APPENDIX K
THE RESPONSE BIAS STUDY

BACKGROUND

For prevalence estimates of a behaviour or condition, based on a random sample, to be representative of the true population values, either the response rate has to be high (>80%) or the characteristics of the non-respondents have to be similar to those who participated in the study. In the case of SPANS, if a large proportion of overweight or obese students did not participate in the study they would be under-represented among those who participated and the estimated prevalence of overweight and obesity will be incorrectly low. This is termed 'non-response bias'. The Response Bias Study was conceived and conducted as a supplement to SPANS to determine if estimates of the prevalence of overweight and obesity, based on the SPANS data, were biased due to systematic non-response.

In SPANS, all of the response rates were below 80% (several were well below that value (see Chapter 3); so non-response bias was possible. Furthermore, three other factors raised concerns about the possibility of non-response bias:

1. Many of the teachers of the selected classes commented that the overweight students were not participating in the study.
2. The prevalence estimates of overweight and obesity varied very significantly across school Years (which was inconsistent with previous Australian studies) and tended to be higher in the school Years with higher response rates.
3. The prevalence estimates were lower than recent smaller-scale, unpublished studies with higher response rates.

For these reasons, the investigators devised a method of estimating the magnitude of the non-response bias and of validating that method. Briefly, each of the classes which participated in SPANS and agreed to participate in the response bias study were divided into two groups:

1. Those whose height and weight had been measured.
2. Those whose height and weight had not been measured as they declined to participate or were not available when the field team visited the school.

Teachers were asked to consider each unmeasured student in turn and to identify, from among the measured students, who they were most similar to in terms of their height and weight. The unmeasured student was then ascribed the height and weight values of the measured student and a BMI category assigned. In order to validate this procedure, the measured students were divided into two groups and the same teachers were asked to consider each student in one of the groups and to identify the student in the other group to whom they were most similar in height and weight. That is, for half of the measured students, estimates of their BMI were attained in the same way as those for the unmeasured students. By comparing statistically the estimated and measured values of BMI the frequency of correct identification of the BMI category of students could be determined. The Response Bias Study was conducted during Term 4 (September to December) 2004. It should be noted that this was seven to eight months later than the main data collection and the body shapes of adolescents can change substantially, even over such a relatively short period of time. It is possible that this interval between the main study and the response bias study had some impact on the data among Year 8 and 10 students, but it was unlikely to have done so among younger students. The participating secondary school teachers were asked to do their best to recall the students as they were at the beginning of the year, when the main data collection was conducted.

Methods

Sample selection

All of the schools that participated in SPANS were considered for inclusion in the Response Bias Study. However, those classes with very low response rates (less than seven students in the class) were not invited to participate in the Response Bias Study as there would not have been enough students in the measured group with which to make comparisons. Classes with a 100% response rate were also excluded because there could have been no non-response bias.

Measures

For each class that participated in SPANS, the students were divided into two groups:

1. Those whose height and weight had been measured (and BMI calculated).
2. Those whose height and weight had not been measured.

For the validation component of the study, the measured students were separated by sex and were rank ordered, based on their BMI values, then allocated sequentially to Groups A and B so the ranges of BMI values were similar between the two groups. The names of the unmeasured students were then combined with the names of the measured students in Group B and the list sorted into alphabetical order. In this way, teachers were unable to identify those students who did not participate in SPANS and a potential source of bias was eliminated. That is, Group A included half of the previously measured students and Group B included half of the previously measured students and all of the students who had been invited to participate in SPANS, but declined.

Procedure

The Response Bias Study was approved by the University of Sydney Human Research Ethics Committee, the NSW Department of Education and Training and the NSW Catholic Education Commission. Principals of all of the schools that participated in SPANS were sent a letter which explained the Response Bias Study and were invited to participate. Those who agreed were invited to nominate a liaison teacher who was contacted to arrange visits to the school.

Figure AK.1 provides a flow diagram of the group allocation, data collection and comparison procedures. The class teachers of the participating primary school classes and the form teachers of the participating secondary school Year 8 and Year 10 classes were invited to participate in the study. These teachers were chosen because they were most familiar with the students being studied. The Response Bias Study only involved collection of data from teachers; no students were involved.

The field team comprised five members: two full-time teachers seconded to the project who were also members of the field team for the main data collection, two trainee teachers and one project officer. All were trained in the data collection methods. During the data collection visit, the field team (reading from a script) asked teachers to consider each student in Group B and to identify the student in Group A to whom they were most similar in height and weight. If the student in question could not be closely matched with a student in Group A, the teacher was asked to identify the student to whom they were most similar and to estimate by how much their size differed in terms of both height and weight (eg by +5 kg). The height and weight (adjusted if necessary) of the measured student were then ascribed to the unmeasured student and their BMI calculated and BMI category (healthy weight, overweight or obese) identified. The data collection procedure was pilot tested with a teacher and minor adjustments were made to the written script prior to implementation.

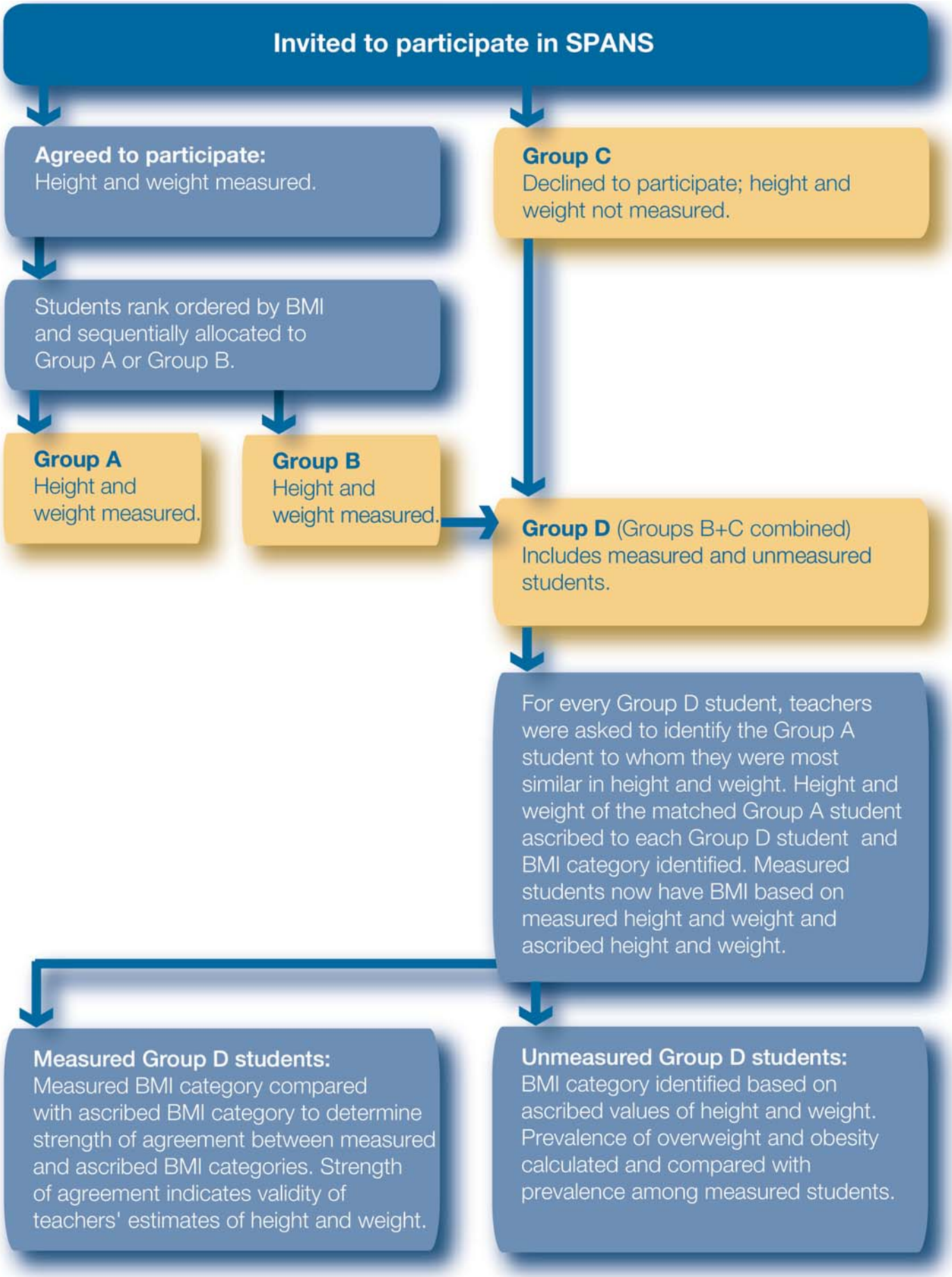
Analysis

There were two stages to the analysis. The first stage examined the validity of the procedure and only involved the students in Group B who had previously been measured. The second stage involved characterisation of the non-response bias.

Validation: In order to determine the validity of this procedure, the data of the measured Group B students were analysed in two steps, with calculations made for each school class. First, the means of the measured and estimated BMIs of the measured students were calculated for each class. The difference between the means (measured BMI – estimated BMI) was then calculated as a potential measure of consistent under- or over-estimation of height and weight by each participating teacher. It was then added to the estimated BMI to give 'adjusted estimated BMI'.

Second, the BMI categories (healthy weight versus overweight or obese) based on both estimated and adjusted estimated BMI were compared with the BMI category based on measured height and weight, using percent agreement. High percentage agreement indicated that the students' BMI category based on their estimated height and weight was frequently the same as their BMI category based on their measured height and weight ie, height and weight estimated using this method provided a valid measure of BMI category. Because of the relatively low numbers in many of the classes and the skewed distributions, weighted kappa was not sufficiently reliable to be used for the analyses.

Figure AK.1 Flow diagram of the group allocation, data collection and comparison procedures



Estimation of non-response bias: The prevalence of healthy weight, overweight and obesity among the previously unmeasured students was compared with the prevalence among previously measured students for boys and girls in each Year group.

Results

Table AK.1 shows the number and proportions of classes which did or did not participate in the Response Bias Study. For most Years, 60-80% of all classes participated, but only 50-60% of Kindergarten and Year 10 girls' classes participated. The two main reasons for not participating in the study were that the school declined to participate and that too few students had been measured in the main study for validation to take place.

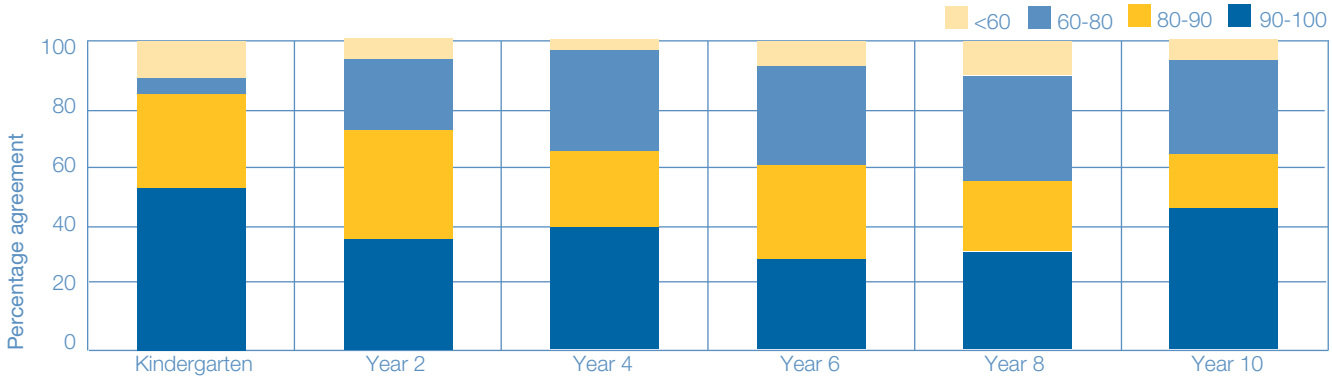
Table AK.1. Number and proportion of boys and girls classes in each Year which did or did not participate in the Response Bias Study and the reasons for non-participation

	Not in main study n (%)	100% response rate n (%)	Permission declined n (%)	<7 students n (%)	Teacher not available n (%)	Completed n (%)
Kinder						
Boys		3 (6.7)	6 (13.3)	13 (28.9)		23 (54.8)
Girls		3 (6.7)	6 (13.3)	11 (24.4)		25 (59.5)
Year 2						
Boys			6 (13.3)	8 (17.8)	1 (2.2)	30 (66.7)
Girls			6 (13.3)	3 (6.7)	1 (2.2)	35 (77.8)
Year 4						
Boys		2 (4.4)	6 (13.3)	8 (17.8)		30 (69.8)
Girls		2 (4.4)	6 (13.3)	3 (6.7)		34 (79.1)
Year 6						
Boys	1 (2.2)	1 (2.2)	6 (13.3)	3 (6.7)		34 (79.1)
Girls	1 (2.2)	1 (2.2)	6 (13.3)	4 (8.9)		33 (76.7)
Year 8						
Boys	2 (4.4)	1 (2.2)	6 (13.3)	5 (11.1)	1 (2.2)	30 (66.7)
Girls			6 (13.3)	5 (11.1)	1 (2.2)	33 (68.8)
Year 10						
Boys	1 (2.2)	1 (2.2)	6 (13.3)	5 (11.1)	1 (2.2)	31 (67.4)
Girls	1 (2.2)	1 (2.2)	6 (13.3)	12 (26.7)	1 (2.2)	24 (52.1)

Validation

Figure AK.1 shows, for each Year, the proportion of classes for which the percent agreement between measured and adjusted estimated BMI categories was <60%, 60-79%, 80-89% or 90-100%. High agreement 80-100% was observed for almost all Kindergarten classes then declined to a low in Year 8, where high percentage agreement was achieved in approximately 55% of classes. This pattern of findings suggests that as children grow taller and become heavier, it becomes more difficult to identify another individual with whom they are most similar. Despite these variations, more than 90% of classes in each Year (except Year 8; 88%) achieved greater than 60% agreement between measured and adjusted estimated BMI categories. On the basis of these findings, it is concluded that the methods used in this study provided a valid estimation of the prevalence of overweight/obesity among non-responders.

Figure AK.2. Proportion of classes in each Year for which percent agreement between measured and adjusted estimated BMI categories was <60%, 60-79%, 80-89% or 90-100%



Non-response bias

Table AK.2 shows the prevalence of healthy weight, overweight and obesity among the students whose height and weight were measured and among the students whose height and weight were estimated for boys and girls in each Year. Several features of the table are noteworthy. First, in nearly every sex/Year group, the prevalence of healthy weight was marginally higher among the non-measured students than among the measured students, suggesting some non-response bias. Second, in most cases, the difference in the prevalence of any BMI category between the measured values and the response bias values did not exceed one percentage point. That is, the prevalence of overweight and obesity among those selected to participate in SPANS, but who declined, was very similar to the prevalence among those who did participate. This demonstrates that although there was some non-response bias, it was small and certainly not large enough for non-response bias to have significantly influenced estimates of the prevalence of overweight and obesity.

Table AK.2. Prevalence of healthy weight, overweight and obesity based on measured and estimated height and weight (Response Bias) among boys and girls in Years K, 2, 4, 6, 8 and 10

	Measured $ (n)	Estimated $ (n)	Difference
Year K boys			
Healthy weight	85.5 (341)	85.1 (290)	-0.40
Overweight	8.3 (33)	8.4 (42)	0.10
Obese	6.3 (25)	6.6 (33)	0.31
Year K girls			
Healthy weight	79.9 (290)	79.4 (346)	-0.53
Overweight	15.7 (57)	16.1 (70)	0.35
Obese	4.4 (16)	4.6 (20)	0.18
Year 2 boys			
Healthy weight	80.8 (361)	81.3 (443)	0.52
Overweight	12.8 (57)	11.6 (63)	-1.19
Obese	6.5 (29)	7.2 (39)	0.67
Year 2 girls			
Healthy weight	78.9 (377)	77.6 (447)	-1.27
Overweight	14.0 (67)	15.3 (88)	1.26
Obese	7.1 (34)	7.1 (41)	0.01

Table AK.2. Prevalence of healthy weight, overweight and obesity based on measured and estimated height and weight (response bias) among boys and girls in Years K, 2, 4, 6, 8 and 10 (continued)

	Measured $ (n)	Estimated $ (n)	Difference
Year 4 boys			
Healthy weight	73.5 (346)	73.5 (439)	0.07
Overweight	20.0 (94)	19.1 (114)	-0.86
Obese	6.6 (31)	7.4 (44)	0.79
Year 4 girls			
Healthy weight	70.5 (352)	70.0 (419)	-0.59
Overweight	22.0 (110)	22.4 (134)	0.33
Obese	7.4 (37)	7.7 (46)	0.26
Year 6 boys			
Healthy weight	68.9 (333)	68.4 (409)	-0.55
Overweight	22.6 (109)	22.2 (133)	-0.33
Obese	8.5 (41)	9.4 (56)	0.88
Year 6 girls			
Healthy weight	76.9 (380)	76.6 (467)	-0.37
Overweight	16.2 (80)	15.7 (96)	-0.46
Obese	6.9 (34)	7.7 (47)	0.82
Year 8 boys			
Healthy weight	73.8 (301)	73.7 (397)	-0.12
Overweight	19.4 (79)	18.2 (98)	-1.18
Obese	6.9 (28)	8.2 (44)	1.30
Year 8 girls			
Healthy weight	77.6 (305)	76.2 (387)	-1.43
Overweight	18.3 (72)	19.1 (97)	0.77
Obese	4.1 (16)	4.7 (24)	0.65
Year 10 boys			
Healthy weight	74.0 (410)	73.5 (624)	-0.51
Overweight	19.5 (108)	19.6 (166)	0.06
Obese	6.5 (36)	7.0 (59)	0.45
Year 10 girls			
Healthy weight	82.6 (342)	81.2 (487)	-1.44
Overweight	14.0 (58)	14.7 (88)	0.66
Obese	3.4 (14)	4.2 (25)	0.79