



AUSPLAY: FOURTH METHODOLOGY REPORT

Covering the data collection period July 1, 2018 to June 30, 2019

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1 INTRODUCTION

1.1 SURVEY OVERVIEW

The AusPlay Survey (AusPlay) is a large scale national population tracking survey funded and led by the Australian Sports Commission (ASC). It fills a major gap in national sport and physical recreation data following the Australian Bureau of Statistics' (ABS) decision in June 2014 to cease funding for all sport and recreation data collection.

AusPlay is the first national survey in Australia to collect adult and children's sport and physical recreation participation data on the same annual survey vehicle. ENGINE was appointed by the ASC in 2015 to deliver AusPlay, following an open tendering process.

The three main objectives of AusPlay are to:

1. Provide insights to help sports grow participation and track trends
2. Provide data that informs government investment, policy and program delivery; and
3. Identify and describe links between sport participation and other influential factors.

1.2 PURPOSE OF THIS REPORT

AusPlay data collection commenced in October 2015. This fourth methodological report covers the: sample design; data collection; weighting; and margin of error calculations, as they relate to the survey data collected in from July 1, 2018 to June 30, 2019.

Separate documents with detailed information on the survey questions and key terms and definitions used in AusPlay reporting can be accessed on the [Clearinghouse for Sport](#).

2 SAMPLE DESIGN

2.1 TARGET POPULATION

The target population for AusPlay is all Australian residents. Randomly selected Australian residents aged 15 years and over are interviewed directly in a CATI interview. Children aged 0-14 are covered by interviewing adult respondents, who are parents or guardians of at least one child in their household, about one randomly selected child.

2.2 ANNUAL SAMPLE SIZE

The AusPlay sample size in 2018/19 was maintained at 21,000 (aged 15+), the same sample size as in 2017/18. The sample was spread equally across the year. In the four quarters covered in this report the adult sample size achieved was 21,060 and the child sample size achieved was 2,943.

2.3 STRATIFICATION

The AusPlay sample is stratified into 14 geographic locations, i.e. 1 mobile sample stratum and 13 landline sample strata based on States and Territories with further splits of the NSW, Victoria, Queensland, South Australia and West Australia into the Greater Capital City Statistical Areas (GCCS) and the Rest of the State. These strata are set out in the table below.

Table 1: AusPlay sample strata

Stratum
Sydney
Rest of New South Wales
Melbourne
Rest of Victoria
Brisbane
Rest of Queensland
Adelaide
Rest of South Australia
Perth
Rest of Western Australia
Tasmania
Northern Territory
Australian Capital Territory
Mobile

2.4 ALLOCATION OF SAMPLE TO STRATA

The random digit dialling (RDD) mobile sample is a national sample with no geographic information and is thus unable to be controlled across the geographic strata. The random nature of the mobile sample means that the expected distribution across geographic strata is in approximate proportion to the mobile phone ownership proportions of the strata.

Given the above and the 50/50 split of the mobile and landline sample, the key sample design issue was the allocation of the landline sample to the strata, *given the expected mobile sample distribution by strata*.

In determining this sample allocation account was taken not only of the need for sound national estimates but also of the need for sound estimates for states and territories. These two design objectives have different optimum sample designs. The optimum design for national estimates is for state and territory sample sizes to be proportional to their respective populations. On the other hand, the optimum design for state and territory estimates is for an equal sample size across each state and territory. The sample design for AusPlay was a compromise between these two objectives.

In developing this compromise design account was also taken of the impact of the landline sample size on the margins of error *given the expected mobile phone sample size for each state/territory*. This analysis was required because of a particular feature of overlapping dual frame sample designs. In these designs the margin of error of a particular state/territory is strongly dependent on the degree of proportionality of the sample across the three phone ownership populations: landline only; mobile only; and access to both a landline and mobile. For a given sample size the margin of error is minimised if the resulting sample sizes for these three phone ownership groups are proportional to their respective population values. The margin of error increases as the sample becomes increasingly disproportional.

The table below sets out the sample allocation to state and territory that was determined from the sample allocation analysis.

Table 2: Annual state and territory sample sizes

	Annual sample size
New South Wales (NSW)	5,200
Victoria (Vic)	4,200
Queensland (Qld)	3,600
South Australia (SA)	2,700
Western Australia (WA)	2,500
Tasmania (Tas)	1,200
Northern Territory (NT)	600
Australian Capital Territory (ACT)	1,000
Total	21,000

2.5 RANDOM RESPONDENT SELECTION

2.5.1 Adult selection

For the landline sample an adult aged 15 years and over was randomly selected from all adults in the household using the last birthday method. The data collection design required up to 5 call-backs to be made to households to interview the selected adult. No substitutions were made if the selected adult was unable to be interviewed.

For the mobile phone sample, the owner of the mobile was interviewed. For the mobile sample up to 5 call-backs were made to attempt to obtain an interview.

2.5.2 Child selection

For each adult respondent who was a parent or guardian of at least one child in their household one child was selected using the last birthday method. The adult respondent completed the AusPlay questionnaire child section as it related to the selected child.

2.6 SAMPLE FRAMES AND STRATIFICATION

The sampling frames used for the over-lapping dual-frame approach (mobile and fixed landline) were provided by *SamplePages*.

The *SamplePages* fixed line RDD sample is derived from a database of all fixed line prefixes in Australia (maintained by the Australian Communications and Media Authority (ACMA)). Random suffixes are then generated and the resulting numbers pinged (rung silently at the exchanges) to determine if they are live.

The *SamplePages* pinged RDD mobile phone samples is obtained in a similar way to the fixed line sample through the ACMA-based list of all possible mobile phone prefixes in Australia and the generation of random suffixes. Unlike the landline sample, these randomly generated phone numbers can't be assigned to part-of-state (state and capital city/rest of state splits), as there is no geographic information attached to mobile numbers.

3 DATA COLLECTION

3.1 INTERVIEWING

Interviewing was conducted from ENGINE’s dedicated CATI facility in Melbourne. The team of interviewers selected were briefed specifically on the project by the ENGINE project team and ASC staff prior to the commencement of the fieldwork.

This report covers the fieldwork period from July 1, 2018 to June 30, 2019. In this period a total of 21,060 interviews were conducted amongst adults aged 15 years and over. Of these respondents 2,943 completed the AusPlay questionnaire child section for a randomly selected child aged 0-14 (selected using the last birthday method). Interviews were conducted continuously over the year.

Interviewing was carried out in compliance with ISO 20252 and membership requirements for Association of Market and Social Research Organisations (AMSRO) and the Australian Market and Social Research Society (AMSRS).

The table below shows the adult sample sizes achieved for the states and territories. There was some discrepancy between the targeted adult sample sizes by state and territory as shown in table 2 above and the actual sample achieved. This was because of the random way the responding mobile sample was distributed across states and territories.

Table 3: Adult and child sample achieved by state/territory: July 2018 - June 2019

State	Adult sample	Child sample
NSW	5,162	787
Vic	4,647	714
Qld	3,660	547
SA	2,478	236
WA	2,531	362
Tas	1,126	105
NT	522	81
ACT	934	111
Total	21,060	2,943

3.2 OVERLAPPING DUAL FRAME DESIGN

An overlapping dual frame design is used, based on fixed line and mobile phone sample frames. The sampling frames are over-lapping because people with both a landline and a mobile phone are able to be selected and interviewed from either frame. This means that a large share of the target population (people with mobiles having access to a landline) are covered by both sample frames. This issue, which has the potential to bias the results, is accounted for in the weighting. The particular benefit of this design is that it provides access to those, who do not have a fixed landline and are contactable only via mobile, estimated to be around 49%¹ of the population.

¹ Derived from ACMA-based data used in the production of population weighting data for AusPlay

3.3 LANDLINE AND MOBILE SHARE

Under the AusPlay design the overall sample is split 50/50 between the landline and mobile sample. This design was based on research conducted by ENGINE into this issue which showed that for the current profile of telephone ownership in Australia (the percentage of the population who are landline only; mobile only and those with access to both a landline and mobile) the 50/50 design provides the lowest possible sample error for a given total sample size.

3.4 RESPONSE RATES

The response rates for the landline sample and the mobile sample are set out on the following pages. The response rate calculation uses the internationally-recognised AAPOR (American Association for Population Opinion Research) standard for calculating response rates.

Table 4: Response rates for the landline sample July 2018 – June 2019

AAPOR Response Rate - Landline		LAND LINE Annually (1 Jul 2018 - 30 Jun, 2019)	
	<i>No answer</i>	1,242	
	<i>Answering machine</i>	555	
	<i>Engaged</i>	2	
	<i>Other non-contact</i>		
A	Total Contact Not Made - Eligibility Unknown		1,799
	<i>Disconnected / Invalid number - phone not connected</i>	72,298	
	<i>Business number/paging service</i>	62,602	
	<i>Incoming call restriction (blocks)</i>	580	
	<i>Fax / 'Killed' # Public phone</i>	10,711	
B	Total Contact Not Made - Not Eligible		146,191
1) Total contact not made (A+B)			147,990
	<i>Call back or appointment scheduled</i>	228	
	<i>Total language barrier</i>	8,586	
	<i>Refused - non-specified</i>	41,405	
	<i>Refused- Eligibility Unknown</i>	16,872	
C	Total Contact Made - Eligibility Unknown		67,091
	<i>Out of scope - Aged under 15</i>	1	
	<i>Out of scope - residency status</i>	32	
	<i>Refused - Age question</i>	24	
	<i>Refused - residency status</i>	1	
	<i>No usual residents</i>	612	
	<i>No-one of correct age</i>	360	
D	Total Contact Made - Not eligible (out-of-scope)		1,030
E	Contact made - Eligible (completed interviews)		11,044
	<i>Last birthday terminate at QRES1a or later</i>	1,014	
	<i>Not proceeding for other reason</i>	1,172	
	<i>Refused - Eligible</i>	404	
	<i>Refused or cannot identify LB person</i>		
	<i>Refused- parent refused for 15-17yo</i>	51	
	<i>LB person refused</i>		

AAPOR Response Rate - Landline		LAND LINE Annually (1 Jul 2018 - 30 Jun, 2019)	
	<i>All usual residents away 2+ weeks/ not available</i>	782	
	<i>Call-backs made without success</i>		
	<i>Total incapable</i>	3,002	
F	Total Contact made - Eligible (non-complete)		6,425
2) Total contact made (C+D+E+F)			85,590
Total finalised outcomes (1+2)			233,580
G	Eligibility rate *		94%
H	Expected eligible from unknown		65,054
J	Total estimated Eligible		82,523
RR	Response Rate		13%

Table 5: Response rates for the mobile sample July 2018 – June 2019

AAPOR Response Rate - Mobile		MOBILE Annually (1 Jul 2018 - 30 Jun, 2019)	
	<i>No answer</i>	1,965	
	<i>Answering machine</i>	1,545	
	<i>Engaged</i>	2	
	<i>Other non-contact</i>		
A	Total Contact Not Made - Eligibility Unknown		3,512
	<i>Disconnected / Invalid number - phone not connected</i>	1,829	
	<i>Business number/paging service</i>	7,276	
	<i>Incoming call restriction (blocks)</i>	107	
	<i>Fax / 'Killed' # Public phone</i>	2,007	
B	Total Contact Not Made - Not Eligible		11,219
1) Total contact not made (A+B)			14,731
	<i>Call back or appointment scheduled</i>	217	
	<i>Total language barrier</i>	5,106	
	<i>Refused - non-specified</i>	24,655	
	<i>Refused- Eligibility Unknown</i>	11,272	
C	Total Contact Made - Eligibility Unknown		41,250
	<i>Out of scope - Aged under 15</i>	4	
	<i>Out of scope - residency status</i>	147	
	<i>Refused - Age question</i>	28	
	<i>Refused - residency status</i>	0	
	<i>No usual residents</i>	324	
	<i>No-one of correct age</i>	1,563	
D	Total Contact Made - Not eligible (out-of-scope)		2,066
E	Contact made - Eligible (completed interviews)		10,089
	<i>Respondent terminate at QRES1a or later</i>	22	
	<i>Not proceeding for other reason</i>	635	
	<i>Refused - Eligible</i>	556	
	<i>Refused or cannot identify LB person</i>		

AAPOR Response Rate - Mobile		MOBILE Annually (1 Jul 2018 - 30 Jun, 2019)	
	<i>Refused- parent refused for 15-17yo</i>	58	
	<i>Call-backs made without success</i>		
	<i>Total incapable</i>	1,107	
F	Total Contact made - Eligible (non-complete)		2,378
2) Total contact made (C+D+E+F)			55,783
Total finalised outcomes (1+2)			70,514
G	Eligibility rate *		86%
H	Expected eligible from unknown		38,399
J	Total estimated Eligible		50,866
RR	Response Rate		20%

4 WEIGHTING

Weights were calculated for each of the four quarterly sets of data. The weighting process was carried out as follows:

4.1 WEIGHTS FOR THE ADULT SAMPLE

The initial probabilities of selection were calculated. For the landline sample the initial probabilities of selection were proportional to the inverse of the household size (persons aged 15+) to reflect the fact that the random respondent was selected from households selected from the landline sample. For the mobile sample the initial probabilities of selection were proportional to the number of active mobile phones used by the mobile phone respondent.

For both the landline and mobile sample, weighting cells were defined by (1) geographic strata x (2) gender x age. These weighting cells are shown in the tables below. The geographic strata and the gender by age weighting cells used were as follows:

Table 6: AusPlay geographic strata

Stratum
Sydney
Rest of New South Wales
Melbourne
Rest of Victoria
Brisbane
Rest of Queensland
Adelaide
Rest of South Australia
Perth
Rest of Western Australia
Tasmania
Northern Territory
Australian Capital Territory

Table 7: Age x gender weighting cells

Gender	Age
Female	15-24
Female	25-34
Female	35-44
Female	45-54
Female	55-64
Female	65+
Male	15-24
Male	25-34
Male	35-44
Male	45-54
Male	55-64
Male	65+

The combination of 13 geographic strata with 12 age x gender weighting cells resulted in $13 \times 12 = 156$ weighting cells for both the landline and mobile samples.

In order to avoid unduly large weights, weighting cells were collapsed if the sample size was less than 5. Weighting cells were collapsed across adjacent age groups but not across gender or geographic strata.

Estimated Resident Population (ERP) data classified by state x part of state x age by gender was available on a quarterly basis for the landline population (the population with access to a landline) and the mobile population (the population who use a mobile phone). The initial probabilities of selection were then pro-rated by a calibration weighting method so that they summed to the relevant weighting cell population totals for both the landline and mobile sample.

The resultant weights at this stage enabled the projection of the landline sample to the landline population and the mobile sample to the mobile population. A further adjustment was required to enable the sample to represent the *full population*. In this adjustment the weights of records from the landline sample with a mobile phone and the records from the mobile sample with a landline were halved to account for the fact that both the mobile sample and the landline sample represented the population of people with both a landline and mobile phone number. In this way the double-counting of this overlap population was accounted for.

A rim-weighting process was then used to ensure consistency of the weights with two sets of Australian Bureau of Statistics (ABS) Estimated Resident Population (ERP) based population data. The first set of population data used was the ERP totals classified by telephone ownership (mobile only; landline only; both landline and mobile) x state/territory. The second set of population data used was the ERP-based totals for the 156 weighting (geographic strata x gender x age).

Rim weighting operates in an iterative fashion. The weights are firstly pro-rated so that their sum for the first set of rim weighting cells is equal to the ERP values of those cells. The weights obtained from this process are then pro-rated so that their sum for the second set of rim weighting cells is equal to the ERP values of those cells. This process then re-commences with the weights being pro-rated again to the first rim-weighting totals and then to the second set of rim-weighting totals. This continues until the weights are consistent with both sets of rim weighting totals. Five rim weighting iterations are used in the AusPlay weighting in order to ensure the convergence of the weights. These weights were the final weights for the adult sample.

4.2 WEIGHTS FOR THE CHILD SAMPLE

The starting point for the child weights was the adult weight for respective adult respondents. The probability of selection of children is inversely proportional to the number of children aged 0-14 in the household. In order to account for this probability of selection the adult weight was multiplied by the number of children aged 0-14 in the household. A further weight adjustment was made which divided the child weight by the number of adults in the household who could have reported the selected child. This adjustment accounts for the fact that the adult weights project to all adults in the population, not just the selected adults.

The final child weights were calculated by a rim-weighting process using two ABS ERP rim values: (1) the quarterly ERP values by age (0-4, 5-8, 9-11, and 12-14) x gender at the national level; and (2) the quarterly ABS child (0-14) ERP values for states and territories. This ensured the weighted child estimates were identical to the two ABS ERP rim values. This form of rim-weighting for child weights was used for the first time in the September, 2017 weight calculations. The previous approach was a rim-weight using only the quarterly child ABS ERP age ranges (0-4, 5-8, 9-11, 12-14) x gender totals. This revised approach was introduced to reduce the variability in state and territory child estimates across time.

4.3 USING THE WEIGHTS

The weights for each quarter were designed so that any quarter's sample could be projected to the full population of Australia. One consequence of this is that the sum of the adult weights equals the ERP adult value for that quarter.

This means, however, that the sum of the adult weights for the combined first four quarters of data will equal four times the average ERP adult value for Australia for that period. The weights provided by ENGINE for the combined first four quarters of data were divided by 4 to account for this issue.

This principle should be used whenever quarterly data is combined to form multi-quarter data. In general, if q quarters of weighted data are to be combined for analysis of that combined time period the quarterly weights should all be divided by q .

5 SAMPLE ERROR ESTIMATES

5.1 STANDARD ERRORS

The AusPlay results are based on a sample and are therefore subject to sample error. Sample error is measured by the standard error (SE) and the margin of error (MOE). Knowledge of the standard error, or the margin of error, enables the 95% confidence intervals to be constructed around survey results and also enables statistical significance testing to be carried out.

The 95% confidence interval for a survey result is calculated as the survey result plus or minus 1.96 x the standard error. For example, if a survey result of 100,000 has a standard error of 10,000 then the 95% confidence interval is $100,000 \pm (1.96 \times 10,000) = 100,000 \pm 19,600 = (80,400 - 119,600)$.

The standard error of a survey result divided by the survey result, expressed as a percentage, is called the relative standard error (RSE). The standard errors and the relative standard errors of a range of AusPlay adult and child results are summarised in the four tables below.

The following example demonstrates the use of these tables. Consider a survey result for NSW of 200,000 from the adult sample. The table below shows that the standard error for this result is 19,100. This means the 95% confidence interval for the survey result is $200,000 \pm 1.96 \times 19,100 = 200,000 \pm 37,400 = (162,600 - 237,400)$.

Table 8: Standard errors for adult estimates

Size of estimate	NSW (no.)	Vic (no.)	Qld (no.)	SA (no.)	WA (no.)	Tas (no.)	NT (no.)	ACT (no.)	Australia (no.)
1,000	1,300	1,200	1,300	1,300	1,300	1,100	1,700	900	1,300
2,000	1,900	1,700	1,800	1,800	1,900	1,600	2,400	1,300	1,800
5,000	3,000	2,800	2,900	2,800	3,000	2,600	3,700	2,100	2,900
10,000	4,300	3,900	4,000	4,000	4,300	3,600	5,300	3,000	4,100
20,000	6,000	5,500	5,700	5,600	6,000	5,100	7,500	4,200	5,800
50,000	9,500	8,700	9,000	8,900	9,500	8,100	11,900	6,600	9,200
100,000	13,500	12,300	12,800	12,600	13,500	11,500	16,800	9,400	12,900
200,000	19,100	17,500	18,100	17,900	19,100	16,300	23,700	13,300	18,300
500,000	30,200	27,600	28,600	28,200	30,100	-	-	-	28,900
800,000	38,100	34,900	36,100	35,700	38,100	-	-	-	36,600
1,000,000	42,600	39,000	40,400	39,900	42,600	-	-	-	40,900
1,500,000	52,200	47,800	49,500	-	52,200	-	-	-	50,100
2,000,000	60,300	55,200	57,100	-	60,200	-	-	-	57,900
5,000,000	95,300	87,300	-	-	-	-	-	-	91,500
8,000,000	-	-	-	-	-	-	-	-	115,700

Table 9: Relative standard errors of adult estimates

Size of estimate	NSW (%)	Vic (%)	Qld (%)	SA (%)	WA (%)	Tas (%)	NT (%)	ACT (%)	Australia (%)
1,000	130.0%	120.0%	130.0%	130.0%	130.0%	110.0%	170.0%	90.0%	130.0%
2,000	95.0%	85.0%	90.0%	90.0%	95.0%	80.0%	120.0%	65.0%	90.0%
5,000	60.0%	56.0%	58.0%	56.0%	60.0%	52.0%	74.0%	42.0%	58.0%
10,000	43.0%	39.0%	40.0%	40.0%	43.0%	36.0%	53.0%	30.0%	41.0%
20,000	30.0%	27.5%	28.5%	28.0%	30.0%	25.5%	37.5%	21.0%	29.0%
50,000	19.0%	17.4%	18.0%	17.8%	19.0%	16.2%	23.8%	13.2%	18.4%
100,000	13.5%	12.3%	12.8%	12.6%	13.5%	11.5%	16.8%	9.4%	12.9%
200,000	9.6%	8.8%	9.1%	9.0%	9.6%	8.2%	11.9%	6.7%	9.2%
500,000	6.0%	5.5%	5.7%	5.6%	6.0%	-	-	-	5.8%
800,000	4.8%	4.4%	4.5%	4.5%	4.8%	-	-	-	4.6%
1,000,000	4.3%	3.9%	4.0%	4.0%	4.3%	-	-	-	4.1%
1,500,000	3.5%	3.2%	3.3%	-	3.5%	-	-	-	3.3%
2,000,000	3.0%	2.8%	2.9%	-	3.0%	-	-	-	2.9%
5,000,000	1.9%	1.7%	-	-	-	-	-	-	1.8%
8,000,000	-	-	-	-	-	-	-	-	1.4%

Table 10: Standard errors of child estimates

Size of estimate	NSW (no.)	Vic (no.)	Qld (no.)	SA (no.)	WA (no.)	Tas (no.)	NT (no.)	ACT (no.)	Australia (no.)
1,000	1,800	1,500	1,700	1,500	1,700	1,800	1,600	1,100	1,700
2,000	2,500	2,100	2,400	2,100	2,400	2,600	2,200	1,600	2,400
5,000	4,000	3,300	3,800	3,300	3,700	4,100	3,500	2,600	3,700
10,000	5,700	4,700	5,400	4,700	5,300	5,800	5,000	3,600	5,300
20,000	8,100	6,700	7,700	6,600	7,400	8,200	7,000	5,100	7,400
50,000	11,700	9,700	11,200	9,600	10,800	11,900	10,300	7,500	10,800
100,000	18,000	14,900	17,100	14,800	16,600	-	-	-	16,600
200,000	25,500	21,100	24,200	20,900	23,500	-	-	-	23,500
500,000	40,300	33,400	38,300	-	37,200	-	-	-	37,200
800,000	50,900	42,300	48,500	-	-	-	-	-	47,000
1,000,000	56,900	47,300	54,200	-	-	-	-	-	52,600
1,500,000	-	-	-	-	-	-	-	-	64,400
2,000,000	-	-	-	-	-	-	-	-	74,400

Table 11: Relative standard error of child estimates

Size of estimate	NSW (%)	Vic (%)	Qld (%)	SA (%)	WA (%)	Tas (%)	NT (%)	ACT (%)	Australia (%)
1,000	170.0%	170.0%	180.0%	210.0%	190.0%	160.0%	170.0%	120.0%	180.0%
2,000	120.0%	125.0%	130.0%	150.0%	135.0%	115.0%	115.0%	85.0%	125.0%
5,000	76.0%	78.0%	82.0%	94.0%	86.0%	72.0%	74.0%	56.0%	80.0%
10,000	54.0%	55.0%	58.0%	66.0%	60.0%	51.0%	52.0%	39.0%	56.0%
20,000	38.5%	39.0%	40.5%	46.5%	42.5%	36.0%	37.0%	27.5%	40.0%
50,000	25.6%	26.0%	27.2%	31.2%	28.6%	24.2%	24.8%	18.4%	26.6%
100,000	17.1%	17.4%	18.2%	20.9%	19.1%	-	-	-	17.8%
200,000	12.1%	12.3%	12.9%	14.8%	13.5%	-	-	-	12.6%
500,000	7.7%	7.8%	8.1%	-	8.5%	-	-	-	8.0%
800,000	6.1%	6.1%	6.4%	-	-	-	-	-	6.3%
1,000,000	5.4%	5.5%	5.8%	-	-	-	-	-	5.6%
1,500,000	-	-	-	-	-	-	-	-	4.6%
2,000,000	-	-	-	-	-	-	-	-	4.0%

5.2 MARGINS OF ERROR

As described above, the 95% confidence interval for a survey result is calculated as the survey result plus or minus 1.96 times the standard error. The amount **1.96 times the standard error** is called the **margin of error**.

This term enables the calculation for a 95% confidence interval to be re-expressed as follows: the 95% confidence interval for a survey result is calculated as the survey result plus or minus the margin of error.

The relative margin of error (RMOE) for a particular survey result is 1.96 x the relative standard error or the margin of error divided by the survey result, expressed as a percentage

The margins of error and the relative margins of error of AusPlay adult and child estimates are summarised in the four tables below. It can be seen that the margin of error values in the tables below is 1.96 times the equivalent standard error values (rounded to the nearest hundred).

The following example demonstrates the use of these tables. Consider a survey result for NSW of 200,000 from the adult sample. The table below shows that the margin of error for this result is 37,400. This means the 95% confidence interval for the survey result is 200,000 +/- 37,400 = (162,600 – 237,400). This is the same 95% confidence interval that was calculated in the same example above, using the standard error tables.

Table 12: Margins of error for adult estimates

Size of estimate	NSW (no.)	Vic (no.)	Qld (no.)	SA (no.)	WA (no.)	Tas (no.)	NT (no.)	ACT (no.)	Australia (no.)
1,000	2,500	2,400	2,500	2,500	2,500	2,200	3,300	1,800	2,500
2,000	3,700	3,300	3,500	3,500	3,700	3,100	4,700	2,500	3,500
5,000	5,900	5,500	5,700	5,500	5,900	5,100	7,300	4,100	5,700
10,000	8,400	7,600	7,800	7,800	8,400	7,100	10,400	5,900	8,000
20,000	11,800	10,800	11,200	11,000	11,800	10,000	14,700	8,200	11,400
50,000	18,600	17,100	17,600	17,400	18,600	15,900	23,300	12,900	18,000
100,000	26,500	24,100	25,100	24,700	26,500	22,500	32,900	18,400	25,300
200,000	37,400	34,300	35,500	35,100	37,400	31,900	46,500	26,100	35,900
500,000	59,200	54,100	56,100	55,300	59,000	-	-	-	56,600
800,000	74,700	68,400	70,800	70,000	74,700	-	-	-	71,700
1,000,000	83,500	76,400	79,200	78,200	83,500	-	-	-	80,200
1,500,000	102,300	93,700	97,000	-	102,300	-	-	-	98,200
2,000,000	118,200	108,200	111,900	-	118,000	-	-	-	113,500
5,000,000	186,800	171,100	-	-	-	-	-	-	179,300
8,000,000	-	-	-	-	-	-	-	-	226,800

Table 13: Relative margins of error for adult estimates

Size of estimate	NSW (%)	Vic (%)	Qld (%)	SA (%)	WA (%)	Tas (%)	NT (%)	ACT (%)	Australia (%)
1,000	250.0%	240.0%	250.0%	250.0%	250.0%	220.0%	330.0%	180.0%	250.0%
2,000	185.0%	165.0%	175.0%	175.0%	185.0%	155.0%	235.0%	125.0%	175.0%
5,000	118.0%	110.0%	114.0%	110.0%	118.0%	102.0%	146.0%	82.0%	114.0%
10,000	84.0%	76.0%	78.0%	78.0%	84.0%	71.0%	104.0%	59.0%	80.0%
20,000	59.0%	54.0%	56.0%	55.0%	59.0%	50.0%	73.5%	41.0%	57.0%
50,000	37.2%	34.2%	35.2%	34.8%	37.2%	31.8%	46.6%	25.8%	36.0%
100,000	26.5%	24.1%	25.1%	24.7%	26.5%	22.5%	32.9%	18.4%	25.3%
200,000	18.7%	17.2%	17.8%	17.6%	18.7%	16.0%	23.3%	13.1%	18.0%
500,000	11.8%	10.8%	11.2%	11.1%	11.8%	-	-	-	11.3%
800,000	9.3%	8.6%	8.9%	8.8%	9.3%	-	-	-	9.0%
1,000,000	8.4%	7.6%	7.9%	7.8%	8.4%	-	-	-	8.0%
1,500,000	6.8%	6.2%	6.5%	-	6.8%	-	-	-	6.5%
2,000,000	5.9%	5.4%	5.6%	-	5.9%	-	-	-	5.7%
5,000,000	3.7%	3.4%	-	-	-	-	-	-	3.6%
8,000,000	-	-	-	-	-	-	-	-	2.8%

Table 14: Margins of error for child estimates

Size of estimate	NSW (no.)	Vic (no.)	Qld (no.)	SA (no.)	WA (no.)	Tas (no.)	NT (no.)	ACT (no.)	Australia (no.)
1,000	3,300	3,300	3,500	4,100	3,700	3,100	3,300	2,400	3,500
2,000	4,700	4,900	5,100	5,900	5,300	4,500	4,500	3,300	4,900
5,000	7,400	7,600	8,000	9,200	8,400	7,100	7,300	5,500	7,800
10,000	10,600	10,800	11,400	12,900	11,800	10,000	10,200	7,600	11,000
20,000	15,100	15,300	15,900	18,200	16,700	14,100	14,500	10,800	15,700
50,000	25,100	25,500	26,700	30,600	28,000	23,700	24,300	18,000	26,100
100,000	33,500	34,100	35,700	41,000	37,400	-	-	-	34,900
200,000	47,400	48,200	50,400	58,000	52,900	-	-	-	49,400
500,000	75,100	76,000	79,800	-	83,500	-	-	-	78,200
800,000	95,100	96,200	100,700	-	-	-	-	-	98,800
1,000,000	106,200	107,600	112,700	-	-	-	-	-	110,500
1,500,000	-	-	-	-	-	-	-	-	135,400
2,000,000	-	-	-	-	-	-	-	-	156,400

Table 15. Relative margins of error for child estimates

Size of estimate	NSW (%)	Vic (%)	Qld (%)	SA (%)	WA (%)	Tas (%)	NT (%)	ACT (%)	Australia (%)
1,000	330.0%	330.0%	350.0%	410.0%	370.0%	310.0%	330.0%	240.0%	350.0%
2,000	235.0%	245.0%	255.0%	295.0%	265.0%	225.0%	225.0%	165.0%	245.0%
5,000	148.0%	152.0%	160.0%	184.0%	168.0%	142.0%	146.0%	110.0%	156.0%
10,000	106.0%	108.0%	114.0%	129.0%	118.0%	100.0%	102.0%	76.0%	110.0%
20,000	75.5%	76.5%	79.5%	91.0%	83.5%	70.5%	72.5%	54.0%	78.5%
50,000	50.2%	51.0%	53.4%	61.2%	56.0%	47.4%	48.6%	36.0%	52.2%
100,000	33.5%	34.1%	35.7%	41.0%	37.4%	-	-	-	34.9%
200,000	23.7%	24.1%	25.2%	29.0%	26.5%	-	-	-	24.7%
500,000	15.0%	15.2%	16.0%	-	16.7%	-	-	-	15.6%
800,000	11.9%	12.0%	12.6%	-	-	-	-	-	12.4%
1,000,000	10.6%	10.8%	11.3%	-	-	-	-	-	11.1%
1,500,000	-	-	-	-	-	-	-	-	9.0%
2,000,000	-	-	-	-	-	-	-	-	7.8%

5.3 USABILITY OF THE SURVEY RESULTS

It is common practice to describe the usability of survey results as follows:

- Results with RMOE values less than 50% are broadly reliable for most purposes;
- Results with RMOE values between 50% and 100% are able to be used with caution;
- Results with RMOE values greater than 100% are unreliable for general use.

A literal translation of this rule, given the result that the RMOE value is 1.96 x the RSE values, is as follows:

- Results with RSE values less than 25.5% are broadly reliable for most purposes;
- Results with RSE values between 25.5% and 51% are able to be used with caution;
- Results with RSE values greater than 51% are unreliable for general use.

Noting the approximation involved in these rules this could be approximated as follows:

- Results with RSE values less than 25% are broadly reliable for most purposes;
- Results with RSE values between 25% and 50% are able to be used with caution; and
- Results with RSE values greater than 50% are unreliable for general use.

The two tables below applies these rules to show the ranges of results that are (1) **Broadly reliable** (RMOE <50%, RSE <25%); (2) **Should be used with caution** (50% <RMOE < 100%, 25% < RSE <50%); and (3) **Unreliable for general use** (RMOE > 100%, RSE >50%) for each state and territory, for adult and child results.

An example is the use of these tables is as follows. Consider a result of 20,000 for Queensland from the adult sample. This estimate is in the range 6,100 to 24,500 and thus should be used with caution.

Table 16. Reliability rules for adult estimates

	<u>Broadly reliable</u>	<u>Use with caution</u>	<u>Not reliable for general use</u>
	<u>(RMOE less than 50%, RSE less than 25%)</u>	<u>(RMOE between 50% and 100%, RSE between 25% and 50%)</u>	<u>(RMOE greater than 100%, RSE greater than 50%)</u>
NSW	Greater than 27,900	Between 7,000 and 27,900	Less than 7,000
Vic	Greater than 23,400	Between 5,900 and 23,400	Less than 5,900
Qld	Greater than 25,100	Between 6,300 and 25,100	Less than 6,300
SA	Greater than 24,500	Between 6,100 and 24,500	Less than 6,100
WA	Greater than 27,900	Between 7,000 and 27,900	Less than 7,000
Tas	Greater than 20,300	Between 5,100 and 20,300	Less than 5,100
NT	Greater than 43,200	Between 10,800 and 43,200	Less than 10,800
ACT	Greater than 13,600	Between 3,400 and 13,600	Less than 3,400
Australia	Greater than 25,700	Between 6,400 and 25,700	Less than 6,400

Table 17. Reliability rules for child estimates

	<u>Broadly reliable</u>	<u>Use with caution</u>	<u>Not reliable for general use</u>
	<u>(RMOE less than 50%, RSE less than 25%)</u>	<u>(RMOE between 50% and 100%, RSE between 25% and 50%)</u>	<u>(RMOE greater than 100%, RSE greater than 50%)</u>
NSW	Greater than 45,100	Between 11,300 and 45,100	Less than 11,300
Vic	Greater than 46,400	Between 11,600 and 46,400	Less than 11,600
Qld	Greater than 50,800	Between 12,700 and 50,800	Less than 12,700
SA	Greater than 67,100	Between 16,800 and 67,100	Less than 16,800
WA	Greater than 55,900	Between 14,000 and 55,900	Less than 14,000
Tas	Greater than 40,400	Between 10,100 and 40,400	Less than 10,100
NT	Greater than 42,000	Between 10,500 and 42,000	Less than 10,500
ACT	Greater than 23,400	Between 5,800 and 23,400	Less than 5,800
Australia	Greater than 48,900	Between 12,200 and 48,900	Less than 12,200

5.4 MARGINS OF ERROR OF PROPORTIONS

The above margin of error tables enable the margins of error to be calculated for estimates of total (e.g. 200,000 adults play golf). These tables may also be used to calculate the margins of error of estimates of proportions (e.g. 18% of adults play golf). To calculate the margins of error of survey proportions the steps needed to be taken are shown by means of an (imaginary) example.

Consider an example in which 10% of adults in a particular category in NSW play golf:

1. Step 1 – determine the numerator and denominator values which give rise to the estimate of proportion. For example, if there are an estimated 200,000 NSW adults in the category of interest and of those 20,000 (10%) play golf.
2. Use the adult tables for relative margin of error to determine the relative margins of error of the numerator and denominator totals. From table 13 above it can be seen that the relative margin of error of the numerator (20,000) is 59.0% and for the denominator (200,000) is 18.7%
3. The relative margin of error of the proportion (10%) is then calculated by squaring the two relative margin of error values ($18.7\%^2 = 0.0350$ and $59.0\%^2 = 0.3481$) and subtracting the value for the denominator (0.0350) from that of the numerator (0.3481) to get 0.3131 ($0.3481 - 0.0350$).
4. Finally, the relative margin of error of the proportion is the square root of the final figure obtained (0.3131) which is 0.560 or 56.0%. This figure is the relative margin of error of the estimate of 10%. The margin of error of the estimate of 10% is then $56.0\% / 10\% = 5.6\%$ (since the margin of error is the relative margin of error divided by the estimate).
5. From the above we can then conclude that the 95% confidence interval for the estimate of 10% is $10\% \pm 5.6\% = (4.4\% - 15.6\%)$.