SPANS

3 Response rates and description and representativeness of the samples

This chapter reports the response rates for primary and secondary schools and for boys and girls in each school Year in the main study, the physical activity sub-study and the biomarkers sub-study. The second part of this chapter describes the samples in terms of the number and proportion of boys and girls in each school Year, their mean ages, and the proportion of boys and girls who lived in urban or rural areas, the proportion from each cultural background and the proportion of students from each of the three educational sectors for the main study and both sub-studies. These values are compared with the values of the same variables for NSW to determine the extent to which the sample was representative of the NSW population.

Response rates

Schools

Main study

Primary schools

Of the 45 primary schools selected to participate in SPANS, eight declined. For those eight schools, five first replacement schools and two second replacement schools agreed to participate. In the remaining case, five schools were approached before one agreed to participate. The response rate was calculated as 45 divided by the number of schools approached (58) and was equal to 78%.

Secondary schools

Of the 48 secondary schools selected to participate, 32 agreed. Of the remaining 16 schools, 10 first replacement schools and four second replacement schools agreed to participate.

Of the final two selections: four schools were approached in one case and six schools had to be approached in the remaining case before schools were recruited. The response rate was calculated as for primary schools: 45/74 = 61%.

Physical activity sub-study

One extra Year 8 and Year 10 class was recruited to participate in the physical activity sub-study in each secondary school already participating in the main study. Consequently, the response rate is the same as that of the secondary schools in the main study.

Biomarker sub-study

Because only metropolitan schools could participate in the biomarker sub-study, the response rates are reported separately. Twenty-six schools participated in the biomarker study and 38 metropolitan schools had to be approached (either as first, second or third replacement schools) to recruit the participants. Consequently, the response rate is calculated as 26/38 or 68%.

Students

Table 3.1 shows the number of boys and girls in each Year eligible to participate in the survey, the number who refused, the number who were absent on the day of testing, the number who participated and the response rates for the main survey, the physical activity sub-study and the biomarker sub-study.

Main study

The response rates for the primary school Years were all close to 70% and tended to be slightly higher among girls. However, in Years 8 and 10 the response rates were 63% and 50%, respectively. The lower response rate among Year 10 students was probably due to the blood collection conducted as part of the biomarker sub-study.

Physical activity sub-study

The response rates were similar to those of the main study, but were slightly higher among girls in both Years.

Biomarker sub-study

Approximately 40% of Year 10 students approached to provide a blood sample agreed to do so, with no difference between boys and girls.

Table 3.1. Students' participation rates by Year and sex for the main study, physical activity sub-study and biomarker sub-study

	Class enrolment	Refused	Absent	Participated	Participation Rate (%)
Main study*					
Year K					
Boys	593	173	24	399	67.3
Girls	548	163	16	363	66.2
Total	1,141	336	40	762	66.8
Year 2					
Boys	640	142	41	447	69.8
Girls	641	132	29	478	74.6
Total	1,281	274	70	925	72.2
Year 4					
Boys	666	153	24	471	70.7
Girls	647	110	34	499	77.1
Total	1,313	263	58	970	73.9
Year 6					
Boys	693	143	69	483	69.7
Girls	669	109	65	496	74.1
Total	1,362	252	134	979	71.9
Year 8					
Boys	668	227	19	408	61.1
Girls	613	181	20	393	64.1
Total	1,281	408	39	801	62.5
Year 10					
Boys	1,085	501	26	555	50.5
Girls	851	384	29	415	48.8
Total	1,936	885	55	970	49.7

* Response rate includes participating in questionnaire completion and/or objective measurements.

Table 3.1. Students' participation rates by Year and sex for the main study, physical activity sub-study and biomarker sub-study (continued)

	Class enrolment	Refused	Absent	Participated	Participation Rate (%)
Physical activity sub-study					
Year 8					
Boys	586	239	19	329	56.1
Girls	513	157	16	338	65.9
Total	1,099	396	35	667	60.7
Year 10					
Boys	505	257	20	228	45.1
Girls	520	236	25	261	50.2
Total	1,025	493	45	489	47.7
Biomarker sub-study					
Year 10 only					
Boys	717	419	8	292	40.7
Girls	523	307	12	206	39.4
Total	1,240	726	20	500	40.3

* Response rate includes participating in questionnaire completion and/or objective measurements.

Description of the samples

This section provides a description of the samples in terms of sex, Year group, urban/rural place of residence, cultural background and education sector, for the main study and the physical activity sub-study samples and in terms of sex, cultural background and education sector for the biomarker sub-study sample. Table 3.2 shows the number and percentage of boys and girls in each school Year and Table 3.3 shows the number and percentage of boys and girls from rural and urban areas, from each cultural background and from each education sector for the study samples and for the NSW population.

Main study

There were approximately equal proportions of boys and girls in the sample overall and in each Year, except for Year 10, in which there was a larger proportion of boys. About 18% of the sample was in each Year, although with fewer students in Years K and 8. The mean ages of students in Years K, 2, 4, 6, 8 and 10 were 5.3, 7.3, 9.3, 11.3, 13.3 and 15.3 years, respectively. The characteristics of the samples were similar for primary and secondary schools regarding place of residence and cultural background. Approximately 85% of students attended urban schools and 86% reported that English was the main language spoken at home. European, Middle-Eastern and Asian languages accounted for the majority of the other languages spoken at home. Less than 1% of the students spoke another language at home or failed to provide the information.

Among primary schools, three quarters of the students attended Government schools, less than 20% attended Catholic schools and 5% attended Independent schools. Among secondary schools, less than 60% of students attended Government schools, 28% Catholic schools and 14% Independent schools.

Physical activity sub-study

Slightly more Year 8 than Year 10 students and more boys than girls participated in the physical activity sub-study, but the differences were small. Compared with the main study, a larger proportion of rural students and students from Asian cultural backgrounds participated.

Biomarker sub-study

Five hundred students participated in this sub-study. Two records were misplaced during transit to the data entry company and two students had type 1 diabetes so their data were excluded from the analyses, leaving n = 496. Compared with the main study, girls were under-represented in the biomarker sub-study, comprising only 41.2% of the participants. Only Year 10 students from Sydney metropolitan schools participated.

Table 3.2. Number and percentage of boys and girls in each school Year for the main study, the physical activity sub-study and the biomarker sub-study (%)

	Year K n (%)	Year 2 n (%)	Year 4 n (%)	Year 6 n (%)	Year 8 n (%)	Year 10 n (%)	Total n (%)
Main study							
Boys	399	447	471	483	408	555	2763
	(7.3)	(8.2)	(8.7)	(8.9)	(7.5)	(10.1)	(51.1)
Girls	363	478	499	496	393	415	2,644
	(7.2)	(8.8)	(9.2)	(9.2)	(7.2)	(7.6)	(48.9)
Total	762	925	970	979	801	970	5,407
	(14.1)	(17.1)	(17.9)	(18.1)	(14.8)	(17.9)	(100)
Physical activity sub-study*							
Boys					322	262	584
					(26.3)	(21.4)	(47.7)
Girls					349	293	642
					(28.5)	(23.9)	(52.4)
Total					671	555	1,226
					(54.7)	(45.3)	(100)
Biomarker sub-study#							
Boys						290	290
						(58.5)	(58.5)
Girls						206	206
						(41.5)	(41.5)
Total						496	496
						(100)	(100)

* Only students in Years 8 and 10 participated in the physical activity sub-study.
\# Only Year 10 students from Sydney metropolitan schools participated in the biomarker sub-study.

Representativeness of the samples

It was intended that the SPANS sample should be representative of the NSW population so the findings of the study could be accepted as reflecting the characteristics of the appropriate age groups in the NSW population. Table 3.3 shows the number and percentage of boys and girls from rural and urban schools, from each cultural group and from each education sector for the study samples and for the NSW population.

Census data that included the variable used in SPANS to classify the students' place of residence as urban or rural were not available from the Australian Bureau of Statistics. Consequently, data for place of residence (provided by the Australian Council for Educational Research – ACER) based on young people enrolled in NSW schools were used instead. Although not all children and adolescents resident in NSW are enrolled in a school, most are, so the school-based data will be very similar to the NSW population data and is a reasonable basis for comparison.

The proportion of young people from each cultural background was identified from 2001 Australian population census data for 5-11-year-olds (primary school age) and 12-15-year-olds (the age of the secondary school sample).

The proportions of sample students enrolled in each education sector were compared with data for the NSW population, again provided by ACER. It should be noted that the population data included all school students, not only those included in the sampling frame.

The differences between the sample and population values were tested using the one-way Rao and Scott chi-square test, an adjustment to the standard chi-squared test that allows for a stratified, cluster sampled survey design (Rao & Scott, 1984).

Main study

For both primary and secondary schools, the proportions of the sample who were resident in urban or rural areas were very similar to the population proportions and in neither case were the differences statistically significant.

However, the distribution of students from different cultural backgrounds in the samples was significantly different from the population distributions.

With regard to cultural background, for both primary and secondary schools the proportion of people identified as 'other/missing' was much higher in the population than in the sample. This difference was probably due to the different modes of data collection. Where these data were missing on the SPANS questionnaire, the field staff were able to clarify the response with the student before leaving the school. Of course, clarification was not possible for population census data collection. Among primary schools, the proportions of each cultural background in the sample are similar to the proportions in the population, except for those from an English-speaking cultural background and 'other/missing'. The statistical significance is very likely due to the different proportions of 'other/missing' in the sample and population, so it is reasonable to conclude that the sample does not differ from the population in a way that would materially affect the results of the study.

In the secondary school sample, students from English-speaking backgrounds appeared to be over-represented in the sample, students from European and Middle-Eastern cultural backgrounds were slightly under-represented and students from Asian cultural backgrounds were slightly over-represented. As with the primary school sample, the proportion of people identified as 'other/missing' was much higher in the population than in the sample, largely accounting for the observed statistical significance. Again, the differences between the sample and the population were unlikely to have materially affected the results.

The proportion of primary school students enrolled in each school sector was similar to the population values, although students in Government schools were slightly over-represented and those in Independent schools were slightly under-represented. Secondary school students attending Government schools were somewhat under-represented in the sample and students from Catholic schools were over-represented. The differences between the sample and the population distributions were not statistically significant for either primary or secondary schools.

Physical activity sub-study

Students resident in rural areas were somewhat over-represented in the physical activity sub-study, although the sample values were not significantly different from the population values. Those from English-speaking backgrounds were substantially over-represented and each of the other cultural backgrounds was slightly under-represented, the difference between the sample and population distributions being highly statistically significant. However, because students from the three non-English-speaking cultural backgrounds only represent small proportions of the sample (and population) the effects on the prevalence estimates would have been small, at most. The distribution of students across education sectors in the sample was almost identical to that of the population.

Biomarker sub-study

The proportion of students from English-speaking backgrounds was similar to the population values, the sample proportions of students from European and Middle-Eastern cultural backgrounds were smaller than the population values and the sample proportion of students from Asian cultural backgrounds was approximately twice that of the population. The difference in the distributions was highly statistically significant. The distribution of students across education sectors appeared to differ fairly substantially from the population, with students from the Government sector under-represented and students from the Catholic and Independent sectors substantially over-represented. These differences were, nevertheless, not statistically significant.

Table 3.3. Number and percentage of boys and girls from rural and urban schools, from each cultural group and from each education sector for the study samples and for the NSW population

	n (%)	Sample population n (%)	Difference χ^2, P value
Main study: primary schools			
Rurality			
Urban	3,090 (85.0)	432,867 (82.0)	χ_4^2 12 = 0.27
Rural	546 (15.0)	95,303 (18.0)	P = 0.6
Cultural background			
English-speaking	3,129 (86.1)	491,308 (78.4)	
European	102 (2.8)	24,671 (3.9)	χ_4^2 42 = 17.85
Middle-Eastern	158 (4.3)	25,161 (4.0)	P = 0.001
Asian	223 (6.1)	44,979 (7.2)	
Other/missing	24 (0.7)	40,671 (6.5)	
Education sector			
Government	2,767 (76.1)	379,862 (71.1)	χ_2^2 22 = 0.92
Catholic	679 (18.7)	107,017 (20.0)	P = 0.6
Independent	190 (5.2)	47,147 (8.8)	
Main study: secondary Schools			
Rurality			
Urban	1,486 (83.9)	383,821 (82.7)	χ_1^2 12 = 0.04
Rural	285 (16.1)	80,538 (17.3)	P = 0.8
Cultural background			
English-speaking	1,515 (85.5)	275,973 (78.2)	χ_4^2 42 = 34.48
European	48 (2.7)	15,534 (4.4)	P<0.0001
Middle-Eastern	32 (1.8)	14,620 (4.1)	
Asian	165 (9.3)	25,872 (7.3)	
Other	11 (0.6)	20,862 (5.9)	
Education sector			
Government	1,023 (57.8)	296,431 (63.4)	χ_2^2 22 = 0.53
Catholic	493 (27.8)	110,238 (23.6)	P = 0.8
Independent	255 (14.3)	61,182 (13.1)	

Table 3.3. Number and percentage of boys and girls from rural and urban schools, from each cultural group and from each education sector for the study samples and for the NSW population (continued)

	Sample population n (%)	Difference n(%)	X^2, P value
Physical activity sub-study			
Rurality			
Urban	950 (77.5)	383,821 (82.7)	χ_1^2 12 = 0.63
Rural	276 (22.5)	80,538 (17.3)	P = 0.4
Cultural background			
English-speaking	1,110 (90.5)	275,973 (78.2)	χ_4^2 42 = 41.30
European	28 (2.3)	15,534 (4.4)	P<0.0001
Middle-Eastern	15 (1.2)	14,620 (4.1)	
Asian	68 (5.6)	25,872 (7.3)	
Other/missing	5 (0.5)	20,862 (5.9)	
Education sector			
Government	767 (62.6)	296,431 (63.4)	χ_2^2 22 = 0.01
Catholic	290 (23.6)	110,238 (23.6)	P = 1.0
Independent	169 (13.8)	61,182 (13.1)	
Biomarker sub-study			
Cultural background			
English-speaking	392 (79.0)	275,973 (78.2)	χ_4^2 42 = 34.99
European	13 (2.6)	15,534 (4.4)	P<0.0001
Middle-Eastern	13 (2.6)	14,620 (4.1)	
Asian	74 (14.9)	25,872 (7.3)	
Other/missing	4 (0.8)	20,862 (5.9)	
Education sector			
Government	277 (55.8)	296,431 (63.4)	χ_2^2 22 = 0.52
Catholic	139 (28.0)	110,238 (23.6)	P = 0.8
Independent	80 (16.1)	61,182 (13.1)	

Potential bias

Main study

There is always a risk, in a survey such as SPANS, that overweight or obese students will exclude themselves from the survey with the result that the sample prevalence of overweight and obesity will be an under-estimate of the (true) population values. This phenomenon is known as 'non-response bias'. The investigators devised, validated and conducted the SPANS response bias study in order to determine the extent of non-response bias related to overweight and obesity. Non-response bias was found to be negligible, except among Year 10 girls, for whom the prevalence estimates of overweight and obesity were appropriately adjusted. The response bias study is described in full in Appendix K.

Biomarker sub-study

It was possible that the biomarker sub-study was affected by two kinds of bias. First, the biomarker sub-study could have been affected by a form of selection bias. Only Sydney metropolitan secondary schools were selected to participate in the biomarker sub-study. Fifteen-year-old students living in the Sydney metropolitan area may (or may not) have differed from the NSW population of 15-year-olds, as a whole, in ways that were associated with their biomarkers. Consequently, estimates of the prevalence of the biomarkers may not represent the NSW population values.

Even among the students selected to participate in the biomarker sub-study, non-response bias related to overweight and obesity may have occurred. If that was the case, because many of the biomarkers are strongly associated with overweight and obesity, the estimates of the prevalence of the biomarkers may have been biased away from the (true) population values.

In order to determine the extent of any bias (non-response or selection), the prevalence of overweight and obesity among the students who participated in the biomarker sub-study was compared with the prevalence of overweight and obesity among Year 10 students who participated in the main study, but not the biomarker sub-study. The SPANS response bias study (see Appendix K) found that the extent of non-response bias related to overweight and obesity was negligible in the main study. If the prevalence of overweight and obesity is similar among the participants in the biomarker sub-study and the Year 10 students who did not participate in the biomarker sub-study, it would be reasonable to conclude that the biomarker prevalence estimates are representative of the population values.

Table 3.4 shows the prevalence of healthy weight, overweight, obesity and overweight/obesity combined among the Year 10 boys and girls who participated in the biomarker sub-study and Year 10 boys and girls who did not participate in the biomarker sub-study. Among both boys and girls, those who were overweight or obese were slightly over-represented in the biomarker sub-study. However, in no case were the differences in the proportions of each BMI category between the biomarker sub-study participants and the non-participants, statistically significant.

Table 3.4. Prevalence of healthy weight, overweight, obesity and overweight/obesity combined among Year 10 boys and girls who participated in the biomarker sub-study and boys and girls who did not participate in the biomarker sub-study

	In biomarker sub-study n (%)	Not in biomaker sub-study n (%)	Overall n (%)	Difference X^2, P value
Boys				
BMI (3 categories)				
Healthy weight	210 (72.4)	200 (75.8)	410 (74.0)	χ_2^2 22 = 0.51
Overweight	61 (21.0)	47 (17.8)	108 (19.5)	P = 0.8
Obese	19 (6.6)	17 (6.4)	36 (6.5)	
BMI (2 categories)				
Healthy weight	210 (72.4)	200 (75.8)	410 (74.0)	χ_1^2 12 = 0.38
Overweight/obese	80 (27.6)	64 (24.2)	144 (26.0)	P = 0.5
Girls				
BMI (3 categories)				
Healthy weight	166 (80.6)	176 (84.6)	342 (82.6)	χ_2^2 22 = 0.73
Overweight	31 (15.0)	27 (13.0)	58 (14.0)	P = 0.7
Obese	9 (4.4)	5 (2.4)	14 (3.4)	
BMI (2 categories)				
Healthy weight	166 (80.6)	176 (84.6)	342 (82.6)	χ_1^2 12 = 0.48
Overweight/obese	40 (19.4)	32 (15.4)	72 (17.4)	P = 0.5
All				
BMI (3 categories)				
Healthy weight	376 (75.8)	376 (79.7)	752 (77.7)	χ_2^2 22 = 1.89
Overweight	92 (18.5)	74 (15.7)	166 (17.1)	P = 0.4
Obese	28 (5.6)	22 (4.7)	50 (5.2)	
BMI (2 categories)				
Healthy weight	376 (75.8)	376 (79.7)	752 (77.7)	χ_1^2 12 = 1.63
Overweight/obese	120 (24.2)	96 (20.3)	216 (22.3)	P = 0.2

Of greater interest are the comparisons between the biomarker sub-study and all Year 10 participants in the main study. In those comparisons, the differences in the prevalence of overweight and obesity are small and, as a consequence, the prevalence estimates of all of the biomarkers will be very similar to estimates arrived at if all Year 10 students had given blood samples.

Discussion

In summary, the school and student response rates were good by national and international standards for this kind of survey, particularly blood collection. Comparisons of the characteristics of the main and sub-study samples with the NSW population revealed that the samples were demographically very similar to the population. The characteristics of the samples certainly did not differ from the population sufficiently to have a material impact on the findings of this study.

The SPANS response bias study results provided reliable evidence that non-response bias in relation to overweight and obesity had not occurred to any appreciable degree. Finally, comparison of the prevalence of overweight and obesity among the participants in the biomarker sub-study and the rest of the Year 10 participants indicated that neither selection nor non-response bias had an impact on the study findings. Overall, the findings of the study can be considered to be robust and reliable.

References

Rao JNK, Scott AJ 1984, On chi-squared tests for multiway contingency tables with cell properties estimated from survey data, *The Annals of Statistics,* 12, 46-60.