Although national monitoring has been designed primarily to present an overall national picture of student achievement, there is some provision for reporting on performance differences among subgroups of the sample. Nine demographic variables are available for creating subgroups, with students divided into two or three subgroups on each variable, as detailed in Chapter 1(p4).

The analyses of the relative performance of subgroups used an overall score for each task, created by adding scores for the most important components of the task.

Where only two subgroups were compared, differences in task performance between the two subgroups were checked for statistical significance using t-tests. Where three subgroups were compared, one way analysis of variance was used to check for statistically significant differences among the three subgroups.

Because the number of students included in each analysis was quite large (approximately 450), the statistical tests were quite sensitive to small differences. To reduce the likelihood of attention being drawn to unimportant differences, the critical level for statistical significance was set at p= .01 (so that differences this large or larger among the subgroups would not be expected by chance in more than one percent of cases). The critical level was adjusted to p= .05 for the eight tasks where differences in team performance among 120 teams were being examined.

For the first four of the nine demographic variables, few statistically significant differences among the subgroups were found. For the remaining five variables, statistically significant differences were found on substantial numbers of tasks. Details are presented below.

Zone

Results achieved by students from Auckland, the rest of the North Island, and the South Island were compared.

For year 8 students, there were statistically significant differences among the three subgroups on only two of the 39 tasks. Students from Auckland scored lower than students from the other two zones on a task which involved conducting a chemical experiment (*Salt Solutions,* p34). Students from the North Island (excluding Auckland) performed best on a task involving the effects of gravity on objects (*Link Task 7*, p31). There were no statistically significant differences among the three subgroups on any of the questions of the *Year 8 Science Survey* (p47).

For year 4 students, there were statistically significant differences among the three subgroups on only three of the 37 tasks. Students from the South Island scored markedly higher than students from the other two zones on all three tasks. The first task involved discussion of environmental dangers (*Link Task 5*, p21). The second task required investigation of the strengths of two magnets (*Mighty Magnets*, p23). The third task examined students' understanding of factors involved in combustion (*Link Task 13*, p40). There were no statistically significant differences on questions of the *Year 4 Science Survey* (p46).

Community Size

Results were compared for students living in communities containing over 100,000 people (main centres), communities containing 10,000 to 100,000 people (provincial cities), and communities containing less than 10,000 people (rural areas).

For year 8 students, there were statistically significant differences among the three subgroups on only two of the 39 tasks. Students from the main centres scored lower than students from other areas on a task which asked them to explain how an item of equipment works (*Link Task 10*, p31). Teams of students from rural areas scored lower than teams of students from larger centres on a team task which involved studying the flow of liquids (*Link Task 1*, p11). On the *Year 8 Science Survey* (p47), a statistically significant difference was found on one question. Students from rural areas gave the most positive ratings to a question about how often their class did really good things in science (question 5).

For year 4 students, there were statistically significant differences among the three subgroups on only one of the 37 tasks. Students from the main centres scored lower than students from other areas on a task involving land movement and erosion (*Landshape*, p44). There were no statistically significant differences on questions of the *Year 4 Science Survey* (p46).

School Size

Results were compared from students in larger, medium sized, and small schools (for exact definitions see page 4). Only one statistically significant difference was found on the science tasks. Year 8 students from small schools scored lowest on a task which required students to test the electrical conductivity of different materials (*Flowing Electricity*, p29).

There were no statistically significant differences on the *Year 4 Science Survey*, but there were statistically significant differences on two questions of the *Year 8 Science Survey* (p47). Enthusiasm about science compared to other subjects (question 2) decreased with increasing size of school, and students in the largest schools were less inclined to say they were proud of their best work in science at school (question 8).

School Type

Results were compared for year 8 students attending full primary schools and year 8 students attending intermediate schools. No statistically significant differences were found on the science tasks. However, there were statistically significant differences on two questions of the *Year 8 Science Survey* (p47). On average, intermediate schools students were less enthusiastic about science compared to other subjects (question 2), and less inclined to say that they were proud of their best work in science at school (question 8). These differences on the survey fit with the pattern reported above for school size.

Gender

Results achieved by male and female students were compared. For year 8 students, there were statistically significant differences between boys and girls on ten of the 33 individual tasks. Boys performed better than girls on all ten tasks, which dealt with all strands of the science curriculum. Because of the large number of tasks involved, individual tasks will not be listed. On the *Year 8 Science Survey* (p47), there were statistically significant differences between boys and girls on seven of the eleven questions involving ratings (questions 1, 2, 4, 7, 9, 10, 11). The survey results present a bleak picture of girls' enjoyment of science in school, confidence in their performance and ability, involvement in science activities in their own time, and interest in further study of science. For instance, 41 percent of boys used the top rating on question 1 (how much they liked doing science at school), compared to just 23 percent of girls.

For year 4 students, there were statistically significant differences between boys and girls on three of the 31 individual tasks. On each of these tasks, boys performed better. The three tasks for which differences were found involved batteries and torches (*Batteries*, p28), the earth, sun and moon (*Night and Day*, p42), and land movement and erosion (*Landshape*, p44). There were also statistically significant differences on two questions of the *Year 4 Science Survey* (p46). Girls were less positive than boys about their ability in science (question 6) and their suitability to be a scientist when they grew up (question 10).

The larger number of statistically significant differences for year 8 students suggest that girls are falling behind boys in science learning over the latter years of primary education. The survey results at both levels are particularly disturbing.

Socio-Economic Index

Schools are categorised by the Ministry of Education based on census data for the census mesh blocks where children attending the schools live. The SES index takes into account household income levels, categories of employment, and the ethnic mix in the census mesh blocks. The SES index used ten subdivisions, each containing ten percent of schools (deciles 1 to 10). For our purposes, the bottom three deciles (1–3) formed the low SES group, the middle four deciles (4–7) formed the medium SES group, and the top three deciles (8–10) formed the high SES group.

Results were compared for students attending schools in each of these three SES groups.

For year 8 students, there were statistically significant differences among the three subgroups on 22 of the 39 tasks. In each case, performance was lowest for students in the low SES group. Students in the high SES group generally performed better than students in the medium SES group, but in many cases these differences were small. On the *Year 8 Science Survey* (p47), there was a statistically significant difference on one question (question 4), with an unusual response pattern. Students from low SES schools were most positive and students in medium SES schools least positive about studying more science in school.

There were also many statistically significant differences for year 4 students, on 20 of the 37 tasks. In each case, performance was lowest for students in the low SES group. Students in the high SES group generally performed better than students in the medium SES group, but in many cases these differences were small. There were no statistically significant differences on questions of the *Year 4 Science Survey* (p46).

The results support the use of school SES ratings to target extra funding for schools, and raise doubts about the recent decision to spread the targeted funding across schools in all ten deciles.

Student Ethnicity

Results achieved by Māori and non-Māori students were compared.

For year 8 students, there were statistically significant differences in performance on 19 of the 33 individual tasks. In each case, non-Māori students scored higher than Māori students. However, it is encouraging to note that there were no statistically significant differences between Māori and non-Māori students on questions of the *Year 8 Science Survey* (p47).

For year 4 students, there were statistically significant differences in performance on 19 of the 31 individual tasks. In each case, non-Māori students scored higher than Māori students. However, there were no statistically significant differences on the *Year 4 Science Survey* (p46).

Proportion of Māori Students in Schools

Schools were categorised into three subgroups: schools with less than 10 percent Māori students, schools with 10 to 30 percent Māori students, and schools with more than 30 percent Māori students. Results were compared for students attending schools in these three categories.

For year 8 students, statistically significant differences in performance were found on 18 of the 39 tasks. On each of these tasks, students attending schools with more than 30 percent Māori students scored lowest. On the *Year 8 Science Survey* (p47), statistically significant differences were found on three questions. Students from schools with less than ten percent of Māori students were most positive about the amount of science they learned at school (question 3) and their ability in science (question 7). Students from schools with 10 to 30 percent of Māori students were least likely to say that they had done good things in science in their own time (question 10).

For year 4 students, statistically significant differences in performance were found on 20 of the 37 tasks. In each case, students attending schools with more than 30 percent Māori students scored lowest. There was also a statistically significant difference on one question of the *Year 4 Science Survey* (p46). Students in schools with less than ten percent of Māori students were most inclined to think they would make good scientists when they grew up (question 10).

Proportion of Pacific Island Students in Schools

Because most of the Pacific Island students are concentrated into relatively few schools, it was difficult to create sensible subgroups for schools with higher or lower percentages of Pacific Island students. Two subgroups were formed: students attending schools with up to 5 percent Pacific Island students, and students attending schools with more than 5 percent Pacific Island students. Results were compared for students in these two subgroups.

For year 8 students, statistically significant differences in performance were found on 10 of the 39 tasks. For each of these tasks, average performance levels were lower in the schools with more than 5 percent Pacific Island students. There were no statistically significant differences on the *Year 8 Science Survey* (p47).

For year 4 students, statistically significant differences in performance were found on 10 of the 37 tasks. For each of these tasks, average performance levels were lower in the schools with more than 5 percent Pacific Island students. However, there were no statistically significant differences on the *Year 4 Science Survey* (p46).

Summary

Very few statistically significant differences were found for subgroups based on zone, community size, school size and school type. Few differences between boys and girls were identified at year 4 level but substantially more were found at year 8 level, with the responses to the science survey particularly noteworthy. Statistically significant differences on many tasks were identified for subgroups based on student and school ethnicity, and on school SES index.