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Sue Fullarton
ACER

Maurice Walker
ACER

John Ainley
ACER, john.ainley@acer.edu.au

Kylie Hillman
ACER

Longitudinal Surveys of Australian Youth

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Patterns of Participation in Year 12

Sue Fullarton, Maurice Walker, John Ainley, Kylie Hillman

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EXECUTIVE SUMMARY

Over the past 20 years there have been significant changes to the levels of participation in the senior secondary years of schooling in Australia. The percentage of students remaining to the final year of schooling rose from 35 per cent in 1980 to just over 73 per cent in 2001 (following a peak of 77 per cent in 1992). Since the Finn review of post compulsory education and training in 1992 there has been a push in educational policy to encourage young people to complete Year 12 or its vocational equivalent. Recent research has shown that those who obtain a Year 12 qualification or its vocational equivalent are more likely to continue their involvement in education and training, gain employment-related skills and generally fare better in the labour market compared to those who do not complete Year 12 or its equivalent.

Data gathered from a large nationally representative sample of young people who participated in Year 12 in 2001 provides the basis for the analysis of subject participation in this report. Information from their final year was linked to the accumulation of information about their educational and social background obtained as they progressed from Year 9. In addition, patterns of participation observed in this cohort of young Australians are compared with patterns observed in previous cohorts. The report also makes use of data from six cohorts of students who reached Year 12 from the late 1970s through to 2001 to examine changes in participation in Year 12 and influences on participation. Longitudinal data can make a distinctive contribution to understanding patterns of participation and subject selection in Year 12. Data on participation can be linked to information on student background characteristics collected at an earlier time and also to information about the schools they attended.

Participation in Year 12

The focus of this report is on participation in the final year of school. At present a little less than three-quarters of young Australians remain at school to Year 12. This report documents the differences in Year 12 participation rates between males and females (the gap is about ten percentage points in favour of females), socioeconomic background (the gap between the highest and the lowest of six socioeconomic groups in 2001 is 15 percentage points), cultural background (the participation rate for those of a non-English speaking background is about eight percentage points higher than other students) and earlier school achievement (the gap between the highest and lowest of four achievement groups is 31 percentage points). There are also differences associated with school sector (the gap between independent and government schools is 14 percentage points) and location (the gap between metropolitan and non-metropolitan home locations is eight percentage points). Multivariate analyses indicate that there are net effects of earlier achievement, gender, socioeconomic background and cultural background. There are also net differences between school sectors and between metropolitan and non-metropolitan locations.

As well as documenting these differences in participation for the group entering Year 12 in 2001, the report examines changes in those differences over time and the net effects of student and school background characteristics on participation. The comparisons over time indicate that many of the observed differences between groups in Year 12 participation declined during the expansion of the 1980s but remained stable from 1992 onwards.

The indicators of participation in Year 12 in this report are based on following the progress of individual students from Year 9. These indicators provide a different perspective than apparent retention rates. Apparent retention rates are computed as the ratio of the full-time enrolment in Year 12 to the enrolment in an earlier Year level, and are not able to take account of students who repeat a year, who are enrolled on a part-time basis or who transfer between states or sectors.

Subject Enrolment Patterns in Year 12

The subjects that students choose to study in their senior secondary years have an influence on their educational and career options after they leave school. Subject selection thus involves issues of equity between various social groups. Students from particular backgrounds are more likely to participate in courses that are avenues to higher education and the professions and students from other socioeconomic or ethnic backgrounds are more likely to participate in subjects or courses that lead either directly into vocational education and training or into the workforce without any further formal education or training.

Among the cohort of students who participated in Year 12 in 2001, four key learning areas accounted for 71 per cent of subject enrolments: 20 per cent in English, 17 per cent in mathematics, 20 per cent in studies of society and environment and 14 per cent in the sciences. The largest of the four remaining key learning areas was technology with 14 per cent of enrolments followed by the arts with 8 per cent, health and physical education with 5 per cent and languages other than English with just 2 per cent.

Differences associated with gender, earlier achievement and social background are evident in the patterns of subject participation. Males are more likely than females to be enrolled in advanced mathematics, physics, chemistry, technical studies and computer studies. Females are more likely than males to be enrolled in arts and home sciences. Students with higher levels of earlier achievement (even after allowing for the effect of other related influences), as well as those with aspirations to higher education, were more likely than other students to be enrolled in advanced mathematics, chemistry and physics. Their peers of lower earlier achievement levels were more likely to be enrolled in technical studies, computer studies and home sciences. Students from higher socioeconomic backgrounds were more likely to be enrolled in advanced mathematics, physics and chemistry and those from low socioeconomic status backgrounds were more likely to be enrolled in technical studies, computer studies, arts and home sciences. Those with an Asian background were more likely than any other cultural group to enrol in advanced mathematics, chemistry and physics.

There are three indications of a broadening of student subject selections during the past decade. The first was in the distribution of enrolments across key learning areas. In the early 1990s the four largest key learning areas (English, mathematics, society and environment and the sciences) accounted for 76 per cent of enrolments but by 2001 those areas accounted for only 71 per cent of all subject enrolments. The second was a trend towards increasing enrolments in vocationally oriented studies. Over the period from 1990 to 2001 there have been declines in the humanities and social sciences, the biological sciences and the physical sciences. There has been growth in computer studies and technical studies, as well as the arts. Within economics and business there has been a substantial shift away from subjects such as economics and accounting and towards subjects such as business studies, although overall enrolments have remained steady. The third indication of broadening subject selections has been a decline in the proportion of students taking two subjects from traditional areas of specialisation: two mathematics subjects, the combination of physics and chemistry and two subjects from the humanities and social sciences field.

The Final Year of Secondary School

The final year of secondary school is important both as an outcome of earlier school experiences and as the foundation for future study and work. Patterns of participation in that year changed during the 1980s during a period of expansion, and stabilised during the 1990s. However, even during that period of stability of levels of participation there were changes in the subjects studied by Year 12 students. It is important to continue to monitor changes in these patterns over future years.

1. INTRODUCTION

PARTICIPATION IN EDUCATION AND TRAINING

One of the most significant changes in Australian education during the last two decades has been the increase in the percentage of students who remain at school to complete secondary school: rising from 35 per cent in 1980 to just over 73 per cent in 2001 (following a peak of 77 per cent in 1992) (ABS, 2002). Since the Australian Education Council review of post compulsory education and training in 1992 (known as the Finn review), there has been a broad commitment in Australia to achieve high levels of participation in Year 12 at school or its equivalent in vocational education and training (AEC, 1992). That review set a participation target to be achieved by 2001: 95 per cent of 19-year-olds should have participated in Year 12 or an equivalent vocational course. In 2001, the report from the Youth Pathways Action Plan Taskforce reiterated the view that all young people should have the opportunity to complete 12 years of schooling or its vocational equivalent (Eldridge, 2001). These views reflect an understanding that completion of secondary school is important in providing young people with wider opportunities for further study and employment.

Within this general increase in participation in Year 12 there exist differences associated with student characteristics such as gender, social background, language background and residential location. In addition there are differences associated with the achievement levels that young people have acquired prior to the time when they decide whether to continue at school or leave. There are also differences in the extent of participation in Year 12 among States, school sectors and even among individual schools.

Apparent retention rates computed from enrolment statistics provide one measure of the proportion of students who remain at school until the final year. These are computed as the ratio of the full-time enrolment in Year 12 to the enrolment of the same cohort in an earlier Year level (typically the start of secondary school). Interpretation of this indicator is limited, however, as an apparent retention rate is not able to take account of students who repeat a year or who are enrolled on a part-time basis. It can provide separate estimates for males and females but cannot be linked readily to other student characteristics. Transmigration and transfers affect estimates of values for jurisdictions and sectors.

PARTICIPATION IN LEARNING AREAS

The subjects that students choose to study in their senior secondary years have a major influence on their educational and career options after they leave school. Multi-level analysis of curriculum choice and outcomes and analyses of patterns of course enrolment have shown that senior school subject participation leads to differences in access to higher education, vocational education and training, and labour market choices (Lamb & Ainley, 1999; Lamb & Ball, 1999). The selection of subjects can be seen as involving issues about equity between various social groups, with students from particular backgrounds more likely to participate in courses that are avenues to higher education and the professions and students from other socioeconomic or ethnic backgrounds more likely to participate in subjects or courses that lead either directly into vocational education and training or into the workforce without any further formal education or training.

USING LONGITUDINAL DATA

Longitudinal data, such as those from the *Longitudinal Surveys of Australian Youth* (LSAY), can make a distinctive and significant contribution to understanding patterns of participation and subject selection in Year 12 and changes in those patterns over time. Data about participation and subject selection in Year 12 can be linked to information on student background characteristics collected at an earlier time (rather than by asking people to recall their educational histories) and to information about the schools they attended. These data facilitate causal analyses because the influence of each variable of interest can be isolated from

confounding influences. In addition the progress of each individual through school can be used as a basis for developing statistical indicators of participation. The data can also be used cumulatively to compute whether a person "ever" participated in Year 12, thus allowing for people who may have left school and returned or delayed their progress through school. The capacity to control for the impact of background characteristics and the ability to measure change over time are key features of longitudinal data (OECD, 2000).

LSAY involves initial contact in mid secondary school (currently Year 9). Year 9 is the penultimate year of compulsory schooling for most young Australians. Although it is clear that many factors affecting educational participation operate before then, Year 9 represents a stage at which the full population range is still at school. At that time, extensive background information about the students and their school achievements are gathered from the students. Information about the schools that they attend is also collected. The current LSAY samples are sufficiently large (around 14,000 students from 300 schools) to provide considerable statistical power. Furthermore, because LSAY is multi-wave with new cohorts being sampled periodically, examination of the extent to which relationships among variables change over time is possible. This report makes use of data from cohorts who reached Year 12 typically in 1978, 1982, 1987, 1992, 1998 and 2001 (the earlier samples were age-based rather than Year-based). The report examines changes in participation in Year 12 from 1980 to 2001, and changes in the influences on participation. It also examines the subject choices made by students, the influences on subject participation, and the trends and patterns of subject participation over the last decade.

ORGANISATION OF THE REPORT

The following two chapters provide background material for the rest of the report. Chapter 2 provides definitions and measures of participation. Chapter 3 discusses the data that were used, methods of analysis and the variables that were used to examine influences both on participation and on subject selection.

The substantive analyses in this report are then organised into four chapters. The first of these, Chapter 4, updates previous LSAY reports on Year 12 participation (notably Research Reports 1, 13 and 17), examining both patterns of participation and influences on participation in Year 12.

Chapter 5 examines subject selection, updating LSAY Research Report 15, as well as earlier analyses by Ainley, Robinson, Harvey-Beavis, Elsworth & Fleming (1994) and Ainley, Jones & Navaratnam (1990). Patterns of participation in subject areas are examined by gender, school sector, parents' occupational level, parents' birthplace, achievement, home location, and aspirations to higher education. These measures are similar to those used in previous reports.

The third of the substantive chapters, Chapter 6, uses multivariate analyses to examine influences on subject selection. Influences on enrolments in mathematics (at three levels: basic, intermediate and advanced), physical science (including physics and chemistry separately) and biological science, humanities and social sciences, economics and business, technical studies, computing and the arts are discussed. These discussions are based on the estimates obtained from analyses of models of participation in these subject areas, specifying the following influences: gender, achievement (combined literacy and numeracy), occupational and educational background, aspirations, ethnicity, location, and school sector.

Chapter 7 examines trends in subject participation, reporting on subject areas where there has been growth, as well as subject areas where there has been decline, over the period from 1990 to 2001. In addition to providing a national perspective on trends in participation in subject areas, this chapter also provides information on changes in the extent to which students specialise in areas and changes in relationships between subject participation and two aspects of student background: gender and socioeconomic background.

The final chapter, Chapter 8, provides an overview of patterns and trends in participation in Year 12 and in subject selection by students over an important period in Australia's educational history.

2. DEFINITIONS AND MEASURES OF PARTICIPATION

For a considerable time Australian education systems have been concerned with increasing the participation of young people in postcompulsory education and training. This policy direction has been predicated on the evidence in the literature that there is link between the knowledge and skills that education and training can provide, the material and other benefits that accrue to individuals who participate in that education and training, the benefits to organisations that employ those individuals, and national well being. In recent years the National Goals for Schooling adopted by the Ministerial Council on Education, Employment Training and Youth Affairs have embodied this belief in the goal that states: *all students have access to the high quality education necessary to enable the completion of school education to Year 12 or its vocational equivalent and that provides clear and recognised pathways to employment and further education and training* (MCEETYA, 1999).

Accompanying the pursuit of higher levels of educational participation has been an ongoing process of monitoring levels of participation in the postcompulsory years of school and equivalent forms of education and training. The OECD report entitled *transition from initial education to working life* argued for the importance of "well designed monitoring tools such as statistics, indicators and longitudinal surveys" that reflected interactions among different forms of educational provision (OECD, 2001). The more varied patterns of post-school education and training activities provide an imperative for some measures that focus on combinations of activities as well as, but certainly not instead of, program or institution specific measures.

This report focuses on participation in the final year of secondary school and participation in the various learning areas available in the final year of secondary school. Senior secondary school is the most populous form of education and training in the two years beyond Year 10 involving almost three quarters of each cohort of young people. In its focus on school participation this report complements other reports in the series that focus on various forms of vocational education and training (Ball & Lamb, 2001; Fullarton, 2001) and participation in the work force for those who have left school (McMillan & Marks, 2003). Cohort reports from the series provide a profile of participation in educational and training activities for a cohort in each survey year.

DEFINITIONS OF PARTICIPATION

Individual participation

At an individual level participation in a form of education or training at a particular level is a dichotomous classification. At individual level there are issues concerned with whether one is concerned with participation at a particular time, at any point over a time span (such as a year), or at any time up to a particular age (often up to the age of 19 years). The fact that the classification is typically dichotomous has consequences for the forms of analysis that are appropriate. Participation can also be represented as an ordinal measure representing the highest level of education on a scale such as the Australian Standard Classification of Education (ASCED) (ABS, 2001).

Aggregate participation rates

Participation can also be conceptualised as a property of groups where it is defined as the proportion of a defined population that is participating, or has participated, in a given level or form of education or training. Indicators of participation at a group level depend on estimating the proportion (or percentage) of a defined cohort (a year level or an age group) that is participating at a given level or stage (eg Year level) in a specified form of education or training (eg school, university, vocational education, apprenticeship). In much published literature

participation is discussed as a property of groups but in analyses of the factors that influence participation it is typically the individual dichotomous measure that is used.

Participation or completion

Participation is defined as taking part in, or having taken part in, a particular form of education or training. It does not necessarily refer to the successful completion of the education or training that results in some form of accreditation. A person who commences a university course but withdraws after one year is recorded as having participated in university but not as having completed the course. Some students withdraw from Year 12 during the course of the year so that the point at which participation is measured can result in different estimates (between, for example, February, July and November). There is also a difference in whether one measures participation in the final year of school or completion of the final year of school (in the sense of obtaining a recognised certificate). This issue is complicated because of differences among jurisdictions in definitions of completion and the award of certificates.

Cumulation or point in time

Participation can be defined in terms of whether a person participated in an educational program at a particular time or at any time up to a given time. The latter is often expressed in terms such as "ever participated in Year 12". For example one could define Year 12 participation from among those who were in Year 10 in 1999 by reference to data for 2001 or for any point up to and including 2003 (thus including those who might have left and returned). Similarly completion could be defined in terms of the minimum time to complete or any time up to a given age or stage. The two definitions imply different data requirements. Point-in-time participation can be estimated from cross-sectional or enrolment data but cumulation requires either data collected over time from the same individuals or retrospective data based on recall.

Combination or multiple classifications

Participation can be defined in terms of a single form of education (such as Year 12 at school) or a combination. Combinations can be, and most often are, defined by the "or" operand such as when reference is made to participation in "Year 12 or its vocational equivalent". Combinations can also be defined by the "and" operand such as when reference is made to those who participate in Year 12 and a course of recognised vocational education. Obtaining measures of combination or multiple definitions requires more detailed data than measures of single forms of participation. When a number of different activities are combined to give an overall index there is sometimes little variation over time or across jurisdictions. The measure "fully-active" youth which combines involvement in full-time or part-time study or work or a combination of these activities shows almost no change over the past 20 years even though there has been substantial change in each of the components (ABS, 2002b).

Participation Targets

Sometimes participation is measured in relation to whether or not targets have been attained. One set of targets was the set defined by the Australian Education Council (AEC) Review of Postcompulsory Education and Training (AEC, 1991). One of these targets was that by 2001, 95 per cent of 19-year-olds should be participating in Year 12, have completed Year 12, have completed Years 10 or 11 and be participating in some formally recognised education and training, or have completed Years 10 or 11 and some formally recognised education. Such a target articulates an aspiration and establishes a basis of equivalence of participation in different forms of education and training. However, as a measure of participation the targets are not clearly justified as appropriate and result in an artificial dichotomy in a situation where there are gradations of attainment.

MEASURES OF PARTICIPATION BASED ON ENROLMENT DATA

Measures of participation are designed to represent the extent to which people take part in various forms and levels of education. Many properties of those measures differ according to whether they are derived from aggregated enrolment statistics or unit-record data. Most of the following discussion focuses on participation in the final year of secondary school. It is common to refer to the percentage of a cohort (however defined) that remains at school to the final year as the retention rate.

Measures derived from aggregated enrolment statistics are the most commonly used indicators of participation in Year 12. These measures have the advantage of being based on data for the whole population and not being subject to the sampling errors associated with survey data. However, they have limitations that arise because the data do not necessarily refer to the same individuals tracked over time and therefore any estimates of the size of the parent cohort are potentially biased. They also require explicit decisions about the inclusion or exclusion of overseas students and part-time students[1]. Moreover because they are based on group data, which cannot readily be linked to other student characteristics it is difficult to relate these measures to student and school characteristics.

Measures based on year-level cohorts: apparent retention rates

Measures based on year-level cohorts are intended to reflect the flow of students through a school system. Apparent retention rates are perhaps the most widely cited measure of participation and are readily constructed from enrolment data. They are ratios of the enrolments in Year L for a given year to the enrolments in Year M for a preceding year corresponding to the normal progress of that cohort through school that is (L-M) years previously. For that reason retention rates are best thought of as enrolment ratios.

Retention rates based on the first year of secondary school

It has been common to focus most attention on retention to the final year of school (Year 12) and to take as the base enrolment the first year of secondary school (Year 7 or Year 8 depending on the jurisdiction). Apparent retention rates are well established, conceptually simple and easy to compute. At a national level apparent retention rates provide a valuable perspective on trends over time. They have been documented through Australian Bureau of Statistics publications since 1967. There are some issues concerned with possible changes in the numbers of people returning to school who were not part of the parent cohort (including adults), in the numbers of people pursuing education at this level other than through schools (including home schooling) and in the numbers of part-time enrolments. However the impact of those issues is relatively small and can be handled by defining the scope of the indicator. The major issue in the use of apparent retention rates concerns application to jurisdictions, school sectors and individual schools. Estimates of retentivity for jurisdictions can be biased by migration between states (providing an over-estimate for states where there is net immigration and an under-estimate for states where there is net emigration). The transfer of students between sectors similarly biases estimates for school sectors, providing an over-estimate for non-government schools and an underestimate for government schools. Apparent retention rates are seldom applied to individual schools but where they are used it is often possible to use school records to estimate an "internal retention rate" that only includes students who were in the school from the beginning of the period under consideration (Ainley, Miller & Batten, 1984).

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[1] There are further complications because of different system policies regarding school students who undertake part of their course through a VET provider.

Retention rates based on Year 10 enrolments

Although the long-established basis for calculating apparent retention rates has been the enrolment in the first year of secondary school it is possible to use other base years. Using the Year 10 enrolment as the base year reduces the confounding effects of migration between jurisdictions and provides a measure more focussed on the senior secondary years. MCEETYA has focused on retention rates based on Year 10 and these are now reported by the ABS along with the longer established rates. Such rates need to be considered in conjunction with indicators of the extent to which young people participate in education up to Year 10. Even though more than 98 per cent of each cohort stays at school to Year 10 (ABS, 2003) those that do not are disproportionately drawn from disadvantaged groups in the community. Where apparent retention rates refer to the transition from one year level to the next they are termed progression rates.

Measures based on age groups: age participation rates

An age participation rate involves the computation of the percentage a relevant age group in an activity such as full-time schooling. Participation rates can be expressed as a percentage of a broad age range (say 15 to 19 year-olds) but are more useful when expressed in terms of single age level (eg 17-year-olds). As examples of participation rates in 2002 one could say that 81 per cent of 16-year-olds, 62 per cent of 17-year-olds and 13 per cent of 18-year-olds were in full-time school (ABS, 2003).

An advantage of age participation rates is that the denominator (the size of the population at that age) is measured at almost the same time as the numerator (the number of people of that age studying full-time in school). Hence the confounding effects of migration between states are almost completely eliminated. However, the fact that the measure refers to a single point in time means that the sense of flow through a school system is not as evident as for retention rates. It also means that it is difficult to compare the holding power of jurisdictions because of differences in age-grade distributions. For example, in 2002 76 per cent of 17-year-olds in Victoria and 51 per cent of 17-year-olds in Queensland were in full-time school. Apparent retention rates for Year 10 to Year 12 for the two jurisdictions were 83 per cent and 81 per cent for Victoria and Queensland respectively. In other words there is a difference in age-grade distributions so that students in Queensland reach Year 12 at a younger age than in Victoria: 71 per cent of year 12 students in Victoria are aged 17 compared to 86 per cent in Queensland. There have been attempts to develop age-weighted participation rates but these depend on assumptions about the age distribution of students reflecting the age-distribution of non-students (Brewster et al, 1983).

MEASURES OF PARTICIPATION BASED ON INDIVIDUAL DATA

Measures based on data collected from individuals have advantages over those based on aggregate enrolment statistics. The ABS surveys of *transition from education to work* provide cross-sectional data that allow cross tabular presentation of the various combinations of employment and education status for an age group or for single ages (ABS, 2002). These data are cross sectional and therefore cannot be related to many background characteristics. Data from LSAY have significant potential to address the participation questions because each of them collects information from a representative sample of the whole cohort, and from individuals within the cohort about a wide range of their education, training and labour market activities as well as background accumulated from earlier waves of data collection. Both surveys are based on samples so that estimates involve sampling error. In the case of longitudinal surveys there can be an upward bias in estimates of retentivity because those who continue in school are more likely to be retained in the sample (Marks, Fleming, Long & McMillan, 2000). To some extent this can corrected by the application of weighting procedures.

There is a variety of ways participation rates can be summarised. These include participation rates, absolute percentage differences, participation ratios, relative percentage differences and odds ratios.

It is easiest to explain the different summary measures by way of example. The following table is taken from Long, Carpenter and Hayden (1999) who presented the hypothetical result for educational participation in Year 12 by gender.

Table 1 Percentage of cohort who participated in Year 12 (for two hypothetical samples)

	Cohort 1	Cohort 2
Total Cohort	40	80
Gender		
Male	35	75
Female	45	85

Focusing initially on Cohort 1, the *absolute participation rate* was 40 per cent, with 35 per cent of males and 45 per cent of females participating. Long, Carpenter and Hayden (1999) note three ways in which the gender difference can be reported.

- Report the difference as 10 percentage points. This is the *absolute percentage difference* between males and females for Year 12 participation. When the text refers to a 'gap' of so many percentage points in participation rates, it is referring to the absolute percentage differences.

- Report the *participation ratio* of female to male completion (45/35=1.29). That is, females participate 1.29 times more than males. Similarly it can be reported that females are 29 per cent more likely to complete Year 12 than males. This is the *relative percentage difference* between males and females. In this report we use participation ratios rather than relative percentage differences.

- Report the ratio of the odds of a female completing rather than not completing Year 12 (45/55 = 0.82) to the odds of a male completing rather than not completing Year 12 (35/65= 0.54). The ratio of these two ratios is called the *odds ratio* (0.82/0.54=1.52). Odds ratios are always positive. An odds ratio equal to one signifies no effect of the variable concerned on participation. Odds ratios above one indicate an increased likelihood of participation and odds ratios below one indicate a decreased likelihood. The further an odds ratio is from one, the stronger the effect of the variable. This measure has several desirable properties. First, it uses more information in describing the association between two variables; in this example being male, being female, participating and not participating. Thus it is a more 'complete' measure. Second, it has the property of 'marginal invariance', that is, the strength of an association between two measures is not affected by their distributions. Third, odds ratios are also used to interpret the effects of factors on participation in a multivariate context (see below).

Long, Carpenter and Hayden (1999) note that these three ways of reporting can lead to quite different interpretations when comparing the results of Cohort 2 with Cohort 1.

- The absolute percentage difference is unchanged.
- The ratio or relative percentage difference has declined from 1.29 to 1.13.

- The odds ratio has increased. It is 1.52 for Cohort 1 and 1.89 for Cohort 2.

This example illustrates that odds ratios are not always appropriate measures of equity; in this instance, for example, it is difficult to argue that the level of equity has deteriorated. In the context of rising overall participation levels, odds ratios can increase as the absolute percentage difference declines. Because of this characteristic, in the context of rising participation rates a decline in the odds ratio is strong evidence of an increase in equity or decrease in inequality.

In this report, all three measures are used as the exclusive use of one measure may lead to misleading interpretations.

MEASURES OF SUBJECT AREA PARTICIPATION

Just as participation in Year 12 can be defined as a characteristic of individuals or of groups so can subject area participation. Subject area participation is usually defined relative to the Year 12 population. It is possible to express subject participation relative to the Year 9 population but this was not done in the present report.

Statutory assessment and accreditation authorities in each jurisdiction publish enrolment data for subjects from which aggregate participation rates can be computed. This report bases its estimates of subject area participation on individual data. An individual is defined as having participated in an area if they indicate they were enrolled in a subject from the area for part or all of their Year 12. Based on this information two indicators of subject area participation are used in this report: participation rates and enrolment indices.

Participation rates

Participation rates in individual subjects, and groups of subjects are the percentages of Year 12 students taking that subject or at least one subject from a group of subjects.

In some education systems (such as in Tasmania), the structure and organisation of curriculum patterns in senior secondary school means that many students undertake studies so that they specialise *within* a year instead of following a specialisation over a two-year sequence. In several other states there is a tendency for some students to take one or more Year 12 subjects while they are still in Year 11.

Enrolment indices

Enrolment indices for subject areas and *Key Learning Areas* (KLAs) are the enrolments in an area expressed as a weighted percentage of all enrolments (in full-time equivalent subjects). Values of enrolment indices are additive across areas and sum to 100 for any student or group of students. Another way of thinking about enrolment indices is to consider them as *curriculum share*; a concept that can be envisioned as applying to the program of an individual student or across a group of students. The enrolment index is defined as the sum of the equivalent full-year enrolments in a given subject divided by the total number of equivalent full-year enrolments in all areas. Hence the sum of the values of the enrolment index over all subject areas is 100. For example a student who studied English, 2 mathematics subjects, physics and chemistry would have a score of 0.2 for English, 0.4 for mathematics and 0.4 for physical sciences (i.e. English takes up 20 per cent of the student's instructional time, mathematics 40 per cent and physical sciences 40 per cent).

SUMMARY

Participation can be defined in a variety of ways and measures can be estimated from different types of data. In studies of participation it is important to be clear about the population base that is used as the reference point, the level at which participation is defined and whether the

measure is based on aggregate or individual data. It is also important to be clear about whether the measure refers to a particular time or is cumulative. The present report focuses on Year 12 in school and defines participation as having been enrolled in Year 12 during a defined year (most commonly 2001). With a measure of participation based on individual data many of the issues and uncertainties that arise from aggregated enrolment data do not apply.

3. DATA AND METHODS

This chapter is intended to provide information to facilitate understanding of the results presented in tables and discussed in the text of the substantive chapters that follow. The initial sections provide summaries of the LSAY data used in this report and an explanation of the summary measures of participation. The next section describes the independent variables used in the analyses; the potential influences on participation that were investigated. The final section focuses on multivariate analysis. It discusses why multivariate analyses are necessary, the question of model specification (that is, what measures to include in the analyses), the particular multivariate procedure used in this report (logistic regression), and how to interpret the results, with particular emphasis on the use of odds ratios.

DATA

Data sources

For Chapter 4 of this report, examining participation in Year 12, data from the four *Youth in Transition* (YIT) cohorts, and the 1995 and 1998 Year 9 *Longitudinal Surveys of Australian Youth* (LSAY) cohorts are used. The YIT cohorts are age-based cohorts born in 1961, 1965, 1970 and 1975, with original samples of between 5000 and 6000 students. The LSAY 1995 Year 9 cohort comprises over 13 000 students who were in Year 9 in 1995, and the LSAY 1998 Year 9 cohort comprises just over 14 000 students who were in Year 9 in 1998. Details on the YIT, 1995 and 1998 Year 9 samples are provided in the Appendix. Chapters 5 and 6 of the report, examining subject enrolments, use data from the 1998 LSAY cohort, and finally Chapter 7, examining subject enrolments over the last decade, uses data from the last two YIT cohorts and the two LSAY cohorts.

Sample weights

In order to take into account sample design and sample attrition, many of the statistics presented in this report are based upon weighted data. The weights comprise two components. The first component (the stratification weights) accounts for differences in the distribution of respondents by State, school sector and gender in the original Year 9 sample. These distributions for the Year 9 population in the relevant year are those reported in the ABS publication *Schools Australia*. These weights are necessary to account for the sample design in which the smaller States and Territories were over-sampled. In addition, there are small differences between the sample and the population distributions of school sector by gender within the States and Territories that are corrected by this component. The second component of the weights (the post-stratification weights) adjusts for sample attrition. The attrition from the sample is not random, but is associated with Year 9 achievement and gender. Applying post-stratification weighting allows better statistical representation of those groups who have effectively become under-sampled due to attrition. Further details on the calculation of weights for this sample are provided in LSAY Technical Paper Number 15 (Marks & Long, 2000).

MEASURES OF POTENTIAL STUDENT AND SCHOOL INFLUENCES

This section describes the variables used in this report. Socio-demographic data were collected from responses to questionnaires completed by Year 9 students while at school. School achievement was measured through standardised achievement tests in reading and mathematics administered in schools at the same time as the socio-demographic questionnaires. Measures of rurality were derived from census data on the population density of the locality of the respondent's home address. School sector was, in part, obtained from the sample design. Additional variables analysed in the report were developed from information collected in the second-year mail questionnaire and the subsequent annual telephone interviews.

Student characteristics

Earlier school achievement

Earlier school achievement is a composite score based on a combination of results from two ACER administered tests of literacy and numeracy. The scores were centred about the means and summed to produce a combined measure of achievement. The combined measure was then standardised to a mean of zero and a standard deviation of one. For some of the analyses in this report, this measure was divided into quartiles.

Parental occupation

In the first year of the surveys, students were asked to report the occupations of their father/male guardian and mother/female guardian, and to describe their work. This information was used to create two parental occupational measures.

The first parental occupation measure, *parental occupational group*, is a categorical variable. Responses were assigned occupational prestige scores based on the ANU2 scale. The first analysis of Year 12 participation uses six categories (a condensation of the full scale): professional; managerial; white-collar; skilled; semi-skilled; and unskilled. The multivariate analysis of effects on Year 12 participation used a collapsed version of this scale which categorised parents' occupational prestige into four categories: professional; managerial; clerical/personal service; and manual.

The second parental occupational measure, *parental occupational status*, is a continuous variable. This measure was used in all analyses of subject enrolments. Responses were assigned occupational status scores based upon the ANU3 scale. The ANU3 scale ranges from 0 (low status) to 100 (high status). Examples of jobs at the top of the status hierarchy are medical practitioners, university teachers and legal professionals. Examples of jobs at the bottom of the status hierarchy are various mining, construction and related labourers, forklift drivers, cleaners and product assemblers (Jones, 1989). This scale was divided into quartiles so as to facilitate interpretation, particularly for the multivariate analyses.

To simplify the presentation and to make the best use of available information, the occupation of the male parent/guardian was taken as the basis for both the categorical and the continuous occupational measures. Where information was missing on the male parent the occupation of the female parent/guardian was substituted. This approach was taken because a large proportion of respondents indicated that the occupation of the female parent was 'home duties', an occupation for which there is no occupational prestige score.

Parental education

Respondents were asked to report the highest level of education completed by each parent. Two parental education variables based upon this information are used in this report. The first measure is a simple dichotomy, and this is used in the analysis of participation in Year 12. Students whose parents hold a post secondary degree or diploma are distinguished from other students. Post-secondary education includes university and college education but does not include TAFE. The second measure is based on ASCED categories: mid-secondary level or less, completed secondary school or apprenticeship, completed a TAFE qualification, and completed a university qualification.

Both the parental education measures are based on a combination of father's and mother's education in a manner similar to that used for parental occupation. In this case, however, mother's education level was taken as the base measure, which if missing, was replaced by father's education level. This is because mother's education level (rather than the father's) has been shown to be more predictive of student achievement in many educational studies.

Ethnicity

Two measures of ethnicity are used in this report. Both are based upon the country of birth of the respondent's father (or the country of birth of mother if data on the father is missing).

The first measure has three categories. A respondent is defined as *Australian* if their father was born in Australia, *Other English speaking* if their father was born outside Australia in a predominantly English-speaking country (such as UK, US, New Zealand), and as *non-English* speaking if their father was born outside Australia in a predominantly non-English-speaking country.

The second more detailed measure has three categories. The first category comprises students whose fathers were born in Australia, or in another predominantly English speaking country. The second category comprises students whose fathers were born in a southern European country such as Greece, Italy or Malta. The third category comprises those students born in Asian countries, such as Viet Nam, Singapore, Malaysia and the Philippines. While it is recognised that there is a great deal of cultural diversity even within these groupings, it is considered that there is more diversity between groups than within them. In some analyses these two last categories are collapsed into one to form a dichotomy: English speaking background or language background other than English (LBOTE).

Indigenous status

Students were asked if they were an Aboriginal person or a Torres Strait Islander person. A dichotomous measure was constructed from the responses to this question.

Students' educational aspirations

These were obtained by asking students in Year 10 whether they planned to pursue post-school study.

Aggregate level characteristics

State or Territory

This measure refers to the jurisdiction (State or Territory) in which the student was attending school in Year 12. For the majority of students, the State or Territory in which they sat the Year 9 achievement tests is the one in which they completed Year 12.

School sector

This measure refers to the school attended during Year 12. Three categories are used – government schools, Catholic non-government schools, and non-Catholic non-government schools – identified respectively as government, Catholic and independent. The measure is based upon information from the sampling frame (school sector when in Year 9), which was updated where applicable from information provided by the students in response to questions in the annual surveys on whether they had changed schools and the sector of their current school.

Location

Two measures of location are used in this report. For the Y95 and Y98 cohorts from LSAY the measures are based on the students' home address in the first year of sampling. For the older Youth in Transition cohorts the measures are based on the postcode of the school attended by the student when first sampled.

The first measure is simply a dichotomous measure, distinguishing metropolitan (lives in a place with 100,000 or more persons) from non-metropolitan students.

The second measure is similar to the first, but disaggregates the 'non-metropolitan' group into two categories: regional and rural/remote. Metropolitan areas are defined as above. Regional areas are defined as centres with populations between 1000 and 99 999 persons, and rural and remote areas are defined as centres with less than 1000 persons.

MULTIVARIATE ANALYSIS

Multivariate analyses are important for several reasons. First, it is unlikely that only one factor determines participation in education. Rather, a range of factors such as students' gender, socioeconomic background, performance at school, ethnic background and attitudes towards school each influences participation in Year 12 and higher education. It is important to include those factors that have substantial effects on participation in the analysis rather than examining only one factor in isolation.

A second reason for multivariate analysis is the issue of spuriousness. It is important at a theoretical level to know if a factor's influence is spurious, that is, if its influence can be attributed to the influence of other factors. For example, if students from particular ethnic backgrounds participate at lower levels than other students, this result may be not because of the students' ethnicity *per se,* but because of their socioeconomic background.

The third reason is the corollary of the second. It is important to know the net effect of each factor. For example, Indigenous students participate in education at lower levels than other students. Some of this difference is due to the fact that on average Indigenous students come from lower socioeconomic backgrounds. By controlling for socioeconomic factors in a multivariate analysis, the effect of being Indigenous net of differences in the socioeconomic backgrounds of Indigenous and non-Indigenous students can be assessed. This is important because such analyses can give an indication of the importance of non-economic factors (for example, health and culture) in the lower participation rates of Indigenous students, and thus can help identify policy priorities.

Finally, multivariate analyses provide an understanding of the process by which a factor influences participation. They allow an assessment of whether a particular factor directly influences participation (in Year 12 or in particular subject areas), or whether its effects on participation are indirect, via intermediary (mediating) variables.

For this report, multivariate analyses were performed to understand whether the differences observed in cross-tabular data could be attributed to other factors. For example, could differences in participation between occupational background groups be accounted for by performance in the Year 9 achievement tests, the type of school attended and/or other factors? These multivariate analyses allow researchers to estimate the independent effect of each influence on participation.

Model specification

The use of multivariate analysis raises the question of model specification; that is, which factors should be included in the analysis. It could be argued that the model should include all variables that influence educational participation, however there are likely to be dozens of factors that are correlated with participation. Including all these factors in a single analysis increases the complexity in the interpretation of the results and may cause statistical problems. Model specification should be guided by the most appropriate and parsimonious specification for the particular research question.

The analyses in this report are based on a core model that includes the most theoretically and empirically important influences. The key variables identified for inclusion have been selected on the basis of extensive reviews of the literature, earlier ACER analyses of longitudinal data, and their policy relevance (see Long et al, 1999). The core model is comprised of gender, parental occupational and educational background, parents' country of birth, region (metropolitan, regional, rural and remote), school sector, students' aspirations (higher education or not) and Year 9 achievement. This model allows the estimation of the influence of each factor net of the other factors included in the model. In some of the discussions, these results are compared with the results from the bivariate analyses to assess spuriousness, mediating effects and other issues.

Logistic regression

Multivariate logistic regression is used because of the dichotomous nature of the dependent (outcome) variables, Year 12 participation or enrolment in a particular subject area. Logistic regression coefficients are presented in a number of tables throughout the report. The sign of the logistic coefficient indicates if the factor has a positive or negative influence; that is, whether it increases or decreases participation (respectively). The interpretation of the results differs according to whether the independent variable is dichotomous, categorical or continuous.

For dichotomous independent variables (that is, variables which have only two categories such as male/female), the size of the logistic regression coefficients can be compared. The further away the coefficient is from zero, the stronger its effect. For example the effects of gender and region can be compared using the data contained in Table 3: in 1998, the (positive) effect of gender on Year 12 participation (0.53) was stronger than the (negative) effect of region (-0.24).

For categorical independent variables (which comprise three or more categories, such as occupational groups), the size of the regression coefficients can also be compared but the size is always relative to the reference category. For example, Table 3 shows that the effect on Year 12 participation of coming from a professional background (relative to a manual background) is greater than the effect of coming from a clerical, sales or personal service family background (relative to a manual background). The choice of the reference category does not change the relative differences in the logistic regression coefficients between categories.

The significance tests for logistic regression are the same as for other parametric statistics; that is, tests of the probability of the null hypothesis. Statistically significant estimates are indicated in the tables by asterisks if the probability of the null hypothesis is less than 0.05 (that is 5 chances in one hundred) (*), less than 0.01 (**), or less than 0.001 (***).

Odds ratios

In this report, the logistic regression coefficients (and their statistical significance) are presented. The logistic regression coefficients are provided because of the relativities between categories in a categorical variable. However, when the results are discussed in the text, the logistic regression coefficients are often converted to odds ratios (by taking the exponent of the logistic coefficient), which allow comparisons to be made with the odds ratios derived from the bivariate analyses. Odds ratios derived from regression models are adjusted, meaning they have taken into account the effects of other factors in the model. Odds ratios derived from simple bivariate analyses are unadjusted. Where the adjusted odds ratio of a factor (say, school sector) is substantially less than the unadjusted odds ratio of the same factor, it is evidence that other factors in the regression model (e.g. region or socio-economic-status) are, in part, accounting for some of the effect observed by looking at the original factor (in this case, school sector) in isolation. (See Chapter 2: Measures of Participation, above, for an explanation of odds ratios.)

Predicted probabilities

Predicted probabilities are calculated using the logistic regression equation for the probability of an event occurring:

Prob(event) = $\frac{1}{1+e^{-Z}}$, where Z is the linear combination $Z = B_0+B_1X_1+ B_2X_2+ \ldots + B_pX_p$.

The predicted probabilities can then be graphed so that visual comparison with the probability of a "typical" student's participation can be made easily.

SUMMARY

The present report makes use of longitudinal data from several nationally representative cohorts of young people with an emphasis on those young people who were in Year 9 in 1998. For those who remained at school and progressed without any delay, 2001 was the year in which they completed school. In analysing these data this report makes use of survey data to generate indices of participation in Year 12 and participation in particular learning areas and individual subjects. These aspects of participation are analysed in relation to a range of characteristics of individual students and the schools they attend. The report records simple unadjusted statistics related to these indicators as well as statistics that are based on multivariate analyses. Statistics from the multivariate analyses provide an indication of the magnitude of influences after adjusting for other factors. It provides a comprehensive picture of the final year of school in Australia up to recent times.

4. PARTICIPATION IN YEAR 12

Although there have been substantial increases in educational participation over the last two decades, it does not necessarily follow that social equity in education has improved over this period. This chapter of the report presents the survey estimates of participation in Year 12 for a range of social and educational groups, and examines the influence on participation of different aspects of socioeconomic background.

PATTERNS OF PARTICIPATION IN YEAR 12

Table 2 presents Year 12 overall participation rates for six cohorts, and participation rates by social background and other characteristics for each cohort. These figures show the well-documented step rise in Year 12 participation, from just over a third of the cohort in the early 1980s to more than three quarters in the 1990s and the beginning of the 21st century.

Gender

Data in Table 2 present some evidence that the gender gap in Year 12 participation increased during the first part of the period examined here, but levelled off since the mid-1990s. In 1980, the Year 12 participation rate for girls from the cohort born in 1961 was only 3 percentage points higher than that for boys. The gender gap (the absolute percentage difference) increased steadily to 10 percentage points in 1998 before dropping back to 8 percentage points in 2001. This gap of 8 percentage points in Year 12 participation rates of males and females compares with a gap of 9 percentage points in the Year 10 to Year 12 retention rate calculated by the Australian Bureau of Statistics (ABS, 2002). Similarly, the participation odds ratio of girls to boys has increased from 1.1 in 1980 to a plateau of around 1.6 since the mid-1990s. In one respect, however, the gender gap has remained very consistent over the period of study. The relative percentage difference between girls' and boys' participation in Year 12 has remained unchanged, being 1.1 for each cohort. This means that girls are consistently 1.1 times as likely to participate in Year 12 as boys.

Socioeconomic background

Students with parents in professional occupations show higher rates of Year 12 participation in all six cohorts. In the 1961 cohort, 61 per cent of students from professional backgrounds participated in Year 12, this figure rising to around 90 per cent for the three youngest cohorts. Among students from manual occupational backgrounds in the oldest cohort, only about a quarter reached Year 12, rising to and levelling off at about 70 per cent in the youngest three cohorts.

The absolute percentage difference in Year 12 participation rates between occupational background groups declined in the 1980s and levelled off in the 1990s. In 1980, 1984 and 1989 the differences in Year 12 participation between students from professional and unskilled manual backgrounds were 33, 41, and 32 percentage points respectively. In 1994, 1998 and 2001 the differences were reduced to 17, 17 and 15 percentage points respectively. Similarly, the *relative* percentage difference between students from professional and unskilled manual backgrounds has declined from 2.2 in 1980 to level off at 1.2 in the youngest three cohorts.

Further evidence of a reduction in social inequality in Year 12 participation is provided by the participation/non-participation odds ratio for the highest and lowest participating groups as defined by occupational background. These odds ratios were 5.9 for Year 12 students in 1980 and 1984, dropping to 4.0, 3.7, 3.3 and 3.0 in the four younger cohorts respectively.

Parental education is also related to Year 12 participation. In order to maintain comparability between the Youth in Transition (YIT) and the Year 9 cohorts the measure of parental education

is simply a higher education/non-higher education dichotomy. For the 1961 cohort, just over 54 per cent of students from families in which the mother had a higher education qualification participated in Year 12. This figure rose steadily until the 1975 cohort in which 95 per cent of students from such families participated in Year 12. In the younger two cohorts this Year 12 participation rate dropped off slightly to 87 per cent and 90 per cent respectively, but remained well above the participation rates of students with higher educated mothers in the eldest three cohorts.

Concomitantly, Year 12 participation rates of students from families in which the mother did not have a higher education qualification have increased during the period studied. In 1980 and 1984 the participation rate was 35 per cent, rising to 54 per cent in 1989 and then levelling off at about 76 per cent in the youngest three cohorts.

The *relative* percentage difference between students from higher education and non-higher education backgrounds has declined from highs of 1.5 and 1.9 in 1980 and 1984 to level off at about 1.2 in the youngest three cohorts. The participation odds ratios between these groups has been slightly more erratic in the last two decades, starting off at 2.2 in 1980 then rising to a high of 6.0 in 1994, before dropping back to 2.1 and 2.7 in the youngest two cohorts. However, the difference between the trends in the relative percentage differences and the odds ratios for these two groups is due to the small *non*-participation rate of students from higher education backgrounds (which tends to 'exaggerate' the odds ratio). For example, the odds ratio of 6 observed in 1994 is due to the fact that only 5 per cent of students from higher education backgrounds did not participate in Year 12 compared with almost a quarter of students whose mothers did not have higher education qualifications.

Overall, taking parental occupation and parental education as markers of socioeconomic background, the trends in these data provide evidence of a decrease in social inequality in participation in Year 12 from 1980 through 2001, although this reached a plateau in the mid-1990s.

Ethnicity

Year 9 students from non-English speaking backgrounds continue to display substantially higher levels of Year 12 participation than do other students. The relative percentage difference between the group of students with fathers born in non-English speaking countries and those students with Australian-born fathers has remained essentially unchanged over the period of the study at 1.1. However, as both these groups have increasingly participated in Year 12 over successive cohorts, the odds ratio between the two groups has risen from 1.2 to stabilise at about 1.8 since the mid-1990s. Once again, this is due largely to the relative differences in the non-participation rates. For example, only 14 per cent of students with fathers from non-English speaking countries were not participating at Year 12 in 2001 compared with 22 per cent of students with Australian born fathers (compared with the 1980 figures of 60 per cent and 65 per cent respectively).

Table 2 Participation in Year 12, 1980-2001, by cohort and background (per cent of group)

Cohort	Born in 1961	Born in 1965	Born in 1970	Born in 1975	Year 9 in 1995	Year 9 in 1998
Year Participation Measured	*1980*	*1984*	*1989*	*1994*	*1998*	*2001*
Of Total Cohort	35	37	55	78	76	79
Gender						
Male	34	34	52	74	71	75
Female	37	39	59	82	81	83
Parents' Occupation						
Professional	61	65	76	90	87	88
Managerial	45	49	61	79	81	82
Clerical /Personal Service	36	42	61	83	79	79
Skilled Manual	30	29	48	76	71	76
Semi-Skilled Manual	21	24	50	71	67	71
Unskilled Manual	28	24	44	73	70	73
Parents' Education						
Higher Education	54	68	75	95	87	90
Not Higher Education	35	35	54	76	76	77
Father's Country of Birth						
Australia	35	35	55	76	74	78
Other English -Speaking country	33	33	56	79	76	78
Non-English Speaking country	40	47	60	85	84	86
Region						
Non-Metropolitan	28	33	53	72	69	74
Metropolitan	41	40	58	82	81	82
State or Territory						
New South Wales	36	33	50	71	77	76
Victoria	33	37	55	82	79	82
Queensland	37	41	64	86	77	84
South Australia	36	42	61	90	75	74
Western Australia	35	39	58	74	69	76
Tasmania	26	26	38	60	55	69
Australian Capital Territory	69	71	80	95	83	84
Northern Territory	11	18	50	64	58	66
School Sector						
Independent	88	84	88	96	87	89
Catholic	44	45	61	83	86	85
Government	30	31	48	74	71	75
Achievement in Literacy & Numeracy						
Highest Quartile	67	61	83	92	89	93
Third Quartile	37	36	57	83	84	84
Second Quartile	22	31	51	71	73	76
Lowest Quartile	10	16	22	58	59	62

State or Territory

The well-documented differences in school retention between the Australian States and Territories are reflected in these data. The Australian Capital Territory consistently has had the highest rate of Year 12 participation. Tasmania and the Northern Territory consistently showed the lowest rates. Of interest, however, is that in 2001 the 84 per cent Year 12 participation rate in ACT was equalled in Queensland and that Victoria had an 82 per cent Year 12 participation rate. These data clearly suggest a steady decrease in the differential influence of the State on Year 12 participation; the State in which a student lives now matters less to that student's participation in Year 12 than it has previously. For example, there has been a consistent decline in the difference in absolute participation rates between the State or Territory with the highest rate and that with the lowest over the period of study – from 58 percentage points in 1980 to 15 percentage points in 2001. Similarly, there were consistent declines in both the relative participation rate (from 6.3 to 1.2) and the odds ratio (from 18.0 to 2.4) between the highest and lowest participating State or Territory over the same period.

School sector

One of the most dramatic changes in Year 12 participation is the substantial decline in school sector differences. While Year 12 participation among students from independent schools has not changed greatly since the early 1980s, Year 12 participation has increased substantially among students who attended either government or Catholic schools in Year 9. In 1980 only 30 per cent of those who had attended government schools in Year 9 participated in Year 12. For that cohort (the 1961 cohort), the participation ratio of students from independent to government schools was 2.9. In contrast, in 2001 75 per cent of those who attended a government school in Year 9 went on to participate in Year 12, with the comparable participation ratio declining to 1.2. Similarly, in 1980 those students who attended Catholic schools in Year 9 had a participation rate of just 44 per cent and by 2001 (the youngest cohort) this figure had increased to 85 per cent. The participation ratio between independent and Catholic schools has therefore declined from 2.0 to 1.0 over this period.

Achievement in literacy and numeracy

An important correlate of Year 12 participation is achievement in literacy and numeracy. In these studies, earlier achievement is measured by students' performance in tests on literacy and numeracy performed at either Year 9 or around 14 years of age. Each cohort shows evidence of an 'achievement gradient', with the highest achieving quartile of students most likely to participate in Year 12 followed by the next and subsequent quartile, with the quartile performing least well in the achievement tests least likely to participate in Year 12. The steepness of the achievement gradients suggests that student achievement in school is probably the strongest correlate of Year 12 participation.

There is a strong indication that Year 12 participation has become less associated with earlier achievement in literacy and numeracy since the mid-1990s. In the three oldest cohorts 25 per cent or less of the students in the lowest achieving quartile participated in Year 12. By contrast, in the three youngest cohorts the comparable participation rate was around 60 per cent. The participation ratios of the highest to the lowest achievement quartiles declined from 6.7 in 1980, to level off at 1.6, 1.5 and 1.5 in the three youngest cohorts respectively. This suggests that, in the 1990s senior secondary schooling became more broadly based, and hence diverse, in the range of students enrolled.

INFLUENCES ON PARTICIPATION IN YEAR 12

In this section, multivariate analyses are used to examine the net impact of a variety of factors on Year 12 participation. The dichotomous nature of the dependent variable (i.e. participation in Year 12) requires the use of logistic regression in the analyses that follow. The factors investigated in these analyses are gender, parental occupational[2] and educational background, father's country of birth, location (metropolitan/non-metropolitan), State, school sector and Year 9 achievement. Table 3 presents the estimates obtained from logistic regression analysis of the model of participation. Results in Table 3 are presented as logistic regression coefficients. Odds ratios for selected social background and school characteristics are presented in Table 4. These ratios provide an overall picture of the relative strength of influences and trends over time.

Table 3 Logistic regression coefficients for effects on Year 12 participation, 1980-2001

Cohort	**Born in 1961**	**Born in 1965**	**Born in 1970**	**Born in 1975**	**Year 9 in 1995**	**Year 9 in 1998**
Year Participation Measured	*1980*	*1984*	*1989*	*1994*	*1998*	*2001*
Intercept	-1.25***	-1.59***	-0.46**	0.48***	0.74***	0.85***
Gender (relative to males)						
Female	0.37***	0.18	0.17	0.64***	0.67***	0.53***
Parents' Occupation (relative to Manual)						
Professional	0.95***	1.23***	0.71***	0.42*	0.64***	0.46***
Managerial	0.55***	0.74***	0.22	0.03	0.44***	0.33***
Clerical /Personal Service	0.07	0.60***	0.38	0.26	0.43***	0.15
Parents' Education (relative no higher education)						
Higher Education	0.05	0.67***	0.64*	1.31***	0.28**	0.27**
Father's Country of Birth (relative to Australia)						
Other English speaking country	-0.13	0.12	0.08	0.12	0.09	0.01
Non-English speaking country	0.72***	1.09***	0.59***	0.79***	0.60***	0.69***
Region (relative to Metropolitan)						
Non-Metropolitan	-0.48***	0.0	0.04	-0.40***	-0.46***	-0.24**
State or Territory (relative to New South Wales)						
Victoria	-0.21	-0.01	-0.05	0.71***	0.04	0.29**
Queensland	0.11	0.12	0.52**	1.03***	0.35***	0.55***
South Australia	0.06	0.36*	0.46*	1.52***	-0.15	-0.11
Western Australia	0.09	-0.04	0.18	0.11	-0.49***	-0.14
Tasmania	-0.15	-0.58	-0.49	-0.38	-0.81***	-0.46*
Australian Capital Territory	1.24**	1.40**	0.58	1.45*	-0.23	0.20
Northern Territory	-0.24	-0.36	0.43	-0.18	-0.84*	-0.93**
School sector (relative to government)						
Independent	2.20***	1.98***	1.88***	0.98***	0.45***	0.35***
Catholic	0.46***	0.47***	0.35*	0.21	0.62***	0.33**
Achievement (Standardised)	1.05***	0.83***	0.93***	0.82***	0.71***	0.69***

*Note: Unstandardised logistic regression coefficients. * p < 0.01, ** p <0 .05, *** p < 0.001*

[2] The three manual occupational groups have been combined into a single 'manual' category.

Table 4 Odds ratios for the effects of selected social background and school factors on participation in Year 12, 1980-2001

Cohort	**Born in 1961**	**Born in 1965**	**Born in 1970**	**Born in 1975**	**Year 9 in 1995**	**Year 9 in 1998**
Year Participation Measured	*1980*	*1984*	*1989*	*1994*	*1998*	*2001*
Female vs male	1.4	NS	NS	1.9	2.0	1.7
Professional vs manual	2.6	3.4	2.0	1.5	1.9	1.8
LBOTE vs Australian Background	2.1	3.0	1.8	2.2	1.8	2.0
Metropolitan vs non-metropolitan	1.6	NS	NS	1.5	1.6	1.3
Independent vs Government	9.0	7.2	6.6	2.7	1.6	1.4
Achievement (1 Standard Deviation)	2.9	2.3	2.5	2.3	2.0	2.0

Note: NS denotes the effect was not found to be statistically significant in the relevant model.

Gender

As noted earlier, gender differences in Year 12 participation have persisted over the time being studied. The multivariate analysis confirms that the effect of gender on participation is statistically significant in most of the cohorts studied. However, the adjusted odds ratios (calculated from the regression model and having stabilised between 1.7 and 2.0 since the mid-1990s) are consistently smaller than the unadjusted odds ratios (calculated from the figures in Table 2). Controlling for differences in school sector and other factors in the model, it can be seen, therefore, that the effect of gender on participation in Year 12 is not as strong as the data presented in Table 2 would suggest *prima facie*.

Socioeconomic background

Parents' occupation and education both influence student participation in Year 12. This effect is net of the student achievement, school sector and other factors in the model. Due to the high collinearity between professional occupations and parents' (higher) education, it is not possible to interpret the effects for these two variables presented in Table 3.

The results in Table 5, which are the estimates for the occupation variables for the same model but excluding parental education, are more interpretable. These estimates show a decline in the influence that a professional family background has on participation in Year 12. In the early 1980s the adjusted participation odds ratio of students with professional backgrounds to students with manual backgrounds was from 2.7 to 3.9. Since the mid-1990s this adjusted participation odds ratio has decreased to and remained around 1.8.

Ethnicity

Ethnicity (measured by father's country of birth) is a significant influence on the likelihood of participation in Year 12, although only when the father is from a predominantly non-English speaking country (NESC). Among the six cohorts, the Year 12 participation odds ratio for students whose father was born in a NESC (as opposed to those with Australian-born fathers) was between 1.8 and 3.0. If the cohort born in 1965 is ignored the other five cohorts all record odds ratios of between 1.8 and 2.2, indicating that this effect is fairly stable across the period being studied. Compared with students whose father was born in Australia, there was no statistically significant effect on Year 12 participation of students whose father was born outside Australia but in another English speaking country.

Table 5 Net effects of occupational background on Year 12 participation, 1980-2001

Cohort	Born in 1961	Born in 1965	Born in 1970	Born in 1975	Year 9 in 1995	Year 9 in 1998
Year Participation Measured	*1980*	*1984*	*1989*	*1994*	*1998*	*2001*
Parents' Occupation						
Professional	0.98***	1.37***	0.78***	0.63***	0.71***	0.61***
Managerial	0.59***	0.78***	0.24	0.03	0.43***	0.33***
Clerical /Personal Service	0.08	0.62***	0.42	0.31*	0.41***	0.21*
Manual	-	-	-	-	-	-

*Note: Unstandardised logistic regression coefficients. * p < 0.01, ** p <0 .05, *** p < 0.001*

Location

The multivariate analysis is consistent with the observation made in the first section of this chapter that there is a difference in rates of participation in Year 12 between those from metropolitan areas and those from non-metropolitan areas and that the trend is 'flat' (there is little evidence of change). The adjusted odds ratios for statistically significant regional effect vary only between 1.3 and 1.6.

State or Territory

In the multivariate analysis, the effects of State and Territory on Year 12 participation are more equivocal than the unadjusted data presented in Table 2 suggested. For example, the adjusted effect of the student being in school in the ACT as opposed to NSW in 1998 on participation in Year 12 in 2001 was not statistically significant, despite an unadjusted odds ratio of 1.7. Similarly, in 2001, the adjusted participation odds ratio between the Northern Territory and NSW was only 0.4, compared with the unadjusted value of 1.6. On the other hand, the effect of the student being in school in Queensland as opposed to NSW in 1998 on participation in Year 12 in 2001 was shown to be stronger than the unadjusted odds ratio of 0.6 would suggest, with an odds ratio of 1.8. Further to this, it can be seen from Table 3 that the adjusted State effects are seldom consistent across the cohorts, either in terms of magnitude and statistical significance. It therefore seems problematic to attempt an explanation of participation in Year 12 based on State or Territory.

School sector

School sector is confirmed in the multivariate analysis as having a significant influence on participating in Year 12. The effect on Year 12 participation of studying at independent schools as opposed to government schools has consistently reduced over the period of the study, with the odds ratio falling from 9.0 in 1980 to 1.4 in 2001. This effect is net of parents' occupation and education and, importantly, achievement test scores.

Interestingly, when the adjusted and unadjusted odds ratios are compared over time, there are consistently greater differences in comparison of independent versus government schools, than for Catholic versus government schools. This suggests that in independent schools more of the effect on participation can be attributed to other factors in the regression model (e.g. family background, achievement etc.) than in Catholic schools.

Achievement

Achievement in literacy and numeracy is an obvious influence on a student's choice to participate to Year 12 in school. The multivariate analysis confirms this influence. It also shows that the strength of the effect is decreasing over time. Unlike the analysis presented in the previous section that examined participation differences between achievement quartiles (see Table 2), the multivariate analysis expresses the effect on participation in terms of the difference that a change of one standard deviation from the mean in achievement makes. For example, in 1980 the effect of being one standard deviation from the mean yields a coefficient of 1.05 (see Table 3), which translates to an odds ratio of 2.9 (see Table 4). By 1998 and again in 2001, the odds ratio of this effect in isolation had dropped to 2.0. This demonstrates that, while the influence of achievement on Year 12 participation is still quite large, it has decreased over time, thus confirming the earlier suggestion that the Year 12 population has become increasingly diverse in terms of achievement.

SUMMARY: WHAT HAPPENED IN THE 1990s?

The greatest expansion of participation in the senior secondary years was from 1980 to 1992. Over this period there was a change in the extent to which Year 12 participation was associated with influences such as earlier school achievement, parental occupational, parental educational background, as well as school sector. Thus, during the 1980s there was a reduction in inequality based on these markers. However, this reached a degree of saturation from 1992 onwards as participation rates fell a little and then stabilised. Other differences in participation, such as between males and females, and between students whose parents were born in Australia and those whose parents where born in a predominantly non-English speaking country, have remained relatively unchanged over this time. This leads to a conclusion that, for many factors, a stasis of inequality has been reached while for other factors there are relatively smaller changes occurring. It could well be that there is some 'structural' inequality inherent that will be resistant to further change in the absence of another period of expansion of participation.

The expansion of participation in Year 12 has brought a similar expansion in the curriculum, with schools catering for a far more diverse student population, both culturally and academically. In the next chapter, the subjects studied in Year 12 by the youngest cohort of students are examined. Patterns in subject selection can be compared with earlier patterns so as to inform discussion about trends in curriculum provision and uptake.

5. PATTERNS IN SUBJECT PARTICIPATION

The following chapters of the report update the analyses conducted on the 1995 cohort of the LSAY program when they completed secondary school in 1998 with data for the 1998 cohort, who completed Year 12 in 2001. In the three years since the 1995 cohort completed Year 12, curriculum has continued to evolve, with a growing emphasis on VET in Schools, particularly in the areas of technology and computing.

This report refers to subject participation rather than subject choice, in recognition of the fact that subject "choice" is almost always limited by the range of subjects that the school is able to offer. In large metropolitan schools this range may be wider than in smaller metropolitan schools or in rural and remote schools. Smaller schools may tend to focus on traditional subjects and not provide a wide range of alternatives.

One purpose of this report was to examine the ways in which enrolments in subject areas related to various characteristics of Year 12 students, their background, and the school that they attended. Previous reports (Ainley et al., 1990; 1994; Fullarton & Ainley, 2000; Lamb & Ainley, 1999) have indicated that there are a number of ways in which social and school factors shape curriculum enrolment patterns. In general, these studies show that students from higher socioeconomic backgrounds, those from private schools, high early school achievers and students from non-English speaking backgrounds are more likely to enrol in courses with stronger links to university entry, and thus to professional jobs. Other research has shown that students from lower socioeconomic levels are more likely to take courses associated with Vocational Education and Training (Fullarton, 2001; Lamb, Long & Malley, 1998).

NUMBERS OF SUBJECTS TAKEN IN YEAR 12

Typically, students in Year 12 study five (48 per cent of students) or six (34 per cent of students) subjects. Nationally the average was 5.3 subjects, and while there are some state variations that can be seen in Table 6, students in most states study between five and six subjects. The exceptions to this are in Queensland where around 63 per cent of students study six subjects, and in Tasmania where around 52 per cent of students study only four subjects. These apparent anomalies, however, may not reflect actual differences in overall workload or teaching time. Where the average number of full-year equivalent subjects is fewer it usually corresponds to those subjects having more teaching time per week. Where the number is greater, each subject usually has proportionally less instructional time than in those states where students generally take five subjects. Table 6 also shows that there is a slight decrease in the average number of subjects studied by Year 12 students from 1998.

Table 6 Number of full-time equivalent subjects studied by Year 12 students[a] in 1998 and 2001

	Number of Subjects	
State/Territory	**1998**	**2001**
New South Wales	5.6	5.4
Victoria	5.0	4.9
Queensland	6.0	5.8
South Australia	5.1	4.7
Western Australia	5.7	5.5
Tasmania	4.3	4.1
Northern Territory	4.9	4.8
Australian Capital Territory	5.0	4.7
Australia	5.4	5.3

a N = 7 048 (unweighted), N = 6 909 (weighted)

As has been seen in previous reports, there was little difference in the number of subjects studied by students in the three school sectors. Students in Catholic schools studied on average 5.6 subjects, while their counterparts at independent schools studied on average 5.4 subjects and those in government schools 5.1 subjects. A reason for this could be the additional studies in religion undertaken by students in Catholic schools.

PARTICIPATION RATES IN SUBJECTS AND SUBJECT AREAS

To analyse enrolment patterns, individual subjects were classified into 15 broad subject areas, with a small residual 'not classified' category. These subject areas in turn were then grouped into eight Key Learning Areas. Table 7 provides some examples of how subjects are grouped into subject areas and then into Key Learning Areas.

Table 7 Key Learning Areas and subjects, 2001

Key Learning Area	Subject Area	Subject Examples
English	English	English, ESL, Literature
Mathematics	Mathematics	General Mathematics, Further Mathematics, Specialist Mathematics, Mathematics A, Mathematics B, Mathematics Extension, Business Mathematics
Society and Environment	Humanities & Social Sciences	Geography, History, Politics, Social Studies
	Economics & Business	Accounting, Economics, Legal Studies, Business Studies, Tourism
	Religion	Religious studies, Texts and Traditions
Science	Biological & other Sciences	Biology, Psychology, Environmental Studies, Earth Sciences
	Physical Sciences	Chemistry, Physics
Arts	Arts	Art, Music, Dance, Drama, Theatre Studies, Graphic Communication, Media Studies
LOTE	LOTE	French, German, Italian, Japanese, Chinese, Indonesian
Technology	Computer Studies	Computing Applications, Software design and development, IT Information systems
	Technical Studies	Materials & Technology, Design & Technology, Technology Studies, Textiles and Design, Graphics
	Home Science	Home Economics, Human Development, Child Care/Child Studies, Hospitality Studies
	Agriculture	Agricultural Science, Agriculture & Horticulture, Agriculture
Health & Physical Education	Physical Education	Physical Education, Outdoor Education, Sport
	Health	Health Education/Studies, Personal Development, Life Management Studies
Not Classified		Subjects or units that were not able to be classified by the interviewers into the categories listed above

Table 8 Year 12 enrolment levels in Key Learning Areas and specified subject areas in 2001

Key Learning Area	Subjects	Percentage of Students		
		No subject	One subject	More than one subject
English	English	3.8	91.1	5.1
Mathematics	Mathematics	15.7	76.7	7.6
Society & Environment	SOSE	32.2	38.1	29.7
	Economics & Business	60.3	29.3	10.3
	Religion/Pastoral Care	84.5	15.4	0.1
	Humanities/Social Sciences	65.6	28.8	5.5
Science	Sciences	45.0	36.3	18.7
	Physical Sciences	74.8	15.5	9.7
	Biological/Other Sciences	61.8	35.1	3.1
Arts	Arts	68.3	23.9	7.8
LOTE	Languages	90.3	9.4	0.3
Technology	Technology	47.7	35.3	17.0
	Computer Studies	73.0	24.9	2.0
	Home Science	82.0	15.1	2.9
	Agriculture	97.4	2.4	0.2
	Technical Studies	84.0	12.8	3.2
Health & Physical Education	Health & PE	76.4	21.3	2.3
	Health	92.3	7.6	0.1
	Physical Education	83.3	15.3	1.5

Table 8 records the pattern of enrolments, expressed as participation rates, for Year 12 students nationally in the eight Key Learning Areas and in their constituent subject areas. Table 9 records participation rates among Year 12 students in subject areas over the period from 1993 to 2001.

English

English is still almost universally studied by Year 12 students, as one of the only compulsory subjects at this year level. An English subject was studied by almost 96 per cent of students, including a little over 5 per cent who studied more than one English subject. Enrolments in English and English Literature have declined slightly since 1998, but the increase in enrolments in English as a Second Language has more than compensated for this.

Mathematics

Almost 85 per cent of students in Year 12 were studying mathematics at some level. Of these students, Table 8 shows that fewer than 8 per cent were undertaking more than one mathematics subject.

For the first time, the data for mathematics is able to be coded into three categories, according to their purpose and scope as described by the Senior Secondary Board of Studies or equivalent in each state or territory.

- Fundamental/Basic mathematics – comprising those mathematics subjects which cover basic mathematics skills and are terminal in their nature (that is, they do not usually feed into further studies);
- Intermediate level mathematics – comprising those subjects which, while not assumed knowledge for university subjects or courses, are useful for students who wish to pursue study in areas such as the social sciences or psychology, where techniques such as those found in statistics are applied; and
- Advanced mathematics – comprising those subjects that are prerequisites or assumed knowledge for university courses in engineering and physical, mathematical, and computer sciences.

Table 9 shows that a little more than one in five students were enrolled in a basic mathematics subject, such as business mathematics, trade mathematics or mathematics for living. One-quarter of the Year 12 students were enrolled in an intermediate mathematics subject, and almost four in ten students were enrolled in advanced level mathematics.

Dekkers and Malone (2000) documented a decline in enrolments in advanced-level mathematics subjects over the past ten years, with concomitant rises in the proportions of enrolments for intermediate and fundamental-level mathematics. This has occurred partly because the most advanced level mathematics is no longer a pre-requisite for the number of university courses that it once was, and also partly because in a number of states, more than one mathematics subjects is not commonly undertaken at Year 12 level. This report provides a reference point for future monitoring of participation in the various levels of mathematics through the LSAY data.

Studies of Society and Environment (SOSE)

Around seven out of every ten of the Year 12 students were studying at least one subject in this area. In terms of the subject areas that constitute this Key Learning Area, a little more than 34 per cent of Year 12 students undertake subjects in the humanities and social sciences area while almost 40 per cent study in the area of economics and business. From Table 9 it can be seen that the business studies area continues to grow in terms of proportion of enrolments, while the more traditional areas of geography, politics and social sciences, and economics continue to see a decline in enrolments.

Science

Overall, 55 per cent of students are enrolled in a science subject or subjects at Year 12 level. Enrolments in the biological and other sciences, however, remain a great deal higher than enrolment levels in the physical sciences, with almost four in ten studying at least one subject in the biological sciences area and about one-quarter studying at least one subject in the physical sciences area.

The greatest difference can be seen in the proportion of students studying two subjects in any particular area, which is almost 10 per cent of those studying physical sciences but only 3 per cent of those enrolled in biological and other sciences. In the dual physical sciences combination, the 10 per cent represents those studying physics and chemistry, while the few students who have a double biological science in Year 12 are likely to be studying environmental science or psychology as the second subject.

Table 9 Year 12 participation rates in subject areas, 1993-2001

Key Learning Area	Subjects	Percentage of Year 12 students		
		1993	1998	2001
English	English	92.1	92.8	88.0
	ESL	1.2	0.8	6.0
	Literature	5.5	5.3	4.5
Mathematics	Mathematics	86.3	87.5	84.3
	Basic Mathematics	-	-	22.5
	Intermediate Mathematics	-	-	25.9
	Advanced Mathematics	-	-	35.8
Society and Environment	History	21.1	17.4	18.2
	Geography	18.3	13.8	12.0
	Politics & Social Studies	15.2	15.7	7.0
	Economics	17.8	10.8	7.0
	Legal Studies	15.2	11.1	11.8
	Accounting	12.0	7.3	6.4
	Business Studies	9.2	17.1	22.7
	Secretarial Studies	4.3	1.8	1.4
	Tourism & Hospitality	1.9	1.5	2.2
	Religious Studies	17.6	12.2	15.5
Science	Chemistry	22.6	20.3	17.8
	Physics	20.4	20.0	16.6
	Biology	31.7	25.2	25.4
	General/Multi Strand Science	7.2	10.2	7.0
	Psychology	5.1	5.5	6.9
	Other Sciences	4.2	1.9	3.2
Arts	Creative and Visual Arts	17.4	18.2	20.9
	Performing Arts	7.3	6.6	10.0
	Music	3.6	4.9	6.2
LOTE	French	1.9	1.5	2.0
	German	1.2	1.3	1.0
	Indonesian	na	0.8	0.8
	Italian	1.1	1.0	1.2
	Japanese	2.2	2.1	2.7
	Other languages	1.3	3.4	2.3
Technology	Computer Studies	20.7	27.7	27.0
	Technical Studies	16.9	23.2	16.4
	Home Science	11.0	4.7	6.1
	Food/Catering	3.8	6.5	9.8
	Agriculture	2.4	2.8	2.6
	Child Studies	na	1.1	4.2
Health & Physical Education	Physical Education	17.6	17.7	15.0
	Health	1.9	8.5	9.9
Not Classified/Other		1.7	7.2	0.1

Note: Data refer to the percentage of Year 12 students taking one or more subjects from the area.

Arts

Enrolments in the Arts have continued to grow, with almost one-third of all Year12 students participating in the arts. This is predominantly in the performing arts, where enrolments have increased by around 3.4 percentage points since 1998, participation in creative and visual arts has increased by 2.7 percentage points, and in music by 1.3 percentage points.

Languages other than English

Enrolments in the Languages Other than English Key Learning Area remain very low, despite injections of funding and political support over the last decade. The only real increase has been in the percentage of students studying Japanese, which has increased from 2.2 per cent in 1993 to 2.7 per cent in 2001.

Technology

In the technology Key Learning Area, the largest number of enrolments is in computer studies, which enrols about one-quarter of students. In comparison, technical studies draw about 16 per cent and home sciences about 18 per cent of students.

Health and Physical Education

Enrolments in physical education subjects have declined slightly since 1993; however there has been a growth in enrolments in the health area.

The subjects in 1993 that enrolled more than 20 per cent of students were English, mathematics, history, chemistry, physics, biology and computer studies. In 2001 they were English, mathematics, business studies, biology, creative and visual arts, and computer studies. What does this tell us about the subjects that Year 12 students choose to study? An increase in enrolments in both business studies and performing and creative arts does not suggest any clear trend at present.

SUBJECT AREA ENROLMENTS AND STUDENT CHARACTERISTICS

The subject of this section of the report is the nature of the relationship between a range of student background characteristics and participation in particular subject areas. These background characteristics are traditionally those that have some equity considerations, or those that are known from other research to be associated with participation in particular subject areas. This section of the report makes use of the enrolment index described in Chapter 2. The index can be thought of as representing “curriculum share” for particular subject areas.

Gender

Values of the enrolment index for all students and separately for males and females are shown in Table 10. Enrolment patterns are similar to those seen in previous years. The subjects in which females continue to account for the majority of enrolments are home sciences (71 per cent of enrolments), Languages other than English (65 per cent) and arts (64 per cent of enrolments). Males clearly predominate in technical studies (82 per cent of enrolments), computer studies (67 per cent of enrolments) and physical education (68 per cent of enrolments). However each of these areas enrols a small percentage of all students, so it is useful to examine gender differences in areas that enrol a larger number of students.

Around 55 per cent of students, for example, study a science subject in Year 12. While the total proportion of students studying a science subject is similar for males and females, as in previous years there are strong gender differences in the type of sciences studied. Of the students enrolled in physical sciences, 64 per cent were males, whilst of the students enrolled in biological and other sciences, 60 per cent were female. Within the physical sciences, it is physics that has the greatest gender differentiation. Of the students enrolled in physics, almost three-quarters are males. Of those enrolled in chemistry, just over half are males (55 per cent).

Table 10 Enrolments[a] for Year 12 in subject areas by gender

Key Learning Area	Subjects	All students	Male	Female
English	English	19.5	19.0	19.9
Mathematics	Total mathematics	17.4	18.9	16.1
	Basic	*4.2*	*3.9*	*4.5*
	Intermediate	*5.3*	*5.4*	*5.2*
	Advanced	*8.0*	*9.7*	*6.5*
Society & Environment	SOSE	20.0	18.5	21.5
	Humanities/Soc Sciences	7.6	6.3	8.8
	Economics & Business	9.7	9.6	9.9
	Religion/Pastoral Care	2.6	2.6	2.7
Science	Science	14.1	14.6	13.8
	All Physical Sciences	6.5	8.5	4.8
	Chemistry	*3.1*	*3.4*	*2.8*
	Physics	*3.1*	*4.7*	*1.7*
	Biological/Other Sciences	7.7	6.1	9.0
Arts	Arts	7.8	5.5	9.8
LOTE	Languages	1.9	1.3	2.4
Technology	Technology	14.2	16.4	12.2
	Technical Studies	3.8	6.5	1.5
	Computer Studies	5.6	7.6	3.8
	Home Science	4.2	1.5	6.6
	Agriculture	0.5	0.8	0.3
Health & Physical Education	Health & PE	4.9	5.6	4.2
	Physical Education	3.4	4.3	2.5
	Health	1.5	1.3	1.7
Not Classified/Other		0.1	0.1	0.1

a as measured by the enrolment index

In the area of mathematics, there continues to be marked gender differences. For males, the curriculum share for mathematics is almost 19 per cent, for females a little over 16 per cent. While this is not cause for a great deal of concern, the enrolments in particular strands of mathematics shows that males are more likely to be studying advanced mathematics than females. More than half (54 per cent) of the enrolments in advanced mathematics are males, compared to 46 per cent of the enrolments in intermediate level mathematics and 42 per cent of the enrolments in fundamental mathematics.

Curriculum share for females in the humanities and social sciences area was higher than that for males, and females were primarily enrolled in history subjects. Enrolments in economics and business subjects were about even for males and females, and there was little difference in the types of subjects studied.

Social background

Subject selection traditionally has been a function, at least partly, of a student's social background. While both effects of parents' occupational level and educational level were examined, they provide much the same information, so influences of social background are explored in this report using parents' occupational status.

Table 11 Enrolments[a] for Year 12 in subject areas by parents' occupational level

Key Learning Area	Subject Area	Low	Low middle	Upper middle	High
English	English	19.6	19.3	19.5	20.0
Mathematics	Total mathematics	16.9	17.7	17.4	18.0
	Basic	*4.4*	*4.4*	*3.7*	*2.9*
	Intermediate	*6.3*	*6.0*	*5.5*	*4.4*
	Advanced	*6.4*	*7.3*	*8.4*	*10.8*
Society & Environment	SOSE	19.2	19.9	20.2	21.2
	Humanities/Social Sciences	6.9	7.1	7.7	9.1
	Economics & Business	10.2	10.1	9.5	9.0
	Religion/Past Care	2.1	2.6	3.0	3.2
Science	Sciences	12.2	13.3	15.6	16.8
	All Physical Sciences	4.4	5.7	7.1	9.3
	Chemistry	*2.1*	*2.7*	*3.6*	*4.6*
	Physics	*2.2*	*2.8*	*3.3*	*4.4*
	Biological/Other Sciences	7.8	7.6	8.5	7.5
Arts	Arts	7.9	7.7	7.6	8.0
LOTE	Languages	2.1	1.5	1.7	2.4
Technology	Technology	16.7	15.6	13.0	9.5
	Technical Studies	4.4	4.2	3.3	2.6
	Computer Studies	6.3	5.9	4.8	4.6
	Home Science	5.5	5.0	3.8	2.1
	Agriculture	0.5	0.5	1.0	0.2
Health & Physical Education	Health & PE	5.1	4.9	4.8	4.1
	Physical Education	3.6	3.8	3.3	2.6
	Health	1.5	1.1	1.6	1.5
Not Classified/Other		0.1	0.1	0.2	0.1

a as measured by the enrolment index

While it would be possible to explain gender differences by talking about preferences according to gendered learning styles, it is more difficult to explain differences in subject selection by socioeconomic status or social background. The existence of these differences is evident, however, in the data contained in Table 11.

The most notable of these is the lower level of participation in the physical sciences and advanced mathematics amongst those from less well-educated backgrounds and those from lower occupational backgrounds. Students whose parents were in the highest occupational level were three and a half times more likely to be studying an advanced level mathematics than a basic level mathematics, whereas for those with parents in the lowest occupational level, the difference was only half again as likely. Students with parents in the highest occupational levels were also more likely to be studying the traditional humanities subjects as well.

Technology, and economics and business studies (primarily business studies), were those most favoured by those students whose parents were in the lowest occupational levels.

Aboriginal and Torres Strait Islander students

There were just 109 students who identified themselves as being from an Aboriginal or Torres Strait Islander background, representing 1.6 per cent of the sample for this survey. As such, it would be unwise to draw too many conclusions about the subjects chosen by this group of students. Figure 1 provides a comparison of enrolment levels of Aboriginal and Torres Strait Islander background students with all other students in the Australian population. With the caveat necessary when dealing with such small numbers of students, it is apparent that other Australian students are more likely to be enrolled in the areas of advanced mathematics, chemistry, and physics, while Aboriginal and Torres Strait Islander students are more likely to be enrolled in technology studies, home sciences, physical education and health.

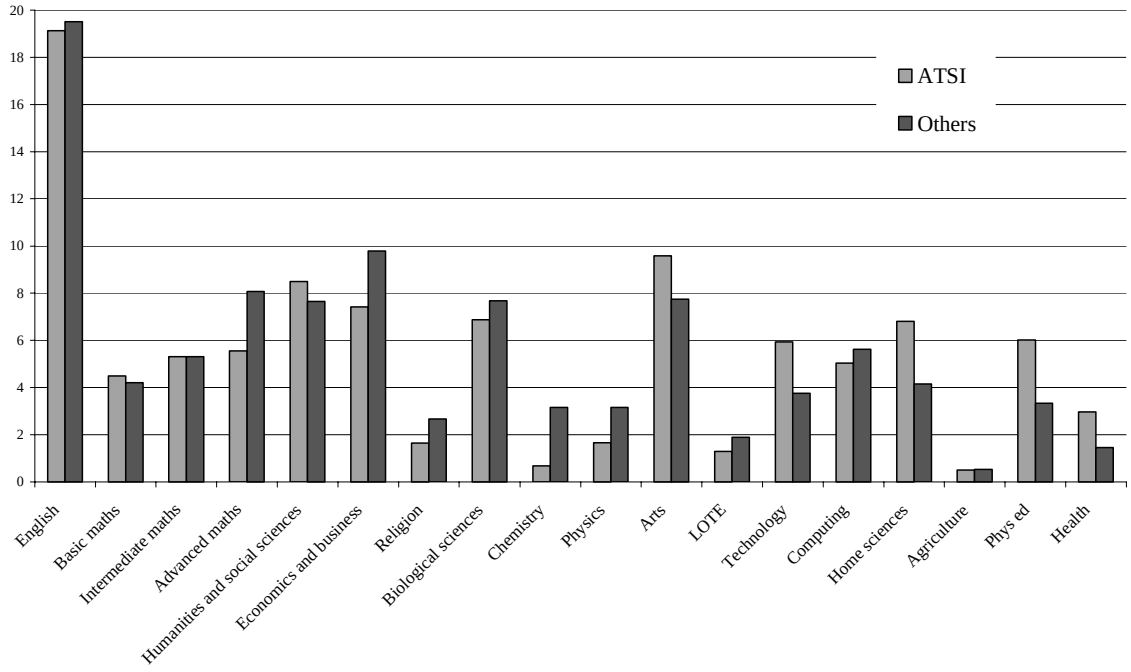

Figure 1 Year 12 subject enrolments by Aboriginal and Torres Strait Islander students and other Australian students

Table 12 provides enrolment indices according to parental birthplace. For this analysis, two main language groups were examined, as well as the total for countries with language backgrounds other than English as a whole, and Anglo-Australian groups as a whole. The two main language groups that are identified separately in this analysis are Southern European and Asian, both traditionally a source of immigrants to Australia, and each representing about 6 per cent of the sample. The aggregation of all students other than Anglo-Australian students to a single category is liable to mask considerable differences in subject selection, as can be seen in any secondary school in Australia. There is a very strong trend for students with an Asian background to study what are considered to be the most academic subjects: advanced mathematics, physics and chemistry, in order to obtain high tertiary entrance marks and enter the most prestigious university courses.

Table 12 Enrolments[a] for Year 12 in subject areas by parental birthplace

Key Learning Area	Subject Area	Australia or other English speaking country	Southern European country	Asian country	Total LBOTE[3]
English	English	19.4	19.5	19.6	19.7
Mathematics	Total mathematics	17.0	16.9	22.1	18.9
	Basic	*4.7*	*2.3*	*2.0*	*2.4*
	Intermediate	*5.3*	*7.2*	*3.6*	*5.4*
	Advanced	*7.2*	*7.5*	*16.6*	*11.2*
Society & Environment	SOSE	19.9	22.6	19.2	20.9
	Humanities/Soc Science	8.0	6.2	5.3	6.5
	Economics & Business	9.2	13.6	11.5	12.0
	Religion/Past Care	2.7	2.8	2.4	2.5
Science	Sciences	14.2	11.9	17.9	14.2
	All Physical Sciences	6.1	5.1	12.7	8.1
	Chemistry	*3.0*	*1.9*	*5.7*	*3.6*
	Physics	*2.8*	*2.8*	*6.7*	*4.3*
	Biological/Other Sciences	8.1	6.8	5.2	6.0
Arts	Arts	8.2	7.6	4.9	6.4
LOTE	Languages	1.3	4.4	3.5	4.0
Technology	Technology	14.3	14.1	10.9	13.1
	Technical Studies	4.1	3.4	1.9	2.7
	Computer Studies	5.1	7.1	7.8	7.6
	Home Science	4.6	3.5	1.2	2.7
	Agriculture	0.7	0.0	0.0	0.1
Health & Physical Education	Health & PE	5.4	2.9	1.8	2.7
	Physical Education	3.8	2.1	1.4	1.9
	Health	1.7	0.9	0.4	0.8
Not Classified/Other		0.1	0.1	0.0	0.1

a as measured by the enrolment index

There are some very striking differences shown in Table 12, which would not be evident if the LBOTE data were aggregated. In mathematics, for instance, there would appear to be no difference in enrolments in intermediate level mathematics between Anglo-Australian and LBOTE students. On closer examination, however, students from a Southern European background were equally likely to be studying intermediate or advanced mathematics, with only a small proportion enrolled in basic level mathematics. An Anglo-Australian student is less than twice as likely to be studying an advanced mathematics than a basic mathematics, while those students with a Southern European background were a little more than three times and those with an Asian background eight times as likely. Although not as dramatic, there are also substantial differences in the enrolment indices for chemistry and physics. Enrolments in chemistry and physics are both high for those students with an Asian background, and in both cases around twice the enrolment level of Anglo-Australian students; however enrolments in chemistry were lower for students with a Southern European background.

Australian students and those with a Southern European background were more likely to be enrolled in subjects in the Key Learning Areas of the Arts and Technology, although enrolments

[3] Total LBOTE is the total for countries where the language background is other than English, and includes both Southern European, Asian, and all other countries.

in computer studies were higher for both Southern European and Asian students than for Anglo-Australian students.

As might be expected, enrolments in Languages other than English were higher for all non-Australian students. Teese (1989) discussed the decline in enrolments in the traditional languages areas of French and German once a language other than English was no longer a requirement for entry to a tertiary Arts degree, and argued that "perceptions of relevance and access to support [for the study of these languages] are likely to be greater for children from highly educated families amongst whom a knowledge of prestigious foreign languages – as distinct from migrant 'community languages' – is a point of cultural heritage" (p. 238). Just 25 per cent of the Anglo-Australian students studying a LOTE at Year 12 level are studying French, while 35 per cent of them are studying Japanese – a shift from the study of language as a cultural study to the study of a language for business and economic reasons. For those with a Southern European background, 35 per cent are studying Italian, and for those students with an Asian background, almost 60 per cent are studying either Japanese or Chinese.

Achievement and subject enrolments

The longitudinal nature of the LSAY data allows the opportunity to examine the relationships between achievement in the earlier years of secondary schooling and subject selection in Year 12. Information on both literacy and numeracy was gathered when the respondents were in Year 9. Table 13 shows the enrolments by overall achievement level - a composite of the mathematics and reading scores.

As would be expected, the main differences in enrolments occur in mathematics and the physical sciences, and in the technology area. It would appear from these data that advanced mathematics, physics and chemistry take the cream of high achieving students. The enrolment levels in advanced mathematics of students from the highest achievement level is more than six times that of students from the lowest achievement levels, in physics almost eight times and in chemistry almost 12 times. Even the jump from the third quartile of achievement to the top quartile is large in terms of enrolments. Enrolments of the highest achieving students in advanced mathematics, physics and chemistry are all around twice that for the next achievement group. There is also a tendency for the most able students to enrol in subjects within the humanities area, reflecting traditional orientations of academia.

Biological sciences seem to appeal more to the two groups of students in the second and third quartiles of achievement. However, the main orientation of those outside the highest quartile is in the economics and business area, in the arts, and in the technology area. Nothing is particularly striking except perhaps the enrolments in home sciences, accounting for 7.5 per cent of the enrolments in the lowest quartile but only 1.6 per cent of the enrolments in the highest quartile.

Table 13 Enrolments[a] for Year 12 in subject areas by overall achievement quartiles

Key Learning Area	Subject Area	Lowest	Second	Third	Highest
English	English	19.5	19.5	19.5	19.6
Mathematics	Total mathematics	15.4	16.2	17.2	19.8
	Basic	*6.2*	*5.3*	*4.2*	*2.2*
	Intermediate	*6.5*	*6.5*	*5.5*	*3.3*
	Advanced	*2.7*	*4.5*	*7.5*	*14.6*
Society & Environment	SOSE	18.4	20.2	21.7	19.4
	Humanities/Soc Science	6.5	6.9	8.3	8.4
	Economics & Business	9.9	10.7	10.3	8.3
	Religion/Pastoral Care	2.0	2.6	3.1	2.7
Science	Sciences	7.3	11.9	14.7	19.9
	All Physical Sciences	1.4	3.4	5.8	12.8
	Chemistry	*0.5*	*1.5*	*2.8*	*6.2*
	Physics	*0.8*	*1.7*	*2.7*	*6.0*
	Biological/Other Science	5.9	8.5	8.9	7.1
Arts	Arts	8.9	8.7	7.8	6.6
LOTE	Languages	1.6	1.5	1.8	2.6
Technology	Technology	22.3	16.2	12.4	8.9
	Technical Studies	6.5	4.1	3.1	2.5
	Computer Studies	7.6	6.3	5.0	4.3
	Home Science	7.5	5.2	3.8	1.6
	Agriculture	0.7	0.6	0.5	0.4
Health & Physical Education	Health & PE	6.4	5.6	4.8	3.4
	Physical Education	4.7	4.1	3.3	2.2
	Health	1.7	1.5	1.6	1.2
Not Classified/Other		0.2	0.1	0.1	0.1

a as measured by the enrolment index

Aspirations to higher education

A student's aspirations have already been mentioned as a factor in subject selection. The data in Table 14 provide the enrolment indices for two groups of students: those who plan to go on to higher education after completing Year 12, and those who plan to go to work after completing school.

While approximately the same proportion of students are enrolled in mathematics, there are differences in the level of mathematics studied. More than twice the proportion of those with aspirations to higher education compared to those without such aspirations were enrolled in advanced mathematics, while a greater proportion of those without aspirations to higher education were studying basic and intermediate level mathematics.

Enrolments in chemistry and physics were around three times higher for those students with aspirations to higher education, while enrolments in technical studies were three times higher for those students with no aspirations to higher education.

Table 14 Enrolments[a] for Year 12 in subject areas by aspirations to higher education

Key Learning Area	Subject Area	Aspirations to higher education	No aspirations to higher education
English	English	19.4	19.5
Mathematics	Total mathematics	17.8	16.2
	Basic	*4.0*	*5.4*
	Intermediate	*4.6*	*6.8*
	Advanced	*9.4*	*4.1*
Society & Environment	SOSE	20.4	18.3
	Humanities/Social Science	8.0	6.4
	Economics & Business	9.6	9.6
	Religion/Past Care	2.8	2.3
Science	Sciences	16.2	9.2
	All Physical Sciences	8.1	2.7
	Chemistry	*3.9*	*1.2*
	Physics	*3.8*	*1.4*
	Biological/Other Sciences	8.1	6.4
Arts	Arts	8.0	8.1
LOTE	Languages	2.2	1.0
Technology	Technology	11.9	21.0
	Technical Studies	2.6	7.5
	Computer Studies	5.1	6.0
	Home Science	3.8	6.5
	Agriculture	0.4	0.9
Health & Physical Education	Health & PE	4.1	6.4
	Physical Education	2.7	5.0
	Health	1.4	1.4
Not Classified/Other		0.1	0.3

a as measured by the enrolment index

SCHOOL SYSTEM, LOCATION AND ENROLMENTS

Factors such as type of school attended, and geographical factors such as state of residence and location of school attended have some influence on the subjects offered by schools and hence on students' subject selections.

School sector

Subject enrolments for government, Catholic and independent schools are shown in Table 15. As has been shown in previous reports on subject selection, there is a higher rate of enrolment in advanced mathematics and the physical sciences, and in humanities and social sciences and languages other than English among those in schools in the independent sector than for those in either the Catholic or government sector. Although their magnitude is not large, these results are not surprising. Independent schools cater in the most part to those students whose families are in high occupational status groups, or to those who aspire to their children joining these groups. As such, study in the traditional areas of the humanities and languages is encouraged, as is the study of advanced mathematics, physics and chemistry as a means of accessing the prestigious university courses. Study in the biological sciences is increasing in independent schools, and there appears to be a trend to study a biology and chemistry combination for those wishing to enter university courses in medical fields.

Table 15 Enrolments[a] for Year 12 in subject areas by school sector

Key Learning Area	Subject Area	Government	Catholic	Independent
English	English	19.9	18.4	19.4
Mathematics	Total mathematics	17.3	17.2	18.1
	Basic	*4.4*	*3.7*	*4.1*
	Intermediate	*5.6*	*5.2*	*4.3*
	Advanced	*7.4*	*8.4*	*9.8*
Society & Environment	SOSE	17.5	26.8	21.2
	Humanities/Social Sciences	7.7	6.6	9.5
	Economics & Business	9.8	9.9	9.2
	Religion/Pastoral Care	0.1	10.3	2.5
Science	Sciences	13.3	13.9	18.0
	All Physical Sciences	5.8	6.4	9.6
	Chemistry	*2.7*	*3.1*	*4.6*
	Physics	*2.8*	*3.0*	*4.4*
	Biological/Other Sciences	7.5	7.6	8.4
Arts	Arts	8.6	6.1	7.1
LOTE	Languages	1.5	2.0	3.2
Technology	Technology	16.4	11.4	8.8
	Technical Studies	4.5	2.9	2.3
	Computer Studies	5.9	5.8	4.1
	Home Science	5.3	2.5	1.9
	Agriculture	0.6	0.2	0.6
Health & Physical Education	Health & PE	5.3	4.2	4.1
	Physical Education	3.7	2.6	3.1
	Health	1.6	1.6	1.0
Not Classified/Other		0.2	0.1	0.1

a as measured by the enrolment index

The largest differences in enrolments are in the technology area, where enrolments in the government sector are almost twice that of the independent sector, and almost half again that of the Catholic sector. This is evidenced mainly in the areas of technical studies and home sciences, which includes catering. These results can be explained by differing aspirations of students in the different sectors, and by the government sector's stronger take-up of VET in Schools programs (Fullarton, 2001).

Location

Table 16 records the enrolment index values for students according to whether they live in a capital city, another regional city or other regional area, or a rural or remote area. It can be seen that there are not huge differences in the enrolment indices. Enrolments in intermediate and advanced level mathematics, and economics and business are slightly higher in capital cities than in rural and remote areas, however the reverse is true for biological sciences, technical studies and home sciences.

Table 16 Enrolments[a] for Year 12 in subject areas by location

Key Learning Area	Subject Area	Capital city	Regional area	Rural area
English	English	19.5	19.7	19.3
Mathematics	Total mathematics	17.4	17.0	17.8
	Basic	*3.8*	*4.8*	*4.7*
	Intermediate	*5.1*	*5.5*	*6.0*
	Advanced	*8.6*	*6.8*	*7.2*
Society & Environment	SOSE	21.5	17.7	18.7
	Humanities/Social Sciences	8.0	7.5	6.9
	Economics & Business	10.6	8.6	8.7
	Religion/Past Care	2.9	1.6	3.1
Science	Sciences	14.1	13.9	14.7
	All Physical Sciences	6.7	5.7	6.5
	Chemistry	*3.2*	*2.8*	*3.3*
	Physics	*3.3*	*2.6*	*3.0*
	Biological/Other Sciences	7.4	8.2	8.2
Arts	Arts	7.6	9.0	7.2
LOTE	Languages	2.4	1.4	1.2
Technology	Technology	13.1	15.6	15.5
	Technical Studies	3.3	4.2	4.8
	Computer Studies	6.0	5.3	4.8
	Home Science	3.6	5.2	4.8
	Agriculture	0.1	0.9	1.2
Health & Physical Education	Health & PE	4.4	5.6	5.5
	Physical Education	3.1	4.1	3.5
	Health	1.3	1.5	2.0
Not Classified/Other		0.1	0.1	0.1

a as measured by the enrolment index

SUMMARY

This chapter has examined patterns of enrolments amongst those students from the 1998 LSAY cohort who completed Year 12 in 2001. Nationally, students in Year 12 study between five and six subjects. English is almost invariably one of these subjects, as is some level of mathematics. More than eight out of every ten students are enrolled in Year 12 mathematics, with around 30 per cent studying mathematics at a level at which they would be considered for entry into science or engineering courses requiring a high level of mathematics skill.

About one-quarter of the students are enrolled in subjects in the areas of biological sciences and computing, about one-fifth of students are enrolled in subjects in the business studies area and creative and visual arts.

There is a range of student and school characteristics that are potential influences on student participation in particular subjects or subject areas. The largest differences are seen in subject enrolments in advanced mathematics (with a concomitant difference in enrolments in either basic or intermediate mathematics), physical sciences, the arts, technical studies, computer studies and home sciences.

The differences could be summarised as follows.

- Males are more likely than females to be enrolled in advanced mathematics, physics, chemistry, technical studies and computer studies. Females are more likely than males to be enrolled in arts and home sciences.
- Those students with parents with a high occupational status are more likely to be enrolled in advanced mathematics, physics and chemistry, those with parents with a low occupational status to be enrolled in technical studies, computer studies, arts and home sciences.
- Those with an Asian background were more likely than any other group to enrol in advanced mathematics, chemistry and physics, those with a Southern European background were more likely than any other group to enrol in economics and business, intermediate level mathematics and LOTE, and those with an Anglo-Australian background were more likely than any other group to be enrolled in basic mathematics, humanities and social sciences, biological and other sciences, technical studies and home sciences.
- Those from the highest levels of achievement were more likely than those in the low levels to be enrolled in advanced mathematics, chemistry and physics, while those in the lowest achievement quartile were more likely than those in the high level to be enrolled in technical studies, computer studies and home sciences.
- Students in independent schools were more likely than those in government and Catholic schools to be enrolled in chemistry and physics, and those in government schools were more likely than those in Catholic or independent schools to be enrolled in technical studies and home sciences. Other than these differences there were no large differences between enrolments between sectors.
- Students with aspirations to further study after school were more likely to be enrolled in advanced mathematics, chemistry and physics, while those with no such aspirations were more likely to be enrolled in technical studies and home sciences.

This chapter has presented some clear influences on subject participation. Gender, parental background, achievement and aspirations are all clear influences on the subjects that a student selects in Year 12. It is unlikely, however, that these factors act in isolation; it is more likely that a number of factors may interact to influence subject selection. The next chapter uses multivariate analysis to examine these influences.

6. INFLUENCES ON SUBJECT PARTICIPATION: A MULTIVARIATE ANALYSIS

This section investigates influences on subject selection. Multivariate logistic regression is used in this analysis after creating dichotomous variables representing participation (or not) in a particular subject area (and in some cases in particular subjects). This technique and how to interpret the results have been described in Chapter 3.

The analyses are based on a core model that includes the most theoretically and educationally important influences on Year 12 subject selection. The core model comprises gender, parents' occupation, education, and country of birth, school location, school sector, Year 9 achievement, and student's aspirations to further study. The sign of the logistic coefficient indicates if the factor has a positive or negative influence, that is, whether it increases or decreases the likelihood of participation.

For each of the categorical variables, one level must be chosen in order that comparisons can be made. For example males are chosen as the comparison or reference group; female participation can then be compared to male participation, all other things equal. The reference group is made explicit in each separate analysis.

Comparisons can be derived for any combination of the background and educational variables, however the following discussions relate to comparisons with this particular reference group only.

INFLUENCES ON ENROLMENTS IN MATHEMATICS

All of the factors examined in Chapter 4, other than home location perhaps, appear to exert an influence on students' enrolments in mathematics. To investigate this, three separate logistic regressions were carried out for each of the levels of mathematics, and the unstandardised logistic regression coefficients are presented in Table 17. For the examination of the effects on enrolment in advanced mathematics, odds ratios and predicted probabilities will also be used to illustrate the effects found in the logistic regression.

Predicted probabilities are derived from the unstandardised logistic regression coefficients and can then be graphed so as visual comparison with the probability of a "typical" student's participation in advanced mathematics can be made easily. The dotted line in Figure 2 represents the probability of a "typical" student enrolling in advanced mathematics. The probability that this individual will participate in advanced mathematics was calculated to be 0.06. This "typical" student is male, in the lowest quartile of achievement, has no aspirations to higher education, has parents with partial secondary education and in the lowest occupational quartile, Australian or English speaking background, and is attending a government school in a metropolitan area. Statistically significant differences (at $p < 0.05$ level) are marked by a darker shaded bar in Figure 2. While this type of visual interpretation could be provided for each analysis, it is more expedient to provide one for illustration and then present the remaining analysis in tabular format.

Gender

There are significant gender effects on participation in advanced levels of mathematics, although no differences in participation levels for basic and intermediate levels. The odds ratio for advanced mathematics for females to males is 0.54, meaning that, all other things equal, the likelihood of a female enrolling in advanced mathematics is much less than that for a male.

Table 17 Influence of social, background and educational characteristics on participation in mathematics in Year 12, 2001

	Basic maths	Intermediate maths	Advanced maths
Gender (relative to males)			
Female	-0.07	0.04	-0.61 ***
Early school achievement (relative to lowest quartile)			
Lower middle	- 0.30 *	-0.23 *	0.82 ***
Upper middle	- 0.63 ***	-0.93 ***	1.65 ***
Highest	-1.38 ***	-0.93 ***	2.71 ***
Parent's occupational level (compared to lowest quartile)			
Lower middle	0.10	0.09	-0.01
Upper middle	-0.14	0.11	0.10
Highest	-0.25	-0.05	0.29
Parent's educational level (compared to did not complete secondary school)			
Completed secondary school or apprenticeship	0.04	-0.24 *	0.01
Completed TAFE qualification	-0.02	-0.19	0.08
Completed university qualification	-0.16	-0.31 **	0.29 *
Student's aspirations (relative to no aspirations)			
Aspire to higher education	-0.07	-0.43 ***	0.86 ***
Parents' country of birth (relative to Australian-born or other English-speaking)			
Non-English speaking	-0.90 ***	0.04	0.89 ***
Locality (relative to metropolitan)			
Regional	-0.10	0.18	-0.19
Rural and remote	-0.04	0.29 **	0.13
School sector (relative to Government)			
Catholic	-0.14	0.15	0.12
Independent	0.16	0.03	-0.09

* $p < .05$, ** $p < .01$, *** $p < .001$

Achievement

Not surprisingly, earlier school achievement in mathematics and reading is a very significant influence on the likelihood of participating in mathematics in Year 12. Table 17 shows that students in the lowest quartile are most likely to participate in basic mathematics. The odds of students in the other three achievement quartiles being enrolled in basic mathematics are much less than the odds of participation of the lowest achieving students.

In contrast, the odds ratio for participating in advanced mathematics for students in the highest achievement quartile is a little over 15. This means that the odds of a student in the highest achievement quartile participating in advanced mathematics subjects are 15 times the odds of a student in the lowest achievement quartile participating. Even the odds ratio of a little over 2 for the lower middle achievement quartile indicates that the odds of this group of students being enrolled in advanced mathematics is more than twice the odds of a student in the lowest achievement quartile participating. This can be seen in Figure 2, where the probability of participating in advanced mathematics for the highest quartile students is 0.47, for the upper middle quartile is 0.24, and for the lower middle quartile is 0.12 compared to 0.06 for the 'reference' student.

Parents' occupational level and parents' educational level

Net of all other factors in the model, there are no significant effects of parents' occupational level, and very few for parents' educational level. Those students whose parents did not

complete secondary school are significantly less likely to be enrolled in intermediate level mathematics than either those students whose parents completed secondary school or those whose parents are university educated. The probability of enrolling in advanced mathematics for students whose parents completed a university qualification is 0.07 compared to 0.06 for those whose parents did not complete secondary school, and while this is not a huge difference, it is significant. This is consistent with the view that tertiary educated parents are more likely to recognise the value of advanced mathematics as a filter to tertiary courses, and as a means of boosting the tertiary entrance rank of the student.

Aspirations

Students who aspire to higher education are also more likely to be enrolled in advanced mathematics than those who have no such aspirations. The odds ratio for advanced mathematics is 2.6, while that for intermediate mathematics is 0.7, meaning that students with tertiary aspirations are a little less likely to be enrolled in intermediate level mathematics and much more likely to be enrolled in advanced mathematics than those with no aspirations.

Parents' country of birth

Consistent with the argument that students from migrant families are encouraged to enrol in higher level mathematics, the odds of a student from a language background other than English participating in basic level mathematics is 0.4, while the odds of participating in advanced mathematics is 2.5 times the odds of a student with an English-speaking background participating.

Location

The only significant difference found for participation in mathematics was a slightly greater likelihood (odds ratio of 1.3) for students from rural and remote areas to be enrolled in intermediate level mathematics, compared to those students in capital cities.

School sector

There were no significant differences found for school sector. This means that, net of the effects of parents' education and occupation, and, more importantly, achievement test scores, there is no difference in the likelihood of a student from a Catholic or independent school enrolling in basic, intermediate or advanced level mathematics compared to a student from a government school.

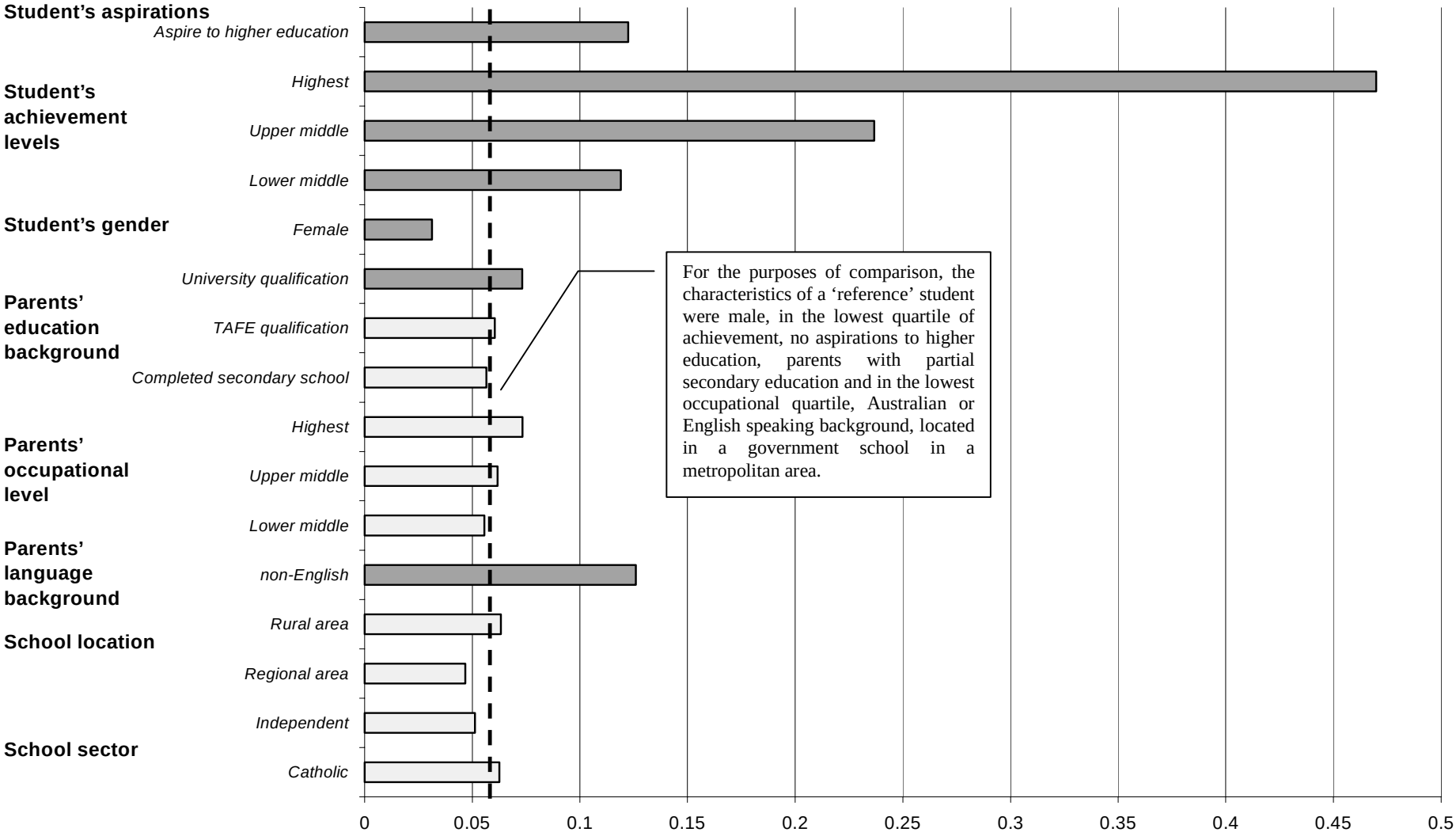

Figure 2 Background influences on the probability of participation in advanced mathematics at Year 12

Table 18 Influence of social, background and educational characteristics on participation in science subjects in Year 12, 2001

	Biological Sciences	Physical Sciences	Physics	Chemistry
Gender (relative to males)				
Female	0.69 ***	-0.81 ***	-1.38 ***	- 0.30 ***
Early school achievement (relative to lowest quartile)				
Lower middle	0.56 ***	0.78 ***	0.66 **	0.88 ***
Upper middle	0.53 ***	1.54 ***	1.56 ***	1.68 ***
Highest	0.25 *	2.47 ***	2.34 ***	2.52 ***
Parent's occupational level (compared to lowest quartile)				
Lower middle	0.10	0.07	0.12	-0.04
Upper middle	0.22 *	0.30 *	0.18	-0.17
Highest	-0.14	0.43 ***	0.32 *	0.32 *
Parent's educational level (compared to did not complete secondary school)				
Completed secondary school or apprenticeship	-0.08	0.13	0.15	0.07
Completed TAFE qualification	0.05	0.19	0.11	0.25
Completed university qualification	0.09	0.32 **	0.35 *	0.28 *
Student's aspirations (relative to no aspirations)				
Aspire to higher education	0.19 *	1.09 ***	1.07 ***	1.12 ***
Parents' country of birth (relative to Australian-born or other English-speaking)				
Non-English speaking	-0.35 ***	0.65 ***	0.79 ***	0.41 ***
Locality (relative to metropolitan)				
Regional	0.08	0.02	0.10	0.00
Rural and remote	0.17	0.21	0.23	0.24 *
School sector (relative to Government)				
Catholic	0.16	-.05	-0.18	-0.09
Independent	0.31 **	0.04	-0.17	0.09

** p < 0.01, ** p <0 .05, *** p < 0.001*

INFLUENCES ON ENROLMENTS IN SCIENCES

It was evident in Chapter 4 that most of the factors examined appear to have an influence on student' enrolments in sciences. To investigate this further, logistic regression has been carried out with the groups 'Biological and other Sciences', and 'Physical sciences'. In addition, it was deemed necessary to examine physics and chemistry individually, due to differing patterns of participation in these two subjects. Relevant data are shown in Table 18.

Biological Sciences

Examining enrolments in the biological sciences first, the significant influences, all other things equal, were gender, prior achievement levels, parents' occupational level, aspirations to higher education, and school sector. These can be summarised as follows:

- Females were more likely to be studying biological sciences. The female to male odds ratio of 2 means that the odds of a female being enrolled in a biological science is twice the odds of a male being enrolled, all other things equal;
- Relative to those students in the lowest achievement quartile, students in each of the other quartiles were more likely to be enrolled in the biological sciences, with the odds 1.8 for those in the lower middle quartile, 1.7 for those in the upper middle quartile and 1.3 for those in the highest quartile;

- There is a small, but statistically significant, higher likelihood of a student with parents in the upper middle occupational level to enrol in biological sciences, and a tendency (but not at significant levels) for those in the highest occupational quartiles not to enrol;
- There were no significant differences in enrolments, all other things equal, by parents' educational level.
- Students with aspirations to tertiary study were more likely than those with no such aspirations to study biological sciences, with an odds ratio of 1.21;
- Those from a language background other than English were less likely to enrol in the biological sciences; and
- Students in independent schools were more likely to be enrolled in biological sciences than those in government schools (odds ratio of 1.4).

Physical Sciences

As would be expected from Chapter 5, those students enrolled in the physical sciences tend to be the high achievers, males, students from high levels of parental occupation and education, students with language backgrounds other than English, and those in Catholic or independent schools. In the logistic regression analysis we are able to see whether these effects are independent, or whether they disappear once we hold other things equal.

Gender

Females are less likely to enrol in the physical sciences as a whole, and this is influenced by a lesser likelihood to participate in both physics and chemistry. The odds of a female enrolling in physics is 0.3 the odds of a male enrolling, and for chemistry the female to male odds ratio is 0.8.

Achievement

Other things equal, achievement is the largest influence on participation in physics and chemistry, which is not surprising given the perception of these subjects and advanced mathematics as the most difficult in the Year 12 curriculum. Overall for participation in the physical sciences, the odds ratios (compared to those students in the lowest achievement quartile) are 2.2 for the lower middle achievement level, 4.7 for those in the upper middle achievement level and a massive 11.8 for those in the highest achievement level.

Participation in both physics and chemistry follows a similar pattern, although, perhaps surprisingly, it is chemistry that has the larger odds. The odds ratios range from 1.9 for physics and 2.4 for chemistry for the lower middle achievement quartile as compared to the lowest quartile, to 10.4 for physics and 12.4 for chemistry for the highest achievement quartile as compared to the lowest quartile. This seems to imply that while prior achievement is a very strong influence, its influence is greater on enrolment in chemistry than in physics, all other things equal.

Parents' occupational level and educational level

For both parents' occupational level and parents' educational level, the significant differences lie between those with the highest-level occupation and highest level of education with those in the lowest levels of each. Looking at the overall results, the odds of a student in the highest parental occupational level enrolling in physical sciences is 1.5 times the odds of a student in the lowest parental occupational level enrolling, with similar odds ratios for physics and chemistry. The odds ratio of enrolling in physical sciences for a student whose parents completed a university qualification is 1.4 times the odds of a student whose parents did not complete secondary school, and the odds are slightly greater that the student with the higher educational background would enrol in physics than chemistry.

Aspirations to higher education

Not surprisingly, those students who aspire to higher education are more likely to enrol in the physical sciences than those who do not. The odds ratios are 3 for all physical sciences, 2.9 for physics and 3.1 for chemistry.

School sector

Other things equal, there are no sector differences in enrolments in the physical sciences overall, nor in physics and chemistry individually.

INFLUENCES ON ENROLMENTS IN STUDIES OF SOCIETY AND ENVIRONMENT

Table 19 provides the unstandardised logistic regression coefficients for the influences on participation in the two main areas in the Key Learning Area of Studies of Society and Environment, humanities and social sciences and economics and business.

Table 19 Influence of social, background and educational characteristics on participation in SOSE subject areas in Year 12, 2001

	Humanities & Social Sciences	Economics & Business
Gender (relative to males)		
Female	0.20 *	0.09
Early school achievement (relative to lowest quartile)		
Lower middle	0.09	-0.08
Upper middle	0.29 **	-0.22
Highest	0.36 **	-0.75
Parent's occupational level (compared to lowest quartile)		
Lower middle	- 0.07	-0.09
Upper middle	- 0.11	0.04
Highest	0.08	0.12
Parent's educational level (compared to did not complete secondary school)		
Completed secondary school or apprenticeship	0.08	0.00
Completed TAFE qualification	0.37 **	-0.00
Completed university qualification	0.24 *	-0.40 **
Student's aspirations (relative to no aspirations)		
Aspire to higher education	0.20 *	-0.36 ***
Parents' country of birth (relative to Australian-born or other English-speaking)		
Non-English speaking	-0.39 ***	0.44 ***
Locality (relative to metropolitan)		
Regional	-0.12	-0.15
Rural and remote	-0.06	0.07
School sector (relative to Government)		
Catholic	-0.16	0.13
Independent	0.52 ***	0.00

** p < 0.01, ** p <0 .05, *** p < 0.001*

The significant influences found for humanities and social sciences are:

Gender

All other things equal, the odds of a female enrolling in humanities and social sciences subjects is 1.2 the odds of a male enrolling.

Achievement

Students in the higher achievement levels are more likely to be enrolled in the humanities and social sciences than those in the lowest achievement quartile (odds of 1.3 for those in the upper middle quartile and 1.4 for those in the highest achievement quartile as compared to the lowest quartile).

Parents' educational level

Those students whose parents have completed some form of tertiary qualification (TAFE or university) were more likely to be studying in the field of humanities and social sciences than those whose parents did not complete secondary school. The relevant odds ratios were 1.5 for those whose parents had completed a TAFE qualification and 1.3 for those whose parents had completed a university qualification. One possible explanation for this finding is that students whose parents have a limited educational background tend to think of education in terms of obtaining employment, whereas those students whose parents have more education are encouraged to think of education in broader terms, and so are encouraged to undertake subjects that do not lead directly to employment.

Aspirations

Students who aspire to higher education are more likely to study humanities and social sciences than those with no such aspirations, probably for the same reasons as outlined above.

English-speaking background

Students from a language background other than English were significantly less likely to enrol in humanities and social sciences, with an odds ratio of 0.7 compared to those from an English-speaking background.

Attendance at an independent school

The odds of a student from an independent school enrolling in humanities and the social sciences was 1.7 times the odds of a student from a government school participating.

The influences on participation in the area of economics and business were fewer. There were no gender differences, no influences according to achievement level or parental occupational level, and no differences according to school location or sector. The significant influences found were:

- Lower levels of participation amongst those students whose parents had completed a university qualification, with the odds ratio of 0.7 for these students compared to those whose parents did not complete secondary school;
- Lower levels of participation amongst those who aspire to tertiary education. The odds ratio for these students is 0.7 compared to those students with no tertiary aspirations; and
- Higher levels of participation amongst those students with a language background other than English. The odds ratio is 1.6 for these students as compared to English background students.

INFLUENCES ON ENROLMENTS IN TECHNOLOGY AND THE ARTS

Table 20 shows the influences on participation in the Key Learning Areas of Technology (separately for technical studies and computing) and the Arts.

Gender

All three subject areas show large gender differences. Technical studies and computing are very much male domains, with the odds ratio of females to males in the order of 0.2 for technical studies and 0.4 for computing. In contrast, Arts is very much a female domain, with an odds ratio of females to males of 2.2.

Achievement level

All other things equal, students in the lowest achievement levels are most likely to be those participating in technology, and to a lesser extent, computer studies. The odds ratios show a declining probability of enrolment as achievement level increases, with the odds ratios for the highest level compared to the lowest level 0.4 for technical studies and 0.6 for computing. There was no apparent influence of achievement level on participation in the Arts.

Table 20 Influence of social, background and educational characteristics on participation in technology subjects and the Arts, in Year 12, 2001

	Technical Studies	Computing	Arts
Gender (relative to males)			
Female	-1.67 ***	-0.90 ***	0.79 ***
Early school achievement (relative to lowest quartile)			
Lower middle	-0.32 *	-0.10	0.14
Upper middle	-0.53 ***	-0.33 **	-0.19
Highest	-0.88 ***	-0.51 ***	-0.18
Parent's occupational level (compared to lowest quartile)			
Lower middle	0.02	0.05	0.06
Upper middle	-0.04	-0.06	-0.10
Highest	-0.02	-0.09	0.07
Parent's educational level (compared to did not complete secondary school)			
Completed secondary school or apprenticeship	0.04	-0.08	0.10
Completed TAFE qualification	0.03	-0.02	-0.05
Completed university qualification	-0.43 **	-0.10	0.11
Student's aspirations (relative to no aspirations)			
Aspire to higher education	-0.78 ***	0.01	-0.13
Parents' country of birth (relative to Australian-born or other English-speaking)			
Non-English speaking	-0.34 *	0.53 ***	-0.36 ***
Locality (relative to metropolitan)			
Regional	-0.01	-0.10	0.04
Rural and remote	-0.23	-0.25 *	-0.13
School sector (relative to Government)			
Catholic	-0.42**	-0.08	-0.21 *
Independent	-0.56 ***	-0.41 ***	0.01

** p < 0.01, ** p <0 .05, *** p < 0.001*

Parents' occupational level and parents' educational level

There were no significant effects of either parents' education or occupation on participation in any of the three subject areas except for a negative influence of parents' completion of a university qualification on participation in technical studies (odds ratio of 0.7).

Students' aspirations

Students' aspirations to higher education were only found to influence enrolments in technical studies, with an odds ratio of 0.5 compared to the odds of a student with no tertiary aspirations participating.

Language background

A students' language background was found to significantly influence their participation in all three of the subject areas. Students with a language background other than English were found to be significantly less likely than those from an English-speaking background to participate in technical studies (odds ratio of 0.7) and the Arts (odds ratio of 0.7), but significantly more likely to participate in studies in computing (odds ratio of 1.7).

Location

The only significant influence of school location was found to be that students in rural and remote schools were less likely to enrol in computing subjects (odds ratio of 0.8). Whether this is a function of fewer opportunities due to lack of teaching staff or lack of equipment, or simply a factor of a different focus for students in these areas, is a matter for further investigation.

School sector

The influence of school sector is in the direction that one would expect. Many of the subjects in both technical studies and computing are VET in Schools subjects, and it is in government schools that the take-up of these is most extensive. It is also to some extent a reflection of the differing aspirations of the students enrolled in a particular school sector.

Students in the Catholic sector are less likely to enrol in technical studies, where the odds ratio compared to students in government schools is 0.7, and in the Arts, where the odds ratio is 0.8. Students in the independent school sector are just as likely as those in the government sector to be enrolled in the Arts, but have a much lower likelihood of being enrolled in either technical studies or computing (odds ratios compared to government school students of 0.6 and 0.7 respectively).

SUMMARY

This chapter has examined some of the influences on enrolments in the Key Learning Areas of Mathematics, Science, and the Arts, and in the subject areas of humanities and the social sciences, economics and business, technical studies, and computer studies.

Other things equal, the following factors had an independent effect on subject participation:

- For advanced mathematics (and concomitantly with other levels of mathematics): gender, achievement level, student's aspirations to higher education and their language background;
- For biological and physical sciences: gender, achievement level, parents' educational level, student's aspirations, language background, and school sector;
- For physical sciences: gender, achievement level, parents' occupational level, parents' educational level, and student's aspiration;

- For humanities and social sciences: gender, achievement level, parents' educational level, student's aspirations, language background and school sector;
- For economics and business: parents' educational level, student's aspirations and language background;
- For technical studies: gender, achievement level, parents' educational level, student's aspirations, language background and school sector;
- For computer studies: gender, achievement level, language background, rurality and school sector; and
- For the arts: gender, language background and school sector.

Although many variables were found to be predictors of subject participation, several variables consistently stood out as important: gender, achievement level, parents' educational level, language background and student's aspirations. It is important to recognise that while education systems aim to make education exclusive to all groups, there are still potential disparities in opportunities depending on a student's gender, socioeconomic background and language background.

Previous chapters of this report have examined participation in Year 12, and the subjects studied by the students who stay to complete their schooling. In the next chapter of the report we use the data available from major studies of subject choice since 1990 to examine shifts in subject enrolments over the last decade.

7. TRENDS IN SUBJECT PARTICIPATION OVER A DECADE

Over the period from 1990 to 2001 there have been shifts in the subjects studied by Year 12 students. The first part of this period corresponded to a peak in participation levels in Year 12. The apparent retention rate to Year 12 in 1990 was 71 per cent and by 1993 it had risen to 77 per cent. Following that rise there was a decline, so that in 1998 the apparent retention rate to Year 12 was 72 per cent and in 2001 the rate was 73 per cent.

Changes in patterns of subject choice during the time from 1990 to 2001 would not generally be explainable in terms of rising Year 12 participation levels and a broadening of the academic and social composition of the Year 12 cohort (although the analyses in Chapter 4 of the report indicate some broadening of composition even though participation levels have been relatively static). The changes observed in the subjects studied by Year 12 students possibly reflect changes in interests and preferences as influenced by changes in assessment procedures and requirements, and also reflect the influence of changing curriculum structures and structural changes in the labour market.

Two indicators are used to examine changing patterns of subject uptake. The first is the participation rates in subject areas. These participations rates for one subject or more than one subject in an area are recorded in Table 21. The second is the value of the enrolment index over time. This provides an indication of the proportion (or share) of the curriculum that is taken up by subjects from that area. These values for each of the four years are recorded in Table 22. The discussion that follows makes use of both indicators.

Table 21 Subject area participation rates from 1990 - 2001

		Percentage of Students							
		One subject				*More than one subject*			
Key Learning Area	**Subject Area**	1990	1993	1998	2001	1990	1993	1998	2001
English	English	89	89	90	91	7	6	4	5
Mathematics	Mathematics	66	69	77	77	18	17	8	8
Society & Environment	SOSE	na	34	37	38	na	37	33	30
	Humanities/Social Sci	34	32	32	29	18	13	8	6
	Economics & Business	30	29	29	29	17	16	10	10
	Religion/Pastoral Care	na	12	12	15	na	7	0	0
Science	Sciences	na	43	40	36	na	25	20	19
	Physical Sciences	15	17	17	16	15	13	11	10
	Biological/Other Sci	45	44	40	35	3	5	3	3
Arts	Arts	21	21	23	24	8	8	8	8
LOTE	Languages	9	9	10	9	1	1	1	0
Technology	Technology	na	32	36	35	na	10	10	17
	Technical Studies	10	13	14	13	2	2	4	3
	Computer Studies	11	20	23	25	0	0	1	2
	Home Science	12	12	14	15	1	2	2	3
	Agriculture	2	2	2	2	1	0	0	0
Health & Physical Education	Health & PE	na	19	24	21	na	1	2	2
	Physical Education	12	17	17	15	0	1	1	2
	Health	na	4	8	8	na	0	0	0

Table 22 Enrolments[a] in Key Learning Areas and specified subject areas, 1990 - 2001

Key Learning Area	Subject Area	1990	1993	1998	2001
English	English	18.1	18.2	18.7	19.5
Mathematics	Mathematics	17.5	17.9	17.7	17.4
Society & Environment	SOSE	na	22.9	20.1	20.0
	Humanities & Social Sciences	11.9	9.6	8.8	7.6
	Economics & Business	11.6	11.3	9.3	9.7
	Religion & Pastoral Care	na	2.0	2.0	2.6
Science	Sciences	17.0	17.2	15.2	14.1
	Physical Sciences	8.1	7.7	7.5	6.5
	Biological & Other Sciences	8.9	9.5	7.7	7.7
Arts	Arts	6.6	6.9	6.6	7.8
LOTE	Languages	2.0	1.8	1.9	1.9
Technology	Technology	na	10.6	13.5	14.2
	Technical Studies	2.5	3.6	5.3	3.8
	Computer Studies	2.0	3.7	5.3	5.6
	Home Science	2.4	2.8	2.4	4.2
	Agriculture	na	0.5	0.5	0.5
Health & Physical Education	Health & PE	na	3.9	5.1	4.9
	Physical Education	2.2	3.2	3.5	3.4
	Health	na	0.7	1.6	1.5
Not Classified/Other		5.8	0.3	1.3	0.1

a as measured by the enrolment index

TRENDS IN THE SUBJECTS STUDIED BY YEAR 12 STUDENTS

English and Mathematics

Trends in participation in English shown in Table 21 indicate that there is little change and that participation in English remains nearly universal (between 4 and 6 per cent of students do not study English as part of their Year 12 course). The increase in enrolment share reflected in Table 22 is probably a result of a decline in the total number of subjects studied between 1998 and 2001. In mathematics, the percentage of Year 12 students studying some mathematics has remained fairly constant at between 84 and 86 per cent of those in Year 12. However, there has been a decline in the percentage undertaking two mathematics subjects as part of their course (the percentage has halved from the early 1990s to the end of the 1990s) and therefore there has been a decline in the curriculum share for mathematics.

Society and Environment

In the humanities and social sciences learning area there has been a continuing decline in overall participation from 52 to 35 per cent of Year 12 students. The most marked decline has been in the percentage of students taking more than one humanities subject. In terms of specific subjects the change from 1993 to 2001 for history has been from 21 to 18 per cent, for geography it has been from 18 to 12 per cent (the figure was 21 per cent in 1990) and for politics or social studies it has declined from 15 to 7 per cent (see Table 9). These trends in participation are reflected in the decline in the curriculum share attributable to the humanities and social sciences from 12 to 8 per cent over the period from 1990 to 2001.

For economics and business there has been a small overall decline from 47 to 39 per cent, largely associated with a decline in the percentage of students taking more than one subject from the area. This overall pattern masks contrary trends within the area. Between 1993 and 2001 participation in economics declined from 18 to 7 per cent (in fact it was 28 per cent in 1990), legal studies declined from 15 to 12 per cent and accounting declined from 12 to 6 per cent. In contrast participation in business studies increased from 9 to 23 per cent (see Table 9). Overall the curriculum share attributable to economics and business declined slightly from 12 to 10 per cent between 1990 and 2001.

Science

Overall, there has been a decline in the curriculum share attributable to the science key learning area over the period from 1990 to 2001 from 17 to 14 per cent. However, this decline needs to be examined in greater detail using participation rates for subject areas and particular subjects. There has been an overall decline in participation rates in the biological and other sciences between 1990 and 2001 from 48 to 38 per cent of Year 12 students. Predominantly, this decline has been in the percentage of students taking one subject as only a few students have ever taken more than one subject from this area. Biology participation has dropped from 35 per cent in 1990 to 25 per cent in 2001. This has been only partly compensated by the increase in psychology enrolments from 5 to 7 per cent between 1993 and 2001 (it was almost non-existent in 1990) and changes in general science enrolments over the period. In the physical sciences, however, the decline in overall participation from 30 to 26 per cent between 1990 and 2001 has been mainly associated with a decline in the percentage of students taking more than one subject (almost entirely physics plus chemistry) from the area (from 15 to 10 per cent). Specifically, chemistry participation has declined from 24 to 18 per cent and physics participation has declined from 22 to 17 per cent.

The Arts

There has been a small increase in the curriculum share for the arts from 7 to 8 per cent over the period from 1990 to 2001 with the increase being greatest in the period from 1998 to 2001. In terms of sub-areas of the key learning area there have been increases in participation rates between 1993 and 2001 from 17 to 21 per cent (the figure was 15 per cent in 1990) for the creative and visual arts, from 7 to 10 per cent for the performing arts and from 4 to 6 per cent for music.

Languages other than English

Despite the emphasis placed on languages other than English through the 1990s there has been very little change in the uptake of languages as measured by either index over the period from 1990 to 2001. Overall, the level of participation in languages other than English remained small, being around 10 per cent of the group, and very few studied more than one language. Within this overall low level of participation there was evidence of a decline in traditional European languages and a growth in Asian languages. There was a decline from 3 to 2 per cent between 1990 and 2001 in French. Following a decline from 1990 to 1998 (where the figure was 1.5 per cent) there was an increase back to 2 per cent over the three years from 1998 to 2001. Participation in German declined from 2 to 1 per cent over the period from 1990 to 2001. In contrast participation in Japanese increased from 1 to 3 per cent and participation in other languages (including Chinese) increased from 1 to 2 per cent (having peaked at 3 per cent in 1998) from 1993 to 2001.

Technology

The key learning area of technology includes a range of different types of study. One of these is the subject area designated technical studies. The percentage of students who participated in technical studies grew from 12 to 16 per cent over the period from 1990 to 2001, having peaked at 18 per cent in 1998. The increase in the early 1990s was associated with a growth in the percentage of Year 12 students taking one subject from the area and the increase in 1998 was associated with an increase in the percentage taking more than one subject from the area. The curriculum share reflected in the enrolment index increase from 2.5 to 5 per cent between 1990 and 1998 before dropping back to 4 per cent in 2001.

For the subject area designated as computer studies the growth in curriculum share has grown steadily from 2 to 6 per cent over the period from 1990 to 2001. This has been associated with a growth in the participation rate from 11 per cent of Year 12 students in 1990 to 27 per cent of Year 12 students in 2001. This has largely been a change in the percentage of students taking one subject from the area because few students take more than one computer studies subjects.

Studies in food and catering studies have experienced increased participation levels over the period from 4 per cent in 1993 to 10 per cent in 2001. Some of this may have involved a relabelling or reclassification of home science subjects but despite this there was a net growth in the area.

Health and Physical Education

The percentage of Year 12 students studying in the physical education area increased between 1990 and 1993 and remained fairly constant since then (possibly with a small decline between 1998 and 2001). Most students only take one subject from the area.

CHANGES IN SUBJECT COMBINATIONS

The data in Table 21 indicates that there has been a decrease in the extent to which Year 12 students specialise by taking more than one subject from subject areas in which there was traditionally specialisation.

In mathematics the percentage of students studying two mathematics subjects declined from around 18 per cent in 1990 to 8 per cent in 2001 and in the physical sciences the corresponding decline was from 15 to 10 per cent.

Similarly, the proportion of students studying two subjects in the humanities and social sciences area declined from 18 per cent to 6 per cent, and in economics and business the decrease was from 17 per cent to 10 per cent.

In recent times, the proportion of students undertaking multiple studies in the technology key learning area increased from 10 per cent in 1998 to 17 per cent in 2001.

CHANGES IN RELATIONSHIPS TO STUDENT BACKGROUND

Over the period from 1990 there were relatively few changes in relationships between subject participation and student background and school characteristics. For example, changes in relative enrolment indexes across subject areas showed only two trends. First, there was an increase in propensity for a greater proportion of Year 12 students in independent non-government schools to participate in the physical sciences (because the decline has been greater in government schools). In 1994 the enrolment index for the physical sciences was 41 per cent higher in independent than in government schools whereas in 2001 it was 66 per cent higher. Secondly there was a small increase in the relative propensity of students in non-government

schools to participate in computer studies (because of a greater increase in non-government schools), although participation in this subject area remains stronger in government than non-government schools. This section examines changes in the relationship with gender and changes in relation to socioeconomic background. It focuses on the period from 1990 to 2001, which is the period for which individual data on subject participation are available.

Changes in gender balance in subject enrolments

Overall changes in the gender balance in subject areas have been summarised by the odds ratios in Table 23. The table does not record data for English and other subject areas in which there were no changes over the period. Odds ratios provide a good way of representing changes in the balance of enrolments and are explained in Chapter 3 of the report.

Table 23 Odds ratios for female compared to male participation in selected subject areas from 1990 to 2001

	1990	1993	1998	2001
Humanities and social sciences	1.19	1.15	1.26	1.44
Biological and other sciences	1.40	1.53	1.59	1.52
Physical sciences	0.42	0.52	0.60	0.54
Arts	1.88	1.35	1.68	1.87
Languages	1.88	1.87	2.18	1.87
Technical studies	0.08	0.25	0.23	0.22
Computer studies	0.78	0.80	0.53	0.48

The data in Table 23 show that from 1990 to 2001 there was an increase in the extent to which female enrolments were predominant in the humanities and social sciences. As has been noted previously this was a time of declining enrolments in this area. Apparently the decline was more rapid for male enrolments than for female enrolments. Expressed differently the enrolment share for the humanities among males declined by 2.6 percentage points compared to 1.3 percentage points for females.

There was also an increase in the predominance of female enrolments in the arts over the period from 1990 to 2001. The enrolment share for the area declined by 0.4 percentage points among males and increased by 2.0 percentage points among females.

In contrast, in computer studies there was an increase in the predominance of male enrolments. Over the period from 1990 to 2001 the enrolment share for computer studies among males increased by 3.5 percentage points whereas the growth for females was 0.5 percentage points.

Socioeconomic background

There were few consistent changes in the relationships between the enrolment share in subject areas and socioeconomic background over the period from 1990 to 2001. There was a suggestion in the data that there had been a slight increase in the disparity between enrolment levels in the technical studies between the highest and lowest socioeconomic levels (but the greatest difference occurred in 1998). There was also a very slight reduction in the extent of the association of physical science enrolments with socioeconomic background between 1998 and 2001. The changes in enrolment share by socioeconomic group are shown in Figure 3.

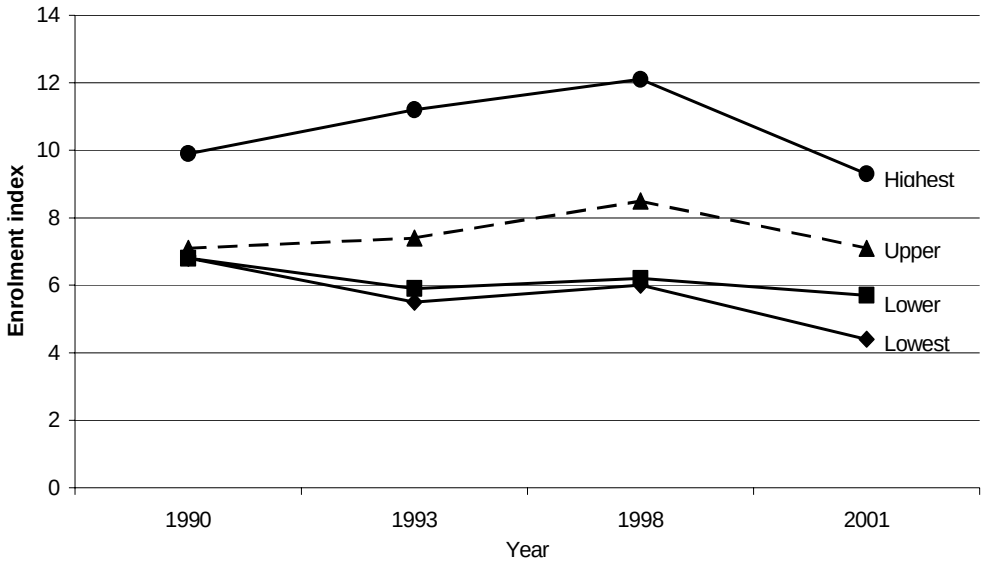

Figure 3 Enrolment trends in the physical sciences by socioeconomic background: 1990 to 2001

SUMMARY

Overall, the main trend in enrolment patterns between 1990 and 2001 has been towards more vocational oriented studies and towards less specialisation in traditional fields. Over this period there have been declines in the humanities and social sciences, the biological sciences and the physical sciences. There has been growth in computer studies and technical studies, as well as the arts in the period from 1998 to 2001. Within economics and business there has been little shift overall but a substantial shift away from subjects such as economics and accounting and towards subjects such as business studies. There has been little change in enrolment levels in Languages other than English (although there has been a shift within the field toward Asian languages).

In terms of subject combinations, there has been a decline in the proportion of students taking two subjects from traditional areas of specialisation. There has been a decline in the proportions of students studying two mathematics subjects, the combination of physics and chemistry and two subjects from the humanities and social sciences field.

Most of the patterns of association linking subject enrolments with gender or social background have remained similar over the period. However, there has been an increase in preponderance of males in computer studies and of females in both the humanities and social sciences and the arts.

8. CONCLUSIONS

Levels of participation in education are important because of the associations between the knowledge and skills that education can provide, the economic benefits for individuals with higher levels of educational participation and the well-being of the nation. People with higher levels of education are more likely to participate in the labour market, less likely to be unemployed, more likely to have higher earnings and enjoy other social advantages. More particularly, those people who stay at school until the final year are more likely to continue their involvement in education and training and thereby gain more directly employment-related skills. This is one reason why an increase in participation in the final year of secondary school, or an equivalent, has been an important feature of government reports and government policy over the past two decades.

The period from 1980 to 1992 was one in which there was considerable expansion of participation in the final year of secondary school. During this period of expansion there was a reduction in the extent to which participation in Year 12 was associated with influences such as earlier school achievement, parental occupational background, parental educational background, as well as school sector. In summary, there was a reduction in inequality of participation in the final year of secondary school. Since 1992 overall levels of participation in the final year of secondary school fell a little and then stabilised. Differences in participation between males and females, between students whose parents were born in Australia and those whose parents where born in a predominantly non-English speaking country, and between students of differing social backgrounds have remained relatively unchanged since then. In other words, the size of the influence on participation of student background on participation has stabilised and seems unlikely to change in the absence of another period of expansion of participation.

The expansion of participation in Year 12 during the 1980s brought a concomitant expansion in curriculum provision, with schools catering for a far more diverse student population, both culturally and academically. This became manifest in the patterns of participation in the subject areas that made up the senior secondary school curriculum. However, during the 1990s when levels of overall participation were relatively steady and the social composition of Year 12 did not change greatly there continued to be changes in patterns of participation in subject areas. The influence of a changing labour market and economy on the choices of subjects made by senior secondary students has meant that the main trend has been towards more vocational oriented studies and towards less specialisation in traditional fields.

Over the period from 1990 to 2001 there have been declines in the humanities and social sciences, the biological sciences and the physical sciences. There has been growth in computer studies and technical studies, as well as the arts. Within economics and business there has been little shift overall but a substantial shift away from subjects such as economics and accounting and towards subjects such as business studies. There has been little change in enrolment levels in Languages other than English, although there has been a shift within the field toward Asian languages. There has been a decline in the proportion of students taking two subjects from traditional areas of specialisation: two mathematics subjects, the combination of physics and chemistry and two subjects from the humanities and social sciences field. Most of the patterns of association linking subject enrolments with gender or social background have remained similar over the period.

In 2001, four key learning areas accounted for 71 per cent of Year 12 subject enrolments: 20 per cent in English, 17 per cent in mathematics, 20 per cent in studies of society and environment and 14 per cent were in the sciences. In 1993, these four key learning areas accounted for 76 per cent of enrolments. The largest of the four remaining key learning areas in 2001 was technology with

14 per cent of enrolments followed by the arts with 8 per cent, health and physical education with 5 per cent and languages other than English with just 2 per cent.

Patterns of subject participation among students in the final year of secondary school reflect a number of influences. One conception of these influences is to regard them as operating at different stages and levels of development. Aspects of student background, such as gender and socioeconomic status, constitute one set of influences. A second set of influences involves the aptitudes (represented as earlier achievement) and interests that students develop through their earlier years of school and elsewhere. A third set of influences involves the opportunities provided through the curriculum structures in schools, and across school systems, that determine what is possible. A fourth set of influences operates at community level in the form of labour market opportunities and prevailing beliefs about where future career opportunities will lay.

The multivariate analyses in the present report provide evidence for all of these sets of influences. In terms of background there is evidence of gender segmentation in subject participation with respect to mathematics, science, technology and arts and languages. There is also evidence that students from enriched socioeconomic backgrounds show a higher level of participation in advanced mathematics and the physical sciences. In terms of developed aptitudes there are strong influences of earlier achievement in the enabling areas of literacy and numeracy as well as of educational aspirations. Differences between jurisdictions and between school sectors reflect in part differences in curriculum structures and opportunities. Changes over time reflect changing perceptions of future employment opportunities as well as prevailing belief systems. Patterns of participation in subject areas, and trends in patterns of participation, are a result of the interaction of these and other influences. There is no single factor that can adequately explain patterns of participation.

In some countries the school years are conceptualised as the formative years, the transition years and the specialisation years. Although there are no clear demarcations marking those periods, the characterisation does embody the notion that the programs students study usually provide an increasing element of choice (and sometimes specialisation) as students progress from their first to the final year of school. Among the arguments for providing structures that allow for a progressive focussing by students are those concerned with responding to the increased diversification of student interests and aptitudes as they move through school. This is linked to the belief that students will learn more effectively if they become actively engaged in the subjects in which they have an interest. The analyses in this report indicate that the foundations that shape the uptake of subjects in the specialisation years are established during earlier stages of school and those patterns have remained relatively stable over time.

REFERENCES

Ainley, J., Batten, M. & Miller, H. (1984). *Staying at High School in Victoria*. (ACER Research Monograph No. 23). Melbourne: ACER

Ainley, J., Jones, W. & Navaratnam, K. K. (1990). *Subject Choice in Senior Secondary School.* Canberra, ACT: Australian Government Publishing Service.

Ainley, J., Robinson, L., Harvey-Beavis, A., Elsworth, G., & Fleming, M. (1994). *Subject Choice in Years 11 and 12*. Canberra, ACT: Australian Government Publishing Service.

Australian Bureau of Statistics (ABS) (2001). *Australian Standard Classification of Education.* Canberra: AGPS Catalogue No. 1272.0

Australian Bureau of Statistics (ABS) (2002a). *Education and Training Indicators*. Canberra: AGPS Catalogue No. 4230.0

Australian Bureau of Statistics (ABS) (2002b). *Education and Work*. Canberra: AGPS Catalogue No. 6227.0

Australian Bureau of Statistics (ABS) (2003). *Schools Australia: 2002*. Canberra: AGPS Catalogue No. 4221.0

Australian Education Council (AEC) (1991). *Young People's Participation in Postcompulsory education and Training*. Report of the AEC Review Committee (Chair: T. B. Finn). Canberra: AGPS.

Ball, K. & Lamb, S. (2001) *Participation and Achievement in VET of Non-completers of School.* LSAY Research Report Number 20. Melbourne: ACER.

Dekkers, J. and Malone, J. (2000). Mathematics enrolments in Australian upper secondary schools (1980 – 1999): Trends and implications. *Australian Senior Mathematics Journal, 14*(2), 49 – 57.

Fullarton, S. & Ainley, J. (2000). *Subject Choice in Years 11 and 12*. LSAY Research Report No. 15. Melbourne: ACER.

Fullarton, S. (1999).*VET in Schools: Participation and Pathway*s. LSAY Research Report No. 21. Melbourne: ACER.

Lamb, S. & Ainley, J. (1999). *Curriculum differentiation in school and its effects on education, training and labour market outcomes: Results from longitudinal surveys of Australian youth.* Paper presented to the Annual Meeting of the American Educational Research Association, Montreal, April.

Lamb, S. & Ball, K. (1999). *Curriculum and Careers: The education and labour market consequences of Year 12 subject choice (LSAY Report No. 12)*. Melbourne, Vic: ACER.

Lamb, S., Long, M. & Malley, J. (1998). *Access and Equity in Vocational Education and Training: Results from Longitudinal Surveys of Australian Youth.* (ACER Research Monograph 55) Melbourne: ACER.

Long, M., Carpenter, P. & Hayden, M. (1999). *Participation in Education and Training*. (LSAY Report No. 12). Melbourne, Vic: ACER.

Marks, G. & Long, M. (2000). *Weighting the 1995 Year 9 Cohort Sample for Differential Response Rates and Sample Attrition*. (LSAY Technical Paper No. 15). Melbourne: ACER.

Marks, G., Fleming, N., Long, M. and McMillan, J. (2000). *Patterns of Participation in Year 12 and Higher Education in Australia: Trends and Issues* LSAY Research Report Number 17. Melbourne: ACER.

McMillan, J. & Marks, G. (2003). *School Leavers in Australia: Profiles and Pathways*. LSAY Research Report No 31. Melbourne: ACER.

Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) (1999). *National Goals for Schooling in the Twenty First Century*. Curriculum Corporation: Melbourne. www.curriculum.edu.au/mceetya/adeldec.htm

Organisation for Economic Cooperation and Development (OECD) (2001). *From Initial Education to Adult Working Life: Making Transitions Work*. Paris: OECD.

Smart, N., Burke, G. & McKenzie, P. (1999). *Development of a framework for key performance measures of student participation, transition, retention and completion/attainment.* Report to the National Education Performance Monitoring Taskforce of the Ministerial Council on Education, Employment, Training and Youth Affairs. Clayton: Monash University – ACER Centre for the Economics of Education and Training.

Smart, N., Burke, G. & McKenzie, P. (2000). *Data issues: Development of a framework for key performance measures of student participation, transition, retention and completion/attainment.* Supplementary report to the National Education Performance Monitoring Taskforce of the Ministerial Council on Education, Employment, Training and Youth Affairs. Clayton: Monash University – ACER Centre for the Economics of Education and Training.

Teese, R. (1989). Australian private schools: Specialisation and curriculum conservation. *British Journal of Educational Studies, 3,* 235-252.

APPENDIX: SAMPLES AND POPULATIONS

Table A1 contains details of the sample of students from the 1998 LSAY cohort who participated in Year 12 during 2001. It provides information about the weighted and unweighted numbers from each jurisdiction and sector. The total number of students from the sample in Year 12 was 7048. Information is also provided about the percentage distribution of the population of Year 12 students based on data from the Australian Bureau of Statistics publication Schools Australia (Cat No. 4221.0).

The Youth in Transition (YIT) cohorts and the 1995 and 1998 Year 9 cohorts have different sampling designs. The YIT samples are age-based samples and the 1995 and 1998 Year 9 samples are grade-based samples. The 1961 and 1975 YIT cohorts are samples from the population of 14 year olds attending school in 1975 and 1989, respectively. These students were in Years 8, 9, or 10 with differing proportions across States. Year 9 students were the modal category in most States and samples. The 1965 and 1970 YIT cohorts are samples of 10 year olds attending school in 1975 and 1980, respectively.

The data for the 1961 and 1965 cohorts are derived from the 1975 Australian Studies in School Performance, and the data for the 1970 cohort are derived from the 1980 Australian Studies in Student Performance (1980 ASSP). The 1975 cohort was not connected with a national assessment study but was implemented in 1989 to complement the other YIT cohorts.

All samples are two-stage stratified random samples using proportional probability sampling. In the first stage schools were sampled with a probability proportional to the number of 14 year olds (or 10 year olds) attending school from a complete list for each State and Territory, arranged in postcode order. (In the 1995 and 1998 LSAY studies, the probability was proportional to the number of Year 9 students). When a school declined to take part in the study, a replacement school of the same type (government, Catholic or independent) in a nearby locality (identified by postcode) was selected. Listing schools in postcode order implicitly stratifies by geographic location. In the second stage, 25 students or two classes were randomly selected at each school. In the case of the 1989 YIT data, either students were randomly selected from the list or one or two intact classes were randomly selected from a list of classes. In the 1995 and 1998 Year 9 cohorts, classes were randomly selected. In the ASSP studies in which students were randomly selected from a list of students, if a student refused to take part, a replacement student was selected. In rare cases, a greater number of students were selected either at the request of the school principal or because classes were selected which included students younger or older than 14 years. If there were fewer than 25 within-scope students in a school all students were selected. When less than 25 students were selected that school was combined with another school in the same locality to form pseudo-schools.

Due to the fact that these YIT cohorts were age-based samples, Year 12 participation is measured as participation by age 19. The cohorts are referred to by the year they were born, for example the 1975 cohort was born in 1975. The 1995 and 1998 Year 9 samples are grade-based samples so Year 12 participation was measured by participation in the calendar year 1998 for the 1995 cohort and 2001 for the 1998 cohort.

Table A 1 Sample details, Year 12 students, LSAY: Y98 data

State/ Territory		Per cent Year 12 population	Sample	Weighted Sample	Per cent weighted sample
NSW	Government	18.7%	1046	1404	20.3%
	Catholic	7.5%	382	505	7.3%
	Independent	4.1%	226	291	4.2%
Vic	Government	15.0%	806	1042	15.1%
	Catholic	5.8%	420	377	5.5%
	Independent	4.9%	267	265	3.8%
Qld	Government	12.9%	913	960	13.9%
	Catholic	4.2%	451	278	4.0%
	Independent	3.9%	292	241	3.5%
SA	Government	4.2%	282	298	4.3%
	Catholic	1.5%	195	110	1.6%
	Independent	1.5%	140	86	1.2%
WA	Government	6.5%	489	446	6.5%
	Catholic	2.1%	178	131	1.9%
	Independent	1.8%	149	128	1.9%
Tas	Government	1.9%	201	112	1.6%
	Catholic	0.4%	92	32	0.5%
	Independent	0.3%	54	21	0.3%
NT	Government	0.5%	108	35	0.5%
	Catholic	0.1%	15	5	0.1%
	Independent	0.1%	35	7	0.1%
ACT	Government	1.5%	204	90	1.3%
	Catholic	0.5%	52	30	0.4%
	Independent	0.2%	51	15	0.2%

Notes: Number of Year 12 students in the sample is 7, 013 (unweighted); *6,902 (weighted)*
Population data for Year 12 based on Australian Bureau of Statistics (2002). *Schools Australia 2001*. ABS: Canberra (Catalogue Number 4221.0) [Data provided by the Australian Bureau of Statistics].