ability tests measured during middle childhood and early adolescence. These measures included: the TOSCA scholastic ability test at age 13 ( $p < .0001$ ); the PAT reading comprehension test at ages 12 ( $p < .0001$ ) and 10 ( $p < .0001$ ); the PAT maths test at age 11 ( $p < .0001$ ); and the WISC-R test at age 8 years ( $p < .0001$ ).

b) Had lower rates of teacher reported attentional ( $p < .0001$ ) and conduct problems ( $p < .001$ ) in the classroom at age 8 years.

c) Were more likely to come from social backgrounds characterised by older mothers ( $p < .01$ ), higher maternal educational achievement ( $p < .0001$ ) and higher socio-economic status ( $p < .0001$ ).

d) Had been exposed to less family dysfunction during the preschool and middle childhood years, including; more positive ( $p < .05$ ) and less punitive mother-child interactions ( $p < .001$ ), fewer parental changes ( $p < .0001$ ) and less family conflict ( $p < .01$ ).

In addition, children from single-sex schools had experienced fewer school changes during their primary years ( $p < .001$ ) and were more likely to be attending a non-state or privately funded secondary school ( $p < .0001$ ).

INSERT TABLE 2 HERE

### **The Relationship between School Type and Academic Achievement after Adjustment for Selection Factors**

The results in Table 2 suggest that secondary school entry was a selective process that was related to child cognitive ability, classroom behaviour and family characteristics. It could therefore be suggested that the associations found between school type and academic achievement may reflect this selective process rather than the direct causal effect of school type on educational outcomes. To take into account the effects of selection on the relationships between school type and academic outcomes, the data were reanalysed using regression methods. For continuous outcome variables linear regression models were fitted to the data and for dichotomous variables logistic regression models were fitted. Model fitting was conducted using forward and backward variable elimination to identify the most parsimonious and best fitting model. The covariate adjusted means or probabilities were then computed using the parameters of the regression models

to estimate the adjusted relationship between academic outcomes and school type. An account of this method is provided by Lee (1981).

The results of this analysis are presented in Table 3 which shows: a) the covariate adjusted relationship between school type and educational outcomes; b) the significance of the association; and c) the covariate factors that were significant in each analysis. Findings show that:

a) In all cases, control for selection or confounding factors substantially reduced the strength of the association between school type and measures of educational achievement. For example, before adjustment for selection factors, children in coeducational schools were 5.6 times more likely to leave school without qualifications compared to children from single-sex schools. After adjustment for selection and confounding factors, these children were only 1.7 times more likely to leave school without qualifications. Nonetheless, even after control for selection, small but consistent achievement differences were found between the two groups, with coeducational school pupils having lower mean pass rates in School Certificate ( $p < .0001$ ) more frequently leaving school early ( $p < .05$ ) and without qualifications ( $p < .05$ ), and having higher subsequent rates of unemployment ( $p < .01$ ).

b) The significant covariates spanned a range of socio-familial (maternal age, educational qualifications, socio-economic status and punitive mother-child interaction), cognitive ability (TOSCA, PAT and WISC-R test performance), behavioural (conduct and attentional problems) and school (school changes and secondary school funding source) factors.

INSERT TABLE 3 HERE

## DISCUSSION

In this study we have examined the effects of single-sex and coeducational secondary schooling on academic achievement in a cohort of New Zealand children studied to the age of 18 years. The major purpose of the study was to address the issue of school type effects on academic achievement, and the extent to which apparent school differences could be explained by selection processes determining school choice. The findings and implications of the study are reviewed below.

### **Associations Between School Type and Academic Achievement**

The present study showed evidence of a pervasive tendency for children attending single-sex schools to obtain higher levels of educational achievement compared to children attending coeducational secondary schools. These differences in achievement were reflected in a range of educational outcomes including; School Certificate attainment, reading ability at age 18, sixth form completion, early school leaving, leaving school without educational qualifications and exposure to unemployment. These differences were evident for both males and females in the cohort.

### **The Role of Selection Factors**

Whilst these results suggest quite substantial academic advantages for children attending single-sex schools compared to children attending coeducational school, subsequent analyses also showed that school choice was associated with a number of individual, family and social factors. Importantly, prior to entry into secondary school, single-sex school pupils differed from their coeducated peers in a variety of ways. Those attending single-sex schools tended to be more academically able, had fewer classroom behaviour problems, and were more likely to come from a family background characterised by relative social advantage, positive mother-child interaction and marital stability. These differences clearly suggest that entry into a single-sex school was a

selective process in which those attending single-sex schools tended to be more academically able, had better social adjustment and were more socially advantaged.

Statistical control for the effects of child and family characteristics that differentiated between single-sex and coeducational school children revealed that a substantial component of the association between school type and children's educational achievement could be explained by the academic and social advantages of single-sex educated students prior to secondary school entry. However even after control for selection and confounding factors, children in single-sex schools had significantly higher rates of achievement in the School Certificate examinations, longer school retention and less exposure to unemployment compared to children in coeducational schools.

The role of selection factors in explaining the associations between school type and educational achievement can be illustrated by comparing the unadjusted and adjusted risks of leaving school without educational qualifications. Before adjustment for the effects of selection, children attending coeducational schools were 5.6 times more likely to leave school without formal educational qualifications. However, after adjustment for the effects of selection, this risk ratio was reduced to 1.7. This result clearly illustrates the point that a substantial component of the association between school type and academic achievement can be explained by differences in children's intellectual ability, classroom behaviour and family backgrounds evident prior to secondary school entry.

### **The Unexplained Association**

Several possible explanations could account for the general tendency for pupils attending single-sex schools to have better educational outcomes than pupils attending coeducational schools even after adjustment for the effects of selection. First, as proposed by Lee & Bryk (1986) differences in educational outcomes across the two school contexts may reflect the social and gender climates found in single-sex and coeducational schools, with single-sex schools offering fewer opportunities during school time for cross-gender interaction that could potentially interfere

with children's academic development. Some support exists for this proposition in the work of Caspi, Lynam, Moffitt, and Silva (1993) who found that early maturing girls in New Zealand coeducational schools were at greater risk of delinquency than early maturing girls in single-sex schools. More generally, problem behaviours such as stealing, drug use, frequent sexual intercourse and fighting were also less common amongst girls enrolled in single-sex schools compared to girls enrolled in coeducational schools. Rutter et al. (1979) also found delinquent behaviours to be more normative in coeducational schools. These findings suggest that, at least for adolescent girls, the social composition of coeducational schools may expose children to greater social and sexual pressures and opportunities that may impede their educational achievement. In addition, a randomised control trial of single-sex and mixed-sex mathematics classes at Ballarat High School found that students in single-sex classes showed consistently higher gains in confidence over time, with confidence being a significant predictor of achievement (Rowe, 1988).

Alternatively, it is possible that the apparent educational advantages of single-sex schooling over coeducational schooling may reflect other school based factors that are also associated with academic achievement. In particular, it is possible that the higher attainment of those in single-sex schools may not reflect the school's gender mix, but rather aspects of school climate that: a) are more common in single-sex schools; and b) also encourage academic success. For example, fundamental differences may exist between coeducational and single-sex schools in terms of: the emphasis placed upon academic excellence; teacher attitudes; class sizes; school competitiveness; resources; school policies regarding discipline and control; and other school related factors.

Finally, it should be borne in mind that the apparent differences between children in single-sex and coeducational schools may reflect the presence of selection factors that have not been adequately controlled in the present study. Whilst we have attempted to take into account a wide range of academic and socio-familial factors associated with school choice, it is possible that other selection factors may exist that have not been adequately represented in this analysis.

## Conclusions

The results of this 18 year longitudinal study suggest three general conclusions about the relationship between school type and educational achievement for this cohort. First, there were general and pervasive tendencies for children attending single-sex schools to have greater success in the national School Certificate examinations, higher Burt reading scores, greater school retention, less likelihood of leaving school without qualifications, and less exposure to unemployment. These achievement differences were evident for both boys and girls. Second, a substantial amount of the difference between the achievement of children in single-sex and coeducational schools was explained by differences in child ability, school behaviour and family functioning prior to secondary school entry. Third, even after control for selection processes, there were small but consistent tendencies for single-sex pupils to outperform their coeducational peers. The origins of these differences remain unexplained and may reflect: a) the benefits of single-sex education; b) the school climate and traditions found in single-sex schools; and/or c) the inadequate control of selection and confounding factors. Whilst it is not possible to distinguish between these two accounts, the findings of the present paper clearly suggest that further study of the differences between single-sex and coeducational schools may be justified.

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Table 1. Academic achievement at age 18 years by school type.

	Type of secondary school		p <sup>1</sup>
	Coeducational	Single-Sex	
<b>Females</b>	(N = 200)	(N = 133)	
Mean number (SD) of School Certificate subjects with grade C or better	2.89 (2.21)	4.65 (1.69)	<.0001
Mean (SD) Burt word reading score	96.32 (12.50)	101.84 (9.61)	<.0001
% Completed sixth form	55.5	84.2	<.0001
% Leaving school before age 17 years	30.0	7.5	<.0001
% Leaving without school qualifications	24.5	3.0	<.0001
% Unemployed 3 months or longer	18.0	5.3	<.001
<b>Males</b>	(N = 209 )	(N = 115)	
Mean number (SD) of School Certificate subjects with grade C or better	2.37 (2.16)	4.39 (1.91)	<.0001
Mean (SD) Burt word reading score	94.33 (15.99)	100.29 (9.76)	<.0001
% Completed sixth form	47.4	74.8	<.0001
% Leaving school before age 17 years	33.0	11.3	<.0001
% Leaving without school qualifications	29.7	7.0	<.0001

	Type of secondary school		p <sup>1</sup>
	Coeducational	Single-Sex	
% Unemployed 3 months or longer	16.7	7.0	<.05
<b>Total Sample</b>	(N = 409 )	(N= 248)	
Mean number (SD) of School Certificate subjects with grade C or better	2.63 (2.19)	4.53 (1.80)	<.0001
Mean (SD) Burt word reading score	95.30 (14.42)	101.13 (9.69)	<.0001
% Completed sixth form	51.3	79.8	<.0001
% Leaving school before age 17 years	31.5	9.3	<.0001
% Leaving without school qualifications	27.1	4.8	<.0001
% Unemployed 3 months or longer	17.4	6.0	<.001

<sup>1</sup> p-values for comparison of means based on t test for independent samples, p-values for comparison of proportions based on chi squared test of independence.

Table 2. Relationship between school type and measures of child characteristics, social background, family functioning and school factors prior to secondary school entry.

Measure	Type of secondary school		p <sup>1</sup>
	Coeducational	Single-Sex	
<b>Individual Factors</b>			
Mean (SD) TOSCA scholastic ability test score (13 years)	32.04 (15.00)	40.63 (13.26)	<.0001
Mean (SD) PAT reading comprehension test score (12 years)	12.13 (4.96)	14.62 (4.04)	<.0001
Mean (SD) PAT maths test score (11 years)	23.72 (7.27)	28.07 (6.29)	<.0001
Mean (SD) PAT reading comprehension test score (10 years)	9.32 (6.78)	13.10 (6.70)	<.0001
Mean (SD) WISC-R Total IQ Scores (8 years)	100.05 (13.12)	107.21 (14.82)	<.0001
Mean (SD) teacher rated attention problems score (8 years)	9.64 (3.40)	8.87 (2.68)	<.0001
Mean (SD) teacher rated conduct problems score (8 years)	22.79 (5.19)	21.71 (3.45)	<.001
<b>Social Background</b>			
% Mother aged <21 at birth of child	14.9	7.2	<.01
% Mother had no formal educational qualifications	57.8	37.5	<.0001

Measure	Type of secondary school		p <sup>1</sup>
	Coeducational	Single-Sex	
<b>Parenting and Family Functioning</b>			
% In highest sextile of avoidance of punishment score (3 years)	19.0	9.0	<.001
% In lowest quartile of maternal emotional responsiveness score (3 years)	28.0	20.4	<.05
% Experienced parental changes (birth-10 years)	30.3	17.1	<.0001
% In highest quintile of family conflict score (birth-10 years)	26.9	15.8	<.01
<b>School Factors</b>			
Mean (SD) number of schools attended	1.51 (.94)	1.37 (.66)	<.0001
% Children attending state schools	90.6	53.2	<.0001

Table 3. Academic achievement at age 18 years by school type after adjustment for covariate factors (total sample).

	Type of secondary school			Significant <sup>1</sup> Covariates
	Coeducational (N=382)	Single-Sex (N=228)	p	
Mean number of School Certificate subjects with grade C or better	3.06	4.00	<.0001	1,2,4-7,9
Mean Burt word reading score	97.6	97.8	>.80	4-7
% Completed sixth form	60.0	68.8	<.10	1,2,4,5,11,12
% Leaving school before age 17 years	25.1	15.4	<.05	1,2,5,8,11,12
% Leaving without school qualifications	19.5	11.6	<.05	1,5,6,8,10, 12
% Unemployed 3 months or longer	15.8	7.5	<.01	3,9,12

<sup>1</sup> Significant covariates: 1 = maternal age, 2 = maternal educational qualifications, 3 = family socio-economic status, 4 = maternal avoidance of punishment, 5 = scholastic ability (13 years), 6 = reading ability (12 years), 7 = maths ability (11 years), 8 = IQ performance (8 years), 9 = attentional problems (8 years), 10 = conduct problems (8 years), 11 = number of schools attended, 12 = source of school funding.