Results from the 2022 Australian Comparative Study of Survey Methods (ACSSM)

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Abstract

Many studies comparing the accuracy of survey estimates generated from probability-samples and non-probability samples have been undertaken over the last 15 years. This study (the Australian Comparative Study of Survey Methods – ACSSM) is one of only a few to build upon a previous study, thereby enabling not only point-in-time comparisons of the relative accuracy of estimates generated from probability and non-probability sample surveys, but also the relativity of these comparisons over time.

The ACSSM compares the results from eight parallel surveys of the residential Australian adult population. The survey methods used are (1) computer-assisted telephone interviewing (CATI) with persons contactable via randomly generated mobile phone numbers, (2) mixed-mode (computer-assisted web interviewing [CAWI] and CATI) interviews via a probability-based online panel, (3) video-assisted live interviewing (VALI) via a probability-based online panel, (4) using SMS push-to-web to obtain questionnaires from a random sample of mobile phone numbers, and (5–8) four samples provided by four non-probability online panels.

We find that non-probability online panel surveys are cheaper, quicker, and generally less accurate, but sometimes only slightly so, than the probability-based alternatives. Within the limitations of this comparative analysis, there is also evidence that the accuracy gap in favour of probability-based sample surveys over non-probability online panel surveys may have narrowed in recent years.

The results generated from probability-based sample surveys are less variable than those obtained when the same questionnaire is administered to members of non-probability online panels. This lower variability, along with the increased methodological disclosure generally associated with probability-based sample surveys, provides survey researchers with grounds to be more confident in the results generated from probability-based sample surveys than those generated from non-probability online panels. We also find, although more equivocally than previous studies, that weighting is more effective in reducing bias for probability-based sample surveys than surveys conducted on non-probability online panels, for which weighting sometimes increases bias.

A pertinent issue remains for those choosing to fund non-probability sample surveys in that, for any given survey, or any given items within a survey, researchers have a less solid basis from which to affirm the accuracy and generalisability of their results than if the same questionnaire is administered to a probability-based sample. Nor can they be as confident as to whether they should use weighted or unweighted data.

It still does seem to be the case that if one wishes to generalise from a sample to the inferential population, that probability-based sample surveys of the general population allow one to do so with more confidence than do non-probability online panel surveys. The cost one is prepared to pay for this increased accuracy and increased confidence is the dilemma, with survey researchers – including academic survey researchers – turning increasingly to the use of far cheaper non-probability online panels.

We conclude with a plea for transparency, especially about the recruiting and sampling practices used by non-probability panel providers. Greater transparency can only enhance the credibility of non-probability panels overall and may lead to new methodological insights which further improve the accuracy of the estimates generated from such panels. If this occurs, survey researchers may have more reason for confidence in the survey estimates generated from non-probability online panels.

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This report makes extensive use of the information provided in the ACSSM Technical Report (Phillips et al., 2023), which is available upon request.

Declaration of interests

This study was conducted and funded by the Social Research Centre. The probability-based online sample evaluated in this study – Life in Australia™ – is owned and operated by the Social Research Centre. This report expresses the views of the authors and not necessarily the views of the Social Research Centre.

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Acronyms

AAPOR	American Association of Public Opinion Research
AAB	average absolute bias
ABS	Australian Bureau of Statistics
A-BS	Address-Based Sampling
ACSSM	Australian Comparative Study of Survey Methods
ADIA	Australian Data and Insights Association
AEC	Australian Electoral Commission
CATI	Computer-assisted telephone interviewing
CAWI	Computer-assisted web interviewing
COMR	Completion Rate
CONR	Consent Rate
CUMRR2	Cumulative Response Rate 2
DFRDD	Dual-frame random digit dialling
DQF	Data Quality Framework (ABS)
DSS	Department of Social Services (Cth)
ERP	estimated resident population
ESOMAR	European Society for Opinion and Market Research
G-NAF	Geo-coded National Address File
IPND	Integrated Public Number Database
ISO	International Organization for Standardization
IVR	Interactive Voice Response
MRP	Multi-level Regression with Poststratification
OPBS	Online Panels Benchmarking Study
OPBS+	Online Panels Benchmarking Study plus Life in Australia™
pp	percentage points
PROR	Profile Rate
RDD	Random digit dialling
RECR	Recruitment Rate
RETR	Retention Rate
RMSE	Root mean square error
RR	Response Rate
RR3	AAPOR Response Rate 3
SMS	Short message service (aka text message)
TSE	Total Survey Error
US	United States
VALI	Video-assisted live interviewing

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1 Introduction

In 2010, an American Association of Public Opinion Research (AAPOR) Task Force Report (Baker et al., 2010) comparing the accuracy and validity of survey findings from probability-based sample surveys with those from non-probability (opt-in) online panels reached the following conclusions:

- 'Researchers should avoid nonprobability online panels when one of the research objectives is to accurately estimate population values.
- The few studies that have disentangled mode of administration from sample source indicate that nonprobability samples are generally less accurate than probability samples.
- There are times when a nonprobability online panel is an appropriate choice. Not all research is intended to produce precise estimates of population values, and so there may be survey purposes and topics where the generally lower cost and unique properties of Web data collection are an acceptable alternative to traditional probability-based methods' (Baker et al., 2010, 714).

While the 2010 AAPOR Task Force Report makes reference to there being 'few studies' in this area, since 2010 there have been many studies comparing the accuracy of survey findings generated from probability-based sampling methods with those from non-probability online panels.

A comprehensive recent review of 25 comparative studies by Cornesse and colleagues (Cornesse et al., 2020) found that the higher accuracy of probability sample surveys has persisted and been demonstrated across various topics, such as voting behaviour, sexual behaviour and attitudes and socio-demographics. The higher accuracy of probability samples has also been reported in several countries including Australia, France, Germany, the Netherlands, Sweden, the United Kingdom, and the United States (US).

Furthermore, Cornesse and her co-authors found that the higher accuracy of probability-based sample surveys has been shown over time, with the first study demonstrating this undertaken in 2007 (Malhotra & Krosnick, 2007) to the most recent ones in 2018 (Blom et al., 2018; Legleye et al., 2018; MacInnis et al., 2018; Sturgis et al., 2018). Cornesse et al. (2020, 15) conclude that 'All of these studies from different times and countries and that focused on different topics reached the same overarching conclusion that probability sample surveys led to more accurate estimates than nonprobability samples'.

The Australian contribution to this field, the Online Benchmarking Study (OPBS), was undertaken in 2015 (Kaczmirek et al., 2019; Lavrakas et al., 2022; Pennay et al., 2018). This current study is known as the

Australian Comparative Study of Survey Methods (ACSSM).

So why undertake another study comparing the relative accuracy of survey findings from probability-based samples with those generated from non-probability online panels? The reasons, in brief, are as follows: 1) coming seven years after the first study enables us to compare the current versus historical accuracy of the probability-based sample surveys and surveys conducted on non-probability online panels, 2) the ACSSM incorporates new and emerging probability-based sample survey designs not included in the 2015 study, 3) the new study has access to a wider range of benchmarks than the 2015 study thereby enabling more robust comparisons, 4) the methods used to analyse and weight the data generated from probability-based and non-probability sample surveys have continued to evolve, providing the opportunity for these new methods to be evaluated, 5) the context for this study, and survey research generally, has changed considerably since 2015 as a result of the impact of the COVID-19 pandemic lockdowns on survey response dynamics, and 6) the use of online research continues to grow, having increased from 24 per cent to 32 per cent of global market research industry revenue between 2013 and 2021 (European Society for Opinion and Market Research [ESOMAR], 2014 and 2022). An additional challenge impacting the survey environment in Australia in 2022 was the occurrence of several unrelated large-scale data privacy breaches, with the potential to negatively affect participation in both probability-based surveys and non-probability panels.[1]

An understanding of the timeline of our previous Australian research into this topic helps provide additional context for the current study. The initial study, the 2015 OPBS, as reported by Pennay and colleagues (2018) compared the findings from three probability-based sample surveys (two administered using computer-assisted telephone interviewing [CATI] using a dual-frame random digit dialling [DFRDD] sample and one administered to an address-based sample [A-BS] of households using online, mail-back and telephone modes of data collection, with five surveys administered

[1] Several large-scale data breaches occurred in Australia in the second half of 2022 attracting widespread publicity and heightening public concern about this topic. The Office of the Australian Information Commissioner (OIAC) reported an increase of 26% in notifiable breaches in the second half of 2022 (OAIC, 2022). This included the second largest data breach ever reported in Australia, the Optus data breach with potentially 9.8 million customers impacted (Turnbull, 2022). Other widely reported data breaches in 2022 included the Medibank data breach with over one-quarter of a million records potentially compromised (Min, 2023) and VicRoads data breach where 942,000 Victorian motor vehicle licence holders had their details compromised (Cowie, 2022).

to samples from non-probability online panels. The OPBS was the catalyst for the establishment of the first, and still only, probability-based online panel in Australia, Life in Australia™, in November 2016.

The same questionnaire used in the OPBS was administered to members of the newly established Life in Australia™ panel in January–February 2017, thereby enabling these results to be added to the original OPBS comparisons (see Kaczmirek et al., 2019).

This means that the comparative accuracy of the estimates generated from Life in Australia™ relative to benchmarks and the other modes of sampling and data collection were undertaken when Life in Australia™ was just established. A key point of interest for the ACSSM is how Life in Australia™ estimates perform relative to other contemporary and emerging survey options now that the panel is in its eighth year.[2]

[2] Throughout this paper we distinguish between the two earlier studies by labelling the initial 2015 study the OPBS and the later study which was expanded to include the results from the same questionnaire being administered to members of Life in Australia™ as OPBS+. For the sake of convenience, although the first study was fielded in November 2015 and the second in January 2017, when it comes to time-series comparisons with the existing study, we label the first study as the 2015 study and the current study as the 2022 study.

2 Previous Australian research

An overview of the survey methods and findings from the previous OPBS and OPBS+ studies provide important context for the current study.

The original OPBS comprised of eight surveys:

- A standalone DFRDD CATI survey fielded in November–December 2015, with 50 per cent of interviews completed via the landline frame and 50 per cent via the mobile frame (*n*=601).
- An A-BS survey fielded in November–December 2015 (*n*=538). The sampling frame used for this survey was the Geo-coded National Address File (G-NAF)[3] with questionnaires being mailed to households. To accommodate situations in which more than one person in a household was in-scope, the printed instructions on the questionnaire asked for the person aged 18 years or over with either the next birthday or the most recent birthday (alternating) to complete the questionnaire. Questionnaires could be completed in three ways: by mailing back the completed questionnaire in the envelope provided, online by following the instructions provided with the survey covering letter or by telephone when responding to a reminder call.
- The October 2015 ANUpoll (*n*=560). A DFRDD survey with a 60:40 split between landline and mobile phone interviews. Respondents who completed the ANUpoll, in October 2015 were invited to take part in a follow-up survey, the OPBS, which was introduced to respondents as a 'future survey about health and wellbeing.' Those who agreed to participate in the follow-up survey provided their contact details. Out of 1,200 respondents who completed the ANUpoll, 693 agreed to be re-contacted. Depending on their preferences, these individuals were either emailed a link to complete the OPBS questionnaire online or mailed a questionnaire to return via the mail. Telephone reminder action and telephone-based data collection were also undertaken.

[3] G-NAF is maintained by Geoscope Australia (formerly the Public Sector Mapping Authority) and is the authoritative national address index for Australia. The sample was selected from the G-NAF database using a stratified sample design in accordance with the distribution of the Australian residential population aged 18 years and above.

- Eight non-probability panel providers were invited to quote to undertake a 'nationally representative' survey of 600 respondents from their respective panels, to be fielded in November and December 2015. Instructions on how this task should be carried out were not provided. Five quotes were received and four panels selected based on the amount of paradata they could provide. Price was not part of the selection criteria.

Table 1 shows that, after weighting, the probability and non-probability sample surveys generally performed similarly with respect to the measurement of secondary demographics (i.e., those demographic variables not used for weighting). The average absolute bias (AAB) ranging from 4.3 percentage points (pp) for Panel 2 to 6.3pp for Panel 4, with Life in Australia™ the most accurate of the probability-based sample surveys (AAB – 5.0pp).

- With respect to the substantive measures, the DFRDD survey was the least biased (3.6pp) followed by Life in Australia™ (4.0pp). The probability-based sample surveys were all more accurate than the non-probability online panels.
- Overall, when substantive and secondary measures were combined in the OPBS+, Life in Australia™ was the least biased of the nine surveys compared in 2015. These results were consistent with the expectations of superior accuracy of the probability-based sample survey estimates compared with the non-probability online panel surveys.
- The findings from the 2015 Australian research as reported in Kaczmirek et al. (2019), Lavrakas et.al. (2022) and Pennay et al. (2018), and accord with those of Yeager et al. (2011) and the vast majority of the subsequent studies in finding that:
    - (non-probability) surveys done via the internet were less accurate, on average, than probability-based sample surveys regardless of mode of administration
    - there was considerable variation in accuracy among the findings of non-probability samples, and much more so than among probability samples, and
    - post-stratification with primary demographics sometimes improved the accuracy of non-probability sample surveys and sometimes reduced their accuracy.
    - Yeager et al. (2011, 709) concluded that their results are consistent with the 'conclusion that non-probability samples yield data that are neither as accurate as nor more accurate than data obtained from probability samples'.

Table 1 Summary of average absolute bias from the 2015 OPBS+

Variable	Average absolute bias, probability surveys				Average absolute bias, non-probability surveys				
	DF-RDD	A-BS	ANU Poll	Life in Australia™	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5
Secondary demographics	5.9	5.7	5.8	5.0	5.5	4.3	5.4	5.6	6.3
Substantive variables	3.6	4.0	4.0	4.6	10.5	10.9	7.2	7.8	6.8
Combined	5.1	5.2	5.2	4.8	7.2	6.5	6.0	6.3	6.5
Rank (lowest has least error)	2	3	4	1	9	8	5	6	7

Source: Kaczmirek et al. 2019, 25.

3 Study objectives

To our knowledge, only two previous studies have compared the accuracy of probability and non-probability sample surveys over time (MacInnis et al., 2018; Yeager et al., 2011). Both studies showed the ongoing superiority of estimates generated from probability-based sample surveys compared with those produced by non-probability online panels. The ACSSM is the first comparative study of this kind since the lifting of most COVID-19 pandemic restrictions and, as such, provides a contemporary view of the relative performance of probability-based and non-probability sampling and survey methods and how this may have changed over time. This study is also timely given the increased use of non-probability sampling methods by academics and practitioners across the social science disciplines (Rivera, 2019, 1) and the increase, in the US at least and likely elsewhere, in the use of probability-based online panels for election polling and other public opinion research and the continuing decline of CATI (Kennedy et al., 2023).

Given this framing, the ACSSM has two overarching objectives and several secondary aims, which will be explored and further developed over time.

The two overarching objectives are:

1) Evaluating contemporary and emerging practices for general population surveys, and

2) Improving contemporary and emerging practices for general population surveys.

In the context of these objectives, as well as the changing survey research landscape in Australia and around the world, the research aims of the study include, but are not limited to, the following:

- Comparing contemporary estimates from surveys administered on probability and non-probability sampling frames against each other and against external benchmarks.
- Understanding how the accuracy of the data generated by probability and non-probability sample surveys have changed over time, including variation between and within different surveys.
- Identifying differences in sample profiles between probability and non-probability panels to inform blending, weighting and fit-for-purpose sampling solutions.
- Comparing the impact of various weighting methods on the accuracy of survey estimates produced from probability and non-probability samples.
- Exploring the differences in the multivariate relationships within and across sampling frames.

- Gaining insight into the motivations of survey respondents recruited through different modes and via different sampling frames, and
- Analysing response quality using available response metrics such as speeding, straight-lining, satisficing, use of non-substantive response options and the use of *non sequiturs* in verbatim responses.

4 Survey design and performance

4.1 Study overview

The initial study design was to field nine parallel surveys of the residential Australian adult population, that is, persons aged 18 years and over, using the sample frames, recruitment and data collection modes outlined in Table 2. For reasons provided below, only eight studies were completed. The geographic coverage is residents of the six Australian states, the Northern Territory and Australian Capital Territory. Residents of the Jervis Bay Territory and Australian External Territories were excluded.

The survey components are briefly described below. Three different sampling frames are used for the nine surveys:

1) Life in Australia™ is the sampling frame for the (i) Video Assisted Live Interviewing (VALI) survey[4] and (ii) the standard mixed mode Life in Australia™ survey
2) Mobile phone numbers were generated using random digit dialling (RDD) and provide the sampling frame for both (iii) the high-effort and (iv) low effort CATI surveys and the (v) short messaging service (SMS) push-to-web survey.[5]
3) Four non-probability online panels (vi–ix) provide the sampling frames for the non-probability surveys, all of which used an online mode of data collection.

4.2 Methodology

A description of the methodology for each survey follows. The methodological detail provided in this paper is thought to be sufficient to enable readers to understand the differences between each of the ACSSM surveys and how these differences might contribute to the differences in the resultant estimates. For those interested in the complete methodological description, the survey technical report (Phillips et al., 2023) is available upon request.

[4] Data collection via the use of video conferencing platforms such as Zoom, Webex, Teams, etc. goes by various names including Video Assisted Live Interviewing (VALI), Video Interviewing and Computer-Assisted Video Interviewing (Hanson, 2021; Schober et al., 2020). Whatever nomenclature is used, the concept is the same: data being collected by an interviewer from a respondent via a synchronous two-way video call with the interviewer entering the data into a programmed survey questionnaire. Within these basic parameters a great deal of variation in how such interviews are administered is possible. For example, the decision to use prompt cards or not.

[5] SMS push-to-web is what would be called 'text-to-web' in an American context.

4.2.1 Sampling frames

Life in Australia™ provides the sample frame for surveys 1 (VALI) and 2 (Life in Australia™). Life in Australia™ is a probability-based online panel which includes people with and without internet access by virtue of using a mixed mode of data collection.

The vast majority (>95%) of panellists' complete questionnaires online with the offline population included via CATI. Given the very small proportion of surveys completed via CATI, Life in Australia™ is referred to as a probability-based online panel in this paper.

Table 2 Summary of ACSSM surveys

Sampling Method	#	Survey	Sampling frame(s)	Recruitment mode(s)	Invitation mode(s)	Interview mode(s)	Sample sizes initiated	Sample sizes achieved	Incentives	Field dates
Probability-based sample surveys	1	VALI	Life in Australia™ (panellists recruited from the following frames: DFRDD, mobile RDD and A-BS using the G-NAF)	CATI, interactive voice response (IVR), mail push-to-web, SMS push-to-web	Email and SMS invitations; email, SMS and telephone reminders; online booking system for VALI appointments	VALI	1,399	600	$10 voucher / donation	23 Nov – 20 Dec 2022
	2	Life in Australia™	As above	As above	Email and SMS (online only), telephone	Online, CATI	796	582	$10 voucher / donation	5–19 Dec 2022
	3	CATI high effort	Mobile RDD	CATI	CATI, pre-notification SMS	CATI	8,958	498	None	5–18 Dec 2022
	4	CATI low effort*	Mobile RDD	CATI	CATI, pre-notification SMS	CATI	23,040	305	None	5–13 Dec 2022
	5	SMS push-to-web	Mobile RDD	SMS	SMS	Online	20,000	599	$10 voucher	5–17 Dec 2022
Non-probability online panels	6	Non-probability Panel 1	Opt-in panel, nationally representative quotas	Open enrolment, email, affiliates (e.g., loyalty programs), online and physical ads, social media influencers	Panel portal	Online	Unknown	850	Points- or miles-based rewards	5–14 Dec 2022
	7	Non-probability Panel 2	Opt-in panel, nationally representative quotas	Mail, affiliates, online and physical ads, social media, personal invitations	Email	Online	8,952	852	Points-based rewards	5–13 Dec 2022
	8	Non-probability Panel 3	Opt-in panel, nationally representative quotas	Mail, telephone, online and physical ads, social media	Email	Online	11,070	891	Points-based rewards	7–16 Dec 2022

Sampling Method	#	Survey	Sampling frame(s)	Recruitment mode(s)	Invitation mode(s)	Interview mode(s)	Sample sizes initiated	Sample sizes achieved	Incentives	Field dates
	9	Non-probability Panel 4	Opt-in panel, nationally representative quotas	Open enrolment, online and physical ads, social media, member referral	Panel portal	Online	Unknown	853	Dollar-based rewards	5–16 Dec 2022

Notes: VALI sample initiated refers to panellists invited to set a VALI appointment. See Final Outcomes and Dispositions for further details. * The low-effort CATI arm using a predictive dialler was abandoned part-way through the experiment due to a combination of technical and configuration issues impacting one of the diallers thus rendering the results in relation to costs, call cycle and productivity invalid and unusable for comparison. Analysis of completes from the two arms confirmed that dialling issues did not impact on the collection of data, making it possible to combine all CATI interviews as a single arm for the purpose of analysis.

The small amount of research into the use of VALI indicates that recruiting for VALI is most effective when there is an established relationship between the research agency/sponsor and the potential survey respondents (McGonagle & Sastry, 2021). Given that Life in Australia™ is owned by the Social Research Centre, with panellists invited to complete a questionnaire every month, there is an established history of survey participation with the Social Research Centre. By virtue of this pre-existing relationship, it was felt that Life in Australia™ would be well-suited to use as a platform from which to recruit VALI participants. A further benefit of using Life in Australia™ as the VALI sample source is that having two surveys conducted on samples drawn from Life in Australia™, the standard online survey and the VALI survey, would enable direct mode comparisons, while controlling for the sampling frame.

To ascertain the feasibility of using Life in Australia™ as the VALI sample source, in May 2022, a subset of panellists were asked to indicate their willingness to participate in a VALI survey later in the year. Of the 3,441 respondents, 1,447 (42%) were in-principle willing to participate, 1,553 (45%) were unwilling and 441 (13%) were unsure.

Of the various surveys implemented as part of the ACSSM, the experimental VALI survey is the most novel. The VALI experiment is co-funded by the Australian Bureau of Statistics (ABS), driven by their curiosity to see how the results from VALI compare with those obtained from other survey modes, in particular CATI. If VALI is to evolve into a mainstream data collection mode, on the back of the COVID pandemic-inspired upsurge in interest, it is right to include the survey estimates generated from VALI in this comparative study, and we have chosen to do so. However, given the already large scope of this paper, we decided that this is not the place to document all the design decisions, and all the development and testing and lessons learnt from undertaking this novel VALI survey. To try and fit such a discussion into an already large report would not do it justice. For this reason, while the VALI comparisons are included and brief methodological details provided, the full documentation of the VALI experiment, and the subsequent evaluative analysis will be provided in a separate paper.

4.2.2 Field methods

VALI

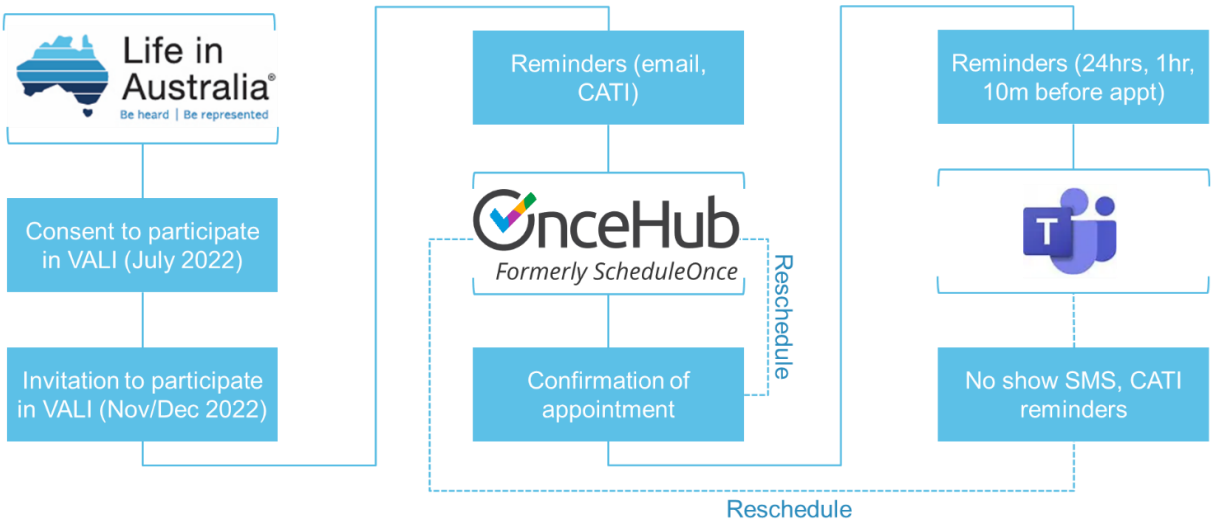
A two-stage approach was used to recruit Life in Australia™ panellists to the VALI survey. In July 2022, all panellists were asked a screening question as to whether they would agree to participate in a video-assisted live interviewing in an upcoming wave of Life in Australia™. Subsequently, in November/December 2022 a random sample of consenting panellists were invited to participate in the VALI survey. The lag between the seeking of consent

and the follow-up survey invitation is explained by a delay in fielding the overall ACSSM study, with fieldwork dates pushed back from October to November/ December for logistical reasons. The VALI workflow is shown in Figure 1 (next page).

Schober et al. (2020) and Hanson (2021) informed our VALI design considerations. Skirmish interviews were also conducted initially within the Social Research Centre, then within the ABS and, finally, with friends and family. These interviews, in conjunction with the previous research, informed the final VALI set-up.

The sample for VALI was released in replicates so that the specially trained six-person interviewing team could maintain a reasonable workflow of appointments/ interviews. A total of 1,399 invitations were issued. Response rates are reported in Section 0.

Figure 1 VALI workflow



Invitations and reminders were sent via email, with use of CATI as a final reminder for one replicate. To support respondents to whom video interviewing was likely to be a new concept, a microsite was created on the Social Research Centre website to explain what was being asked of them. The site included an explanatory video.

The invitation to panellists included a request to make an appointment for an available interviewing timeslot via the scheduling portal (OnceHub). Appointment-setting was necessary for cost control purpose to reduce the amount of idle time for interviewers. Reminders were sent from OnceHub 24 hours, 1 hour, and 10 minutes prior to the allotted time and reminders were also sent when appointments were not kept. The portal proved to be intuitive and easy to use. It offered a dashboard, could launch SMS reminders, offered integration with Outlook, API access and

customisation of look-and-feel (e.g., brand colours, logo), and personalised URLs. Microsoft Teams was used for the video-conferencing platform.

Standard Life in Australia™ $10 incentives were provided to VALI panellists who completed a questionnaire. As is normal practice, respondents had the option of receiving the incentive themselves (either as a Coles e-gift voucher or via PayPal credit) or donating it to charity from a selected list of charities which is periodically changed by the Social Research Centre.

Life in Australia™

Panellists were invited to complete the ACSSM questionnaire following usual Life in Australia™ protocols. A total of 582 questionnaires were completed with 554 being completed online and 28 by telephone. Response rates are reported in Section 0.

Mobile RDD surveys

One of the main methodological changes between the OPBS and the ACSSM is the near total demise in the use of DFRDD sampling frames for general community CATI surveys. These have been replaced by single frame mobile RDD (see, e.g., Hughes, 2020).

Dual-frame RDD surveys involve randomly generating lists of both landline and mobile phone numbers into a composite sampling frame and then ensuring that a fixed proportion of interviews are obtained from each sample source. Weighting then corrects for any disproportionality. This approach, introduced into Australia in 2010 (Pennay, 2010), was originally designed to ensure that the mobile-only population (i.e., those with a mobile phone but not a landline) were included in general community telephone surveys. Over time, as mobile phone saturation became near universal and the use of landlines rapidly diminished, the method morphed into becoming a means of ensuring that that landline only population (i.e., persons who only had a landline and did not have a mobile phone) were included in general community telephone surveys. Mobile phones have become so ubiquitous nowadays that for most general community telephone surveys using a mobile RDD sampling frame is regarded as giving sufficiently good coverage of the adult population to be suitable for most survey research purposes (Hughes, 2020). The Social Research Centre made this transition gradually from 2020.

The initial ACSSM design was to undertake three surveys using mobile RDD as a sampling frame; 1) and 2) were high effort and low effort CATI surveys and 3) was an

SMS push-to-web survey.[6] The high effort CATI survey used autodialler technology to dial numbers when requested to do so by an interviewer and adopted what would be described as fairly rigorous, but not atypical, contact and response maximisation protocols. The low effort CATI survey used predictive autodialler technology (which dials numbers in the background in anticipation of an interviewer being available – and can often result in an annoying delay when the call is answered before an interviewer comes on the line) and protocols designed to try and obtain interviews as quickly and cheaply as possible without efforts to boost household contact rates and response rates.[7]

The original reason for conducting high effort and low effort CATI surveys was to enable a survey cost versus survey accuracy comparison between the two approaches. Unfortunately, the low-effort CATI survey had to be abandoned part-way through fieldwork due to a combination of technical and configuration issues impacting the predictive autodialler, thus rendering the survey paradata unsuitable for our comparative purposes. However, tests of association between high and low effort CATI surveys showed only minor differences across the demographic and substantive variables between the two executions. On this basis, we concluded that predictive autodialler settings did not impact on the data collected, making it

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[6] The sample frames for the CATI and SMS push-to-web surveys were purchased from SamplePages, the only remaining Australian-based supplier of Australian RDD sample. SamplePages selects numbers randomly from the Australian Communication and Media Authority's register of numbers, which shows all allocated blocks of mobile numbers (i.e., telephone number prefixes that are potentially in use). SamplePages does not use a list-assisted approach (Brick et al., 1995); a pure RDD sample is drawn. Before release to the survey company, sampled numbers undergo home location register look-up to check for active status (a process sometimes called 'pulsing' or 'pinging'), with inactive numbers excluded. SamplePages reports a 1 per cent false negative rate for these checks for active status. When a person was reached for the ACSSM CATI surveys, the phone answerer / SMS recipient was the selected respondent, provided they were an adult aged 18 and above and resident in Australia. Coverage of the mobile RDD frame is estimated at 95 per cent of the Australian adult population (ACMA, 2022).

[7] The protocols established for the high effort CATI survey comprised the use of autodialling technology in conjunction with the following; the sending of a pre-notification SMS 1 day prior to sending a survey invitation link via SMS, a maximum of 6 contact attempts or 4 consecutive not-contacts—whichever was reached first and leaving an automated message when a voicemail was first encountered. The low effort CATI survey comprised the use of predicative dialling technology in conjunction with the following call protocols; the sending of a pre-notification SMS 1 day prior to sending a survey invitation link via SMS and a maximum of 4 contact attempts or 2 consecutive not-contacts—whichever was reached first and leaving an automated message when a voicemail was first encountered.

possible to include all the completed interviews in our analysis.

The SMS push-to-web survey involved sending SMS pre-notification messages to mobile phone numbers generated via RDD, followed by another SMS acting as an invitation to complete the survey questionnaire online via the short hyperlink provided. For a random subset of non-respondents an additional reminder SMS was sent in order to boost response.

Non-probability online panels

The selection of the four non-probability panels to participate in this study considered the following factors:

- Cost
- Indicia of quality
    - Answers to ESOMAR 28/37 Questions
    - Industry body membership: Australian Data and Insights Association (ADIA), ESOMAR, the Research Society
    - Accreditation: ADIA Trust Mark, ISO (International Organization for Standardization) 20252, 26362 and/or 27001, Return Path (email deliverability)
    - Methodological information and availability of paradata.
- In addition, the panel provider needed to respond to the Request for Quote (some approached did not) and, in one case, the provider withdrew on the grounds that this was a comparative study.

The final selection was holistic. It included three panels that participated in the OPBS and one that did not. The cost of the most expensive panel included in the study was more than double that of the least expensive panel included in the study.

Sampling frames

Opt-in panels use various methods to recruit and refresh their panels. The ACSSM panels provided general information on the recruitment strategies they use. The information provided by the panels was a high-level description typical of boilerplate for proposals or marketing material. The terminology used differed between panels and it was necessary to make some educated guesses as to what was meant. All panels mentioned marketing both online and offline (e.g., billboards, direct mail). Social media in some form was also mentioned by all panels; it was not always clear whether use of social media was in the form of advertisements, posts, or a combination. Uniquely, Panel 1 mentioned using social media influencers. Panels 1 and 4 allowed open enrolment; we were not able to determine whether Panels 2 and 3 also allowed direct sign-up. Panel 1 mentioned working with affiliates, such as loyalty programs, and use of email (the source of lists of email addresses was not mentioned). Panel 2 allowed personal invitations; it was not clear if this referred to member referral programs (which were

used by Panel 4). Panel 3 also recruited via telephone.

It is common for non-probability panels to share sample where necessary to meet quotas. In this instance, all panels indicated that they were able to meet the ACSSM's requirements using only their own panellists. This likely reflects the small sample size requested and the use of soft quotas (vs hard quotas with potentially hard-to-fill quota cells).

The non-probability panel providers approached for this study were asked to conduct a 'nationally representative' survey of 600 respondents. No instructions were provided as to how this task should be carried out.

Descriptions of sample selection and quotas used by each panel are provided below:

- Panel 1: non-interlocking quotas (quota variables not provided)
- Panel 2: soft quotas only (quota variables not provided)
- Panel 3: soft quotas on age, gender, and location
- Panel 4: non-interlocking quotas on age, gender, and location.

It was clear from the quotations that hard quotas would attract higher costs than soft quotas.

4.3 Questionnaire

The ACSSM questionnaire was designed to enable comparative analysis of the relative performance of the different survey methods across as many topic areas as possible. Decisions about the inclusion of specific items were initially based on the availability of high-quality benchmarks, their suitability for use in calibration models, their usefulness in enabling post hoc assessments of data quality, overlap with the OPBS and suitability for the VALI mode of data collection. These considerations

were balanced with our desire to keep the questionnaire duration to no more than 15 minutes on average (for cost, data quality and response burden reasons) and provide a coherent experience for respondents. The questionnaire was presented to sample members as the 2022 Health and Wellbeing Survey.

A summary of the questionnaire items is included in Table 3 and a copy of the questionnaire is provided as Appendix 1: Questionnaire and the relevant benchmarks in Appendix 2: ACSSM Benchmarks.

Table 3 ACSSM questionnaire Items

Demographics	Gender, age, state, postcode, suburb
	Education, country of birth, speaks a language other than English at home
	Number of adults in household, number of children in household, marital status
Society & politics	Main problem facing Australia*
	Attitudes to euthanasia
	Political interest, vote preference
	Cultural tolerance, discrimination
Survey participation	Online survey panel membership
Health & disability	Requires support with everyday activities
	General health, life satisfaction, Kessler 6 measure of psychological distress
	Long-term health conditions†
Lifestyle	Smoking, exercise
	Alcohol consumption, age of first drink‡
	Internet and social media use, TV consumption
	Time management, support networks, generalised trust
Employment & financial	Job status, home ownership
	Income†
	Caregiver status**
	Receipt of government payments

Notes: * Verbatim item – for mode effect and data quality analysis as well as VALI evaluation. † Long response frame – for mode effect analysis and VALI evaluation. ‡ Complex recall for first drink – for mode effect analysis and VALI evaluation. ** Unable to compare to benchmarks due to change in Census 2021 reporting.

Comparing the time taken to complete the questionnaire is complicated by the different number of questions included in some survey modes (e.g., additional questions were asked in VALI) and the variable length of the introduction (e.g., longer introductions are needed for the RDD CATI surveys). Two interview lengths are shown below (see Table 4). The first is the total interview length per survey mode and the second is the interview length for the questionnaire models common to all surveys. The latter provides a better indication of relative interview length. The median time to complete the questionnaire is shown, rather than the mean, as it is more resistant to outliers.

The median interview length ranged from 7.2 to 21.1 minutes for all content and from 7.1 to 16.5 minutes for the common content. The median time taken by non-probability online panellists to complete the common modules was 7.1 minutes, on average, compared with 9.3 minutes Life in Australia™ panellists.

While questions were presented in as consistent a manner as possible, there were some minor differences in presentation to accommodate the various data collection modes.

Table 4 Median interview length by survey mode

Mode and survey	Total (minutes)	Common sections (minutes)
VALI – Life in Australia™	21.1	10.9
Online – Life in Australia™*	9.7	9.3
Online – SMS push-to web	11.6	11.2
CATI – RDD	18.3	16.5
Online – Panel 1	6.9	6.6
Online – Panel 2	7.7	7.5
Online – Panel 3	8.0	7.4
Online – Panel 4	7.2	6.9
Online – Panels 1–4 combined	7.4	7.1

* Excludes the 28 Life in Australia™ interviews undertaken by CATI which had a median interview length of 16.5 minutes.

4.4 Final call dispositions and response rates

The response rates for each survey are provided in

Table 5. AAPOR definitions and response rates have been used wherever possible. The detailed workings, including full call outcomes and disposition codes are provided as Appendix 3.

For all surveys for which a response rate could be calculated, the response rates are less than 10 per cent, as are the completion rates for those online panels for which it was calculable. The completion rates for the two surveys administered to Life in Australia™ panellists varied considerably (42.9% for VALI compared with 73.1% for the standard execution).

Table 5 Completion and Response Rates by survey frame and mode

Survey mode	Completion rate (%)	Response rate (%)
VALI – Life in Australia™	42.9	1.0[a]
Online – Life in Australia™	73.1	5.6[a]
CATI – RDD (high effort mode)	n.a	7.7[b]
Online – SMS push-to web	n.a	4.0[b]
Online – Panel 1	N/A	n.a
Online – Panel 2	9.5	n.a
Online – Panel 3	8.0	n.a
Online – Panel 4	N/A	n.a

Notes: A meaningful response rate for the abandoned low effort CATI survey could not be calculated. a.Cumulative Response Rate 2 (Callegaro & DiSogra, 2008). b. AAPOR (2016) RR3. N/A – Not Available. n.a – Not Applicable.

5 Weighting

Sample surveys are subject to many forms of bias, notably coverage and non-response bias. Survey weighting is commonly undertaken to try to reduce these biases. Traditionally, weighting methods rely on known probabilities of selection to calculate design weights with further post-stratification adjustments for age, gender and geography distributions applied to account for non-response (Särndal et al., 1992). However, these methods rely on assumptions that many statisticians deem no longer defensible, other than when applied to the relatively high response rate surveys carried out by official statistical agencies.

In a probability-based survey context, single digit response rates with non-ignorable self-selection violate assumptions of random selection thereby undermining the theory on which the design-based approach to weighting is founded. In a non-probability-based survey context, such as opt-in online panels, random selection is not attempted when recruiting the panel, resulting in unquantifiable coverage biases and unknowable chances of selection in relation to the general population of interest.

Superpopulation weights, described in more detail in the next section, are derived via a model-based approach that does not rely on the assumption of known probabilities of selection (Valliant et al., 2000).

Superpopulation weighting can be used for low response probability-based samples and opt-in non-probability-based online panels. By adopting the same model across all of the ACSSM surveys, we are able to make comparisons of the resulting estimates of means and proportions in relation to population benchmarks without having to account for differences in the weighting schemes. Note that optimising the weighting scheme for each survey to arrive at the most robust estimate from each survey will be the subject of future research.

5.1 Superpopulation weighting

Superpopulation weighting involves calibrating the sample using superpopulation weights so that it aligns with population distributions for a broad range of socio-demographic characteristics over and above the usual staples of age, gender, and location.

Superpopulation weights (see, e.g., Dorfman & Valliant, 2005) posit a probability model (the superpopulation mode') that characterises relations among variables that pertain to the units of the population. Such a model makes inferences about population characteristics using sample measurements and auxiliary information in the form of high-quality benchmarks. The model covers the unobserved

processes behind a non-probability sample. This approach uses as broad an array of variables as possible for which high-quality benchmarks are available. Generalised regression (GREG) calibration is typically used for calculating superpopulation weights. GREG calibration is the approach used by many official statistics offices around the world, including the ABS, and is implemented in the *survey* package (Lumley, 2020) in R (R Core Team, 2022).

The choice of benchmarks used in the super-population model was based on an assessment of the items that were most different from the population benchmarks across both the probability-based and non-probability samples.

As noted by Valliant (2020), it is expedient to identify a superpopulation model that produces good results for many different outcome (dependent) variables and thus adjusts adequately for imbalances between sampled and non-sampled cases. To test this, we have applied the same set of covariates to predict each of the outcome variables (excluding those used to derive the covariates themselves) and then calculated fit statistics for each model. The statistics were McFadden's pseudo-R^2 (McFadden, 1987) and the area under the receiver operating characteristic curve (ROC; refer to Hosmer & Lemeshow, 2000, for applications to logistic regression). A summary showing the minimum, median, mean, and maximum of the fit statistics for each survey is provided in Table 6. According to the guidelines given by Hosmer and Lemeshow (2000), the average area under the curve values are in the 'acceptable' range for model fit, so we can conclude that the chosen set of covariates may be used for weighting and estimation across the available outcome variables.

Table 6 Summary of superpopulation model fit statistics

	McFadden's pseudo-R^2				Area under the ROC curve			
Survey	**Min**	**Median**	**Mean**	**Max**	**Min**	**Median**	**Mean**	**Max**
VALI	0.02	0.13	0.16	0.52	0.59	0.76	0.76	0.95
Life in Australia™	0.01	0.12	0.16	0.59	0.58	0.74	0.75	0.96
CATI	0.02	0.10	0.15	0.53	0.59	0.73	0.74	0.95
SMS push-to-web	0.02	0.11	0.15	0.59	0.59	0.77	0.75	0.96
Panel 1	0.01	0.09	0.12	0.49	0.58	0.71	0.72	0.94
Panel 2	0.01	0.08	0.13	0.46	0.57	0.72	0.73	0.92
Panel 3	0.01	0.09	0.14	0.56	0.58	0.73	0.73	0.94
Panel 4	0.01	0.09	0.13	0.54	0.57	0.71	0.73	0.97

Large differences in weights may lead to large variances in survey estimates, and so limiting these variations by weight trimming can improve the precision of estimates. The use of constraints in GREG weighting aims to reduce the variance at

the same time as limiting increases in the bias by limited the number of weights being trimmed to extreme weights. The method applied is incorporated directly in the calibration process by setting the bounds as an optimisation constraint.

5.2 Treatment of missing values

The superpopulation model weighting approach requires that there are no missing values present for calibration variables used in the model. Like most surveys, however, some respondents did not provide answers to all questions commonly used for weighting.

A statistical model (Templ et al., 2011) was applied to each item with missing values to impute the most likely value for a respondent, conditional upon their other responses. Given the very low prevalence of missing values overall (generally much less than 5% for any item), the imputation process is expected to have a negligible impact on weighted estimates made from the dataset.

Imputed values were not used outside of the weight construction process.

6 Methods

6.1 Variance estimation

Valliant et al. (2000) describe several methods for deriving the variance of estimators from a model-based approach to weighting. Assuming that the sampling fraction is negligible, as is the case for all the ACSSM surveys, linearisation (also known as the Taylor series method) is a good approximation (Valliant, 2020; Valliant et al., 2018). Alternatively, and the approach adopted here, is the use of re-sampling methods. These create a series of random sub-samples of the data, estimate the desired parameters for each sub-sample (that is, proportions, means or totals), and then summarise the variance across these values.

The method was implemented in R (Lumley, 2020) is that by Rao & Wu (1988) which uses re-sampling with replacement from strata, defined here by geographic location. The full-sample weight for sampled cases is adjusted to account for the stratum size and the number of times cases are sampled. For each re-sample, the desired estimates are deriving using the adjusted weight. Cases that are not included in a given re-sample receive a weight of 0. The estimate itself is derived from the full-sample weights, but the final variance is an average across the different re-samples, of which there were 500.

Weighting efficiency ($weff$; Kish, 1992) is a commonly used measure of variance introduced into the estimates as a result of using the weights, it is estimated as follows:

$$weff = 100 \times \frac{(\sum_i^n w_i)^2 / n}{\sum_i^n {w_i}^2}$$

where n is the number of respondents and w_i is the weight for the ith respondent. Lower weighting efficiency translates into a lower effective sample size, which is the sample size of an equivalent simple random sample that would be used to determine statistical power in hypothesis testing, these are shown in Table 7. Effective sample size is defined as:

$$n_{eff} = n \times weff$$

The surveys conducted on Life in Australia™ have relatively low weighting efficiency given that the panel was recruited on a probability proportional to size geographic basis and no data collection quotas were imposed. The weighting efficiencies for the two Mobile RDD surveys range from 71 per cent to 74 per cent. The four non-probability online panels, which imposed various quota controls (see p. 18, this report) had weighting efficiencies ranging from 62.9 per cent to 89.5 per cent.

Variance is also used in the calculation of root mean square error (RMSE) defined as

$$RMSE_k = \sqrt{{B_k}^2 + {SE_k}^2}$$

where SE_k is the standard error of the kth estimate and B_k is the bias of the kth estimate. Calculation of bias is described next.

6.2 Bias assessment

To compare the relative accuracy of the various ACSSM surveys, we look at the difference (or bias)[8] between estimates from each survey and the high-quality external benchmarks.

All variables included in the bias assessment were categorised as either demographic (characteristics that describe survey respondents) or substantive (measures of interest in a social research survey context).

Table 8 shows the final list of variables. Variables excluded from the bias assessment are documented in Appendix 6.

Table 7 Weighting efficiency and effective sample size

Survey	n	$weff$	n_{eff}
VALI	600	40.4	242
Life in Australia™	582	58.9	343
CATI	803	74.0	594
SMS push-to-web	599	71.0	425
Panel 1	850	80.5	684
Panel 2	852	62.9	536
Panel 3	891	70.6	629
Panel 4	853	77.1	657

[8] The terms 'bias' and 'error' are used interchangeably throughout this report.

Table 8 Questions used in bias comparison (dataset variable names are shown in brackets)

Secondary demographics	Substantive outcomes
Age pension (b_agepension)	Moderate or intense physical activity (b_activity)
Country of birth (b_birthplace)	Daily smoker (b_dailysmoke)
Number of children living in the household (b_children)	Have experienced discrimination (b_discrim)
Labour force status (b_lfs)	Consumed alcohol in last 12 months (b_drinkfreq)
Marital status (b_marital)	Most people can be trusted (b_gentrust)
Person's income (b_income)	General health status (b_health)
	Psychological Distress (b_k6)
	Life satisfaction (b_lifesatisfaction)
	Multiculturalism is good for a society (b_multicult)
	No long-term health condition (b_nohealthcondition)
	Feel rushed or pressed for time (b_rushed)
	Provide unpaid care in last two weeks (b_unpaidcare)
	First preference for the party vote on Saturday 21 May 2022 (b_votemajor)

6.3 Overall measure

Average absolute bias (AAB) is a measure of the difference between a sample estimate and the corresponding benchmark for a characteristic or outcome of interest. The closer this measure is to zero, the better the sample aligns with the population on the benchmark characteristics. The average absolute bias is calculated as follows:

$$AAB = \frac{\sum_k^p B_k}{p}$$

where p = number of variables used in the bias assessment and B_k is determined by

$$B_k = \frac{\sum_j^{c_k} \left| E\left(x_{jk}\right) - \hat{x}_{jk} \right|}{c_k}$$

where:

$E\left(x_{jk}\right)$ denotes the benchmark value of the jth value of the kth variable;

$\hat{x}_{jk}$ denotes the estimate of the jth value of the kth variable; and

c_k = the number of different values (i.e., categories) for the kth variable.

This calculation of bias is known as a modified Duncan Index (Bottoni & Fitzgerald, 2021) and provides a summary measure by combining bias measures across multiple variables.

A summary measure for each variable type is calculated by averaging AAB and combining it with variance calculations in a single measure, RMSE, as defined in the previous section.

7 Results

7.1 Unweighted comparisons of bias for weighting variables

The items used as weighting variables for all surveys are number of adults in the household, age group, highest level of educational attainment, gender, geography (15 strata formed by the Greater Capital City Statistical Areas), and whether a language other than English is spoken at home. The non-probability online panels used various quota controls (see p. 18, this report). The unweighted bias comparisons for these weighting variables are provided below.

Figure 2 Unweighted comparison of the variables used in weighting (difference from benchmarks, percentage points)

	Survey 1 Life in Australia™	Survey 2 VALI	Survey 3 CATI	Survey 4 SMS push to web	Survey 5 Panel 1	Survey 6 Panel 2	Survey 7 Panel 3	Survey 8 Panel 4	Survey 5-8 Panels average
Sample Size	582	600	803	599	850	852	891	853	3446
Interview length (minutes)	14.4 (CATI) 9.3 (CAWI)	10.9	16.5	11.2	6.6	7.5	7.4	6.9	7.1
Number of adults									
Five or more	-2.3	-2.0	-0.2	0.3	0.2	-0.6	-1.6	0.0	-0.5
Four	-4.3	-5.5	-3.6	-1.7	-2.1	-3.6	-3.7	-1.4	-2.7
Three	-5.2	-8.1	-0.2	0.4	-2.3	-4.0	-3.4	-3.6	-3.3
Two	-5.1	2.9	-8.8	-14.0	-4.0	-8.0	-0.7	-2.8	-3.9
One	16.8	12.7	12.8	15.0	8.2	16.1	9.4	7.8	10.4
Age group									
18-24 years	-7.6	-9.2	-1.9	0.0	0.9	-6.2	-9.2	0.6	-3.5
25-34 years	-7.9	-7.4	-4.6	-4.5	-0.1	-4.3	-2.1	-0.4	-1.7
35-44 years	-3.0	-4.6	-4.0	0.3	1.2	-2.6	2.9	0.7	0.6
45-54 years	1.3	-0.1	-3.4	0.1	0.2	-1.6	0.1	-0.1	-0.3
55-64 years	5.9	8.0	4.9	3.0	1.9	-0.3	2.9	-0.2	1.1
65-74 years	9.5	13.2	5.4	3.2	-1.4	7.8	4.4	3.6	3.6
75+ years	1.8	0.1	3.7	-2.1	-2.7	7.0	1.0	-4.3	0.3
Highest education									
Post Bachelor	16.5	25.2	10.5	14.0	4.4	6.1	7.5	5.2	5.8
Bachelor	1.8	5.7	3.2	0.1	-3.4	-1.5	2.5	0.1	-0.6
Post Year 12 (less than Bachelor)	-2.0	-6.9	-0.3	-1.8	-0.8	-4.8	-4.0	-2.0	-2.9
Year 12	-6.8	-9.7	-5.2	-3.3	6.4	3.6	1.6	6.0	4.4
Less than Year 12	-9.6	-14.3	-8.2	-9.0	-6.6	-3.3	-7.6	-9.2	-6.7
Gender									
Female	6.4	-3.0	-0.6	9.4	-0.1	-6.2	-0.2	-2.8	-2.3
Male	-6.4	3.0	0.6	-9.4	0.1	6.2	0.2	2.8	2.3
Geography									
Greater Sydney	-1.6	0.5	-6.6	-3.3	-0.6	4.1	1.5	2.0	1.8
Rest of New South Wales	3.1	2.1	0.1	-1.5	1.0	0.3	-4.3	-1.5	-1.1
Greater Melbourne	-0.4	2.5	1.8	1.4	1.7	3.2	6.1	0.8	2.9
Rest of Victoria	-1.2	0.8	1.1	1.5	2.1	0.5	-0.9	-1.2	0.1
Greater Brisbane	-1.6	-0.9	0.2	2.2	-2.1	-3.3	1.2	3.1	-0.3
Rest of Queensland	0.2	-3.7	-0.1	-2.5	-2.6	-2.8	-3.3	-2.8	-2.9
Greater Adelaide	-1.0	0.2	1.4	0.6	2.1	-0.3	1.7	0.8	1.1
Rest of SA	0.0	-0.4	0.9	0.3	0.5	0.1	-0.6	-0.7	-0.2
Greater Perth	0.1	-0.8	0.8	0.6	-1.1	0.6	0.8	1.1	0.3
Rest of WA	-0.2	-0.4	-0.4	0.3	-0.6	-0.5	-1.2	-0.5	-0.7
Greater Hobart	0.6	-0.2	-0.3	0.5	0.6	0.1	0.0	0.3	0.2
Rest of Tasmania	0.7	-0.2	0.3	-0.2	-0.3	-0.3	0.0	-0.2	-0.2
Australian Capital Territory	1.7	0.6	0.4	0.1	-0.1	-1.0	-0.7	-0.6	-0.6
Greater Darwin	-0.4	0.1	0.3	0.1	-0.3	-0.4	-0.1	-0.3	-0.3
Rest of Northern Territory	0.0	-0.2	0.1	-0.2	-0.1	-0.2	-0.3	-0.2	-0.2
Languate other than English spoken at home									
No	12.5	14.2	11.2	10.1	12.7	14.7	12.0	12.7	13.0
Yes	-12.5	-14.2	-11.2	-10.1	-12.7	-14.7	-12.0	-12.7	-13.0

The non-probability panels perform well relative to benchmarks and relative to the probability-based sample surveys – none of which imposed quota controls.

The average distance of the non-probability panels from the gender benchmark is 2.3pp. The gender error range for the probability-based sample surveys is from 0.6pp for CATI to 9.4pp for SMS push-to-web.

Looking at the typically under-represented 18–24-year-old age group, the non-probability online panels, on average, under-represent this group relative to benchmarks by 3.5pp. The probability-based sample surveys under-represent 18–24-year-olds as follows; Life in Australia™ (7.6pp), VALI (9.2pp) and CATI (1.9pp). SMS push-to-web did not under-represent 18–24-year-olds (0.0pp).

Another common bias in survey research is the over-representation of people with a university qualification. The bias in the unadjusted measures of having a university qualification for the probability-based sample surveys ranges from 10.5pp for CATI to 25.2pp for VALI. The same error range for the non-probability online panels is from 4.4pp for Panel 1 to 7.5pp for Panel 3.

One-person households are over-represented in all the surveys, ranging from 16.8pp for Life in Australia™ to less than half that amount of error on Panel 4 (7.8pp).

All the surveys under-represent persons from households were a language other than English is spoken at home to a similar extent ranging from 10.1pp for SMS push-to-web to 14.7pp for Panel 2.

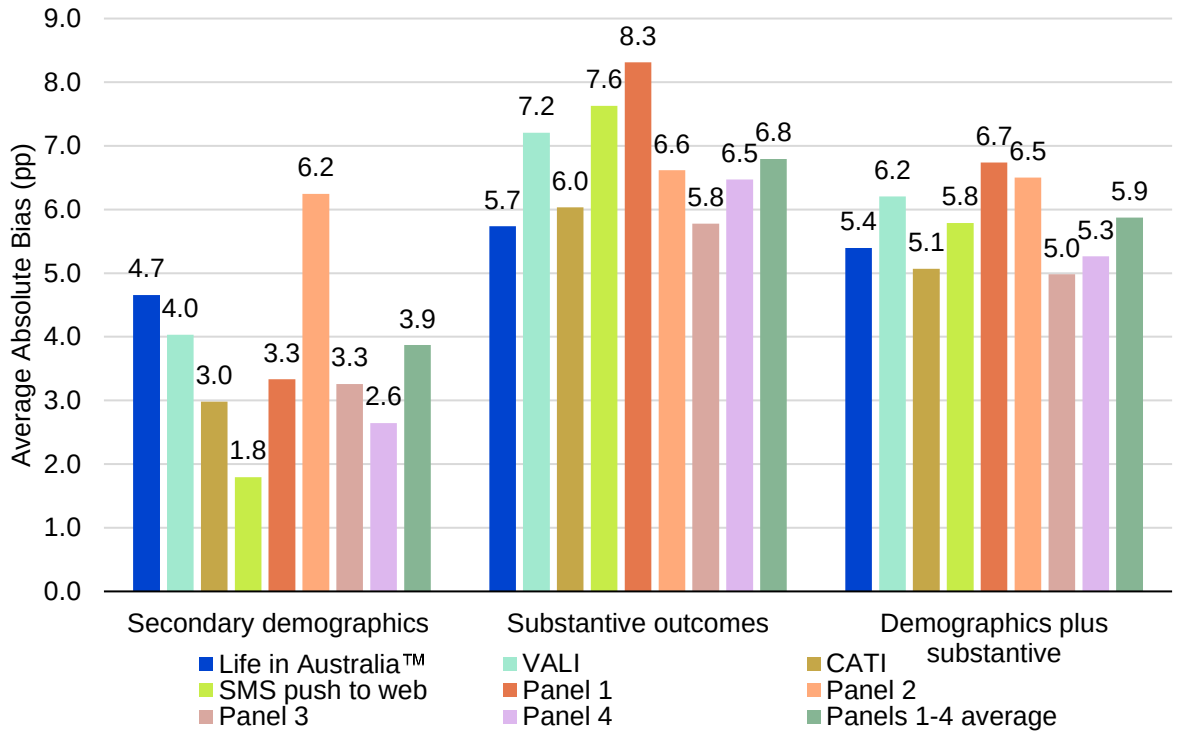
All surveys performed similarly with respect to the geographic dispersion of their samples relative to benchmarks.

7.2 Unweighted comparisons of bias for secondary demographics and substantive variables

The average absolute bias across the six secondary demographic variables for the non-probability online panels (3.9pp) is broadly similar to the error observed in the probability-based sample surveys: Life in Australia™ (4.7pp), VALI (4.0pp), and CATI (3.0pp), with the exception of SMS push-to-web (1.8pp) (see Figure 3). The error range for the probability-based sample surveys is 2.9pp and 3.6pp for the non-probability online panels. Although the non-probability online panels show greater variability in terms of the amount of bias occurring in their unadjusted estimates of secondary demographic characteristics, the amount of bias for these variables is quite similar for both probability-based sample surveys and non-probability online panels. This is consistent with findings reported in previous Australian and international studies (see, e.g., Kennedy et al., 2016, 26; Lavrakas et al., 2022, 249; Yeager et al., 2011, 719).

The third cluster of columns in Figure 3 shows the average absolute bias for all 19 variables. Panel 3 is still the best performing survey with an average absolute bias of 5.0pp, followed by CATI (5.1pp), Panel 4 (5.3pp), Life in Australia™ (5.4pp), SMS push-to-web (5.8pp), VALI (6.2pp), Panel 2 (6.5pp), and Panel 1 (6.7pp). Again, the variability of the unadjusted estimates produced from the probability-based sample surveys (1.1pp) is similar to that of the non-probability online panels (1.8pp), and the unadjusted estimates produced by the probability-based sample surveys are only marginally less biased.

Figure 3 Average absolute bias by variable category and survey: Unweighted estimates



7.3 Weighted comparisons of bias for secondary demographics and substantive variables

7.3.1 Secondary demographics

Once the data are weighted, Table 9 and Figure 4 show that the CATI and SMS push-to-web surveys have the lowest average absolute bias across the secondary demographic variables (1.7pp) followed in ascending order by Panel 3 (2.0pp), Life in Australia™ (2.2pp), VALI (2.4pp), Panel 4 (2.6pp), Panel 2 (2.9pp), and Panel 1 (3.6pp). As seen with the unweighted measures, the average absolute bias range is narrower for the probability-based sample surveys (1.7–2.4pp) than it is for the non-probability online panel surveys (2.0–3.6pp).

The secondary demographic measure which has the most bias across the board is labour force status. The maximum absolute error recorded for probability-based sample survey is 4.2pp (the VALI estimate of personal income), compared with 7.4pp (the Panel 1 estimate of labour force status) for the non-probability online panels (Panel 1).

Three of the four probability-based surveys (Life in Australia™, CATI, and SMS push-to-web) produce estimates that differ from statistically significantly from benchmark values for two of the six secondary demographic items. VALI

produces three estimates that differ significantly from benchmarks, whereas. Panels 1 and 4 are significantly different from benchmark values for four out of six items and Panels 2 and 3 for five items.

In terms of the AAB across all items, only Panel 1 produces estimates that differ significantly than those generated from Life in Australia™.

Table 9 Bias for secondary demographics (weighted)

Secondary demographics	Life in Austr-alia™	VALI	CATI	SMS push-to-web	Panel 1	Panel 2	Panel 3	Panel 4
Receiving the aged pension	1.8	1.2	0.6	0.6	4.1	4.7	2.7	2.3
Birthplace	1.8	1.4	2.0	1.8	5.1	2.2	0.4	3.8
Number of children in the household	0.6	0.9	0.6	1.4	0.7	1.2	1.2	1.2
Personal income	3.6	4.2	2.9	1.7	2.0	1.2	2.1	2.3
Labour force status	1.6	3.2	3.0	3.2	7.4	5.2	2.2	3.9
Marital status	3.8	3.3	1.0	1.4	2.1	3.0	3.5	2.3
Total	**2.2**	**2.4**	**1.7**	**1.7**	**3.6†**	**2.9**	**2.0**	**2.6**
Ranking	4	5	1	1	8	7	3	6
Number of variables significantly different from benchmark	2	3	2	2	4	5	5	4
Largest average absolute bias	**3.8**	**4.2**	**3.0**	**3.2**	**7.4**	**5.2**	**3.5**	**3.9**

Note: Full descriptions of the benchmark variables are provided in Appendix 2: ACSSM Benchmarks. † Fewer than 1% of bootstrap resamples had a bias as different from Life in Australia™ as the observed difference, assuming that the true difference is 0. Refer to Davison & Hinkley (1997), especially Ch 4.

7.3.2 Substantive and overall outcomes

Generally, outside of official statistics, the role of survey research is less about profiling the population in terms of demographic characteristics and more about measuring substantive attitudes and behaviours. On this basis, the most important comparative assessment is how well the respective ACSSM surveys measure the substantive variables of interest, once the data have been weighted.

Three of the four non-probability panels (Panels 2, 3, and 4) produced less biased results than the probability-based VALI and SMS push-to-web surveys.

When all accuracy measures are considered, with the exception of Panel 1, the difference in the average amount of bias between the probability-based sample surveys and the non-probability online panels is relatively small.

The relatively strong performance of non-probability online panels is not without precedent. The Pew Research Centre's 2016 comparative study of US panels and their probability based American Trends

Panel, showed that Pew's American Trends Panel 'does not stand out in this study as consistently more accurate than the nonprobability samples' (Kennedy et al., 2016, 5). The authors of the study also concluded that online panels are not monolithic and choice of panel matters (Kennedy et al., 2016, 3).

Table 10 and Figure 4 show that Life in Australia™ (5.6pp) and CATI (5.8pp) produce the least biased weighted estimates of the substantive outcome measures, followed by Panel 3 (6.3pp), Panel 2 (6.4pp), Panel 4 (6.6pp), VALI (6.9pp), SMS push-to-web (7.1pp) and Panel 1 (8.1pp). The probability-based sample surveys (with an error range of 1.5pp) are, again, less variable than the non-probability online panels (1.8pp) and again, on the whole, more accurate.

The most biased weighted estimate of a substantive outcome produced by a probability-based sample survey is for experienced discrimination in the last 12 months (SMS push-to-web: 20.5pp), compared with a highest bias for a non-probability sample of 14.5pp for Panel 1's estimate of the same item.

The rank order of the surveys in terms of the average accuracy of their weighted substantive measures shows that Life in Australia™ ranks first, followed by CATI and Panel 3. When looking at the weighted estimates for the demographic and substantive variables combined, the rank order for the three least biased surveys remains the same, followed by Panels 2 and 4, SMS push-to-web, VALI, and Panel 1. As previously noted, Panel 3 is the most accurate of the non-probability online panels, was the only panel that reported using outbound telephone calls as part of their panel recruiting strategy.

Of the 13 substantive measures estimated by each survey, the number of variables with a bias of less than 5pp (chosen as a heuristic value for reasonable accuracy) for each survey is: Life in Australia™ (7), VALI (7), CATI (8), SMS push-to-web (5), Panel 1 (3), Panel 2 (6), Panel 3 (6), and Panel 4 (4). On this measure, the probability-based sample surveys fare better than the non-probability online panel surveys.

Of the 13 substantive variables measured by each survey, 10 of the estimates produced from Life in Australia™ contain a statistically significant amount of error. The corresponding figures for the other surveys are CATI (11), SMS push-to-web and Panel 3 (12) and 13 for each of VALI and the rest of the non-probability online panels.

The average absolute bias of the estimates produced by three of the four non-probability online panel surveys (Panels 1, 2, and 4) are significantly higher than that of Life in Australia™. Only Panel 3 is statistically indistinguishable from Life in Australia™.

The other finding to emerge from these comparisons, consistent with previous

research, is that having a relatively inaccurate unweighted demographic profile is not a good predictor that the weighted results will be relatively inaccurate. The case in point is Life in Australia™, which ranks seventh in terms of the accuracy of its unweighted demographic profile, but a first in terms of weighted substantive variables. The opposite is true for SMS push-to-web, which ranks first in terms of the accuracy of its unweighted demographic profile but drops to seventh and sixth in terms of substantive measures and overall estimates, respectively. Three of the four non-probability panels (Panels 2, 3, and 4) produced less biased results than the probability-based VALI and SMS push-to-web surveys.

When all accuracy measures are considered, with the exception of Panel 1, the difference in the average amount of bias between the probability-based sample surveys and the non-probability online panels is relatively small.

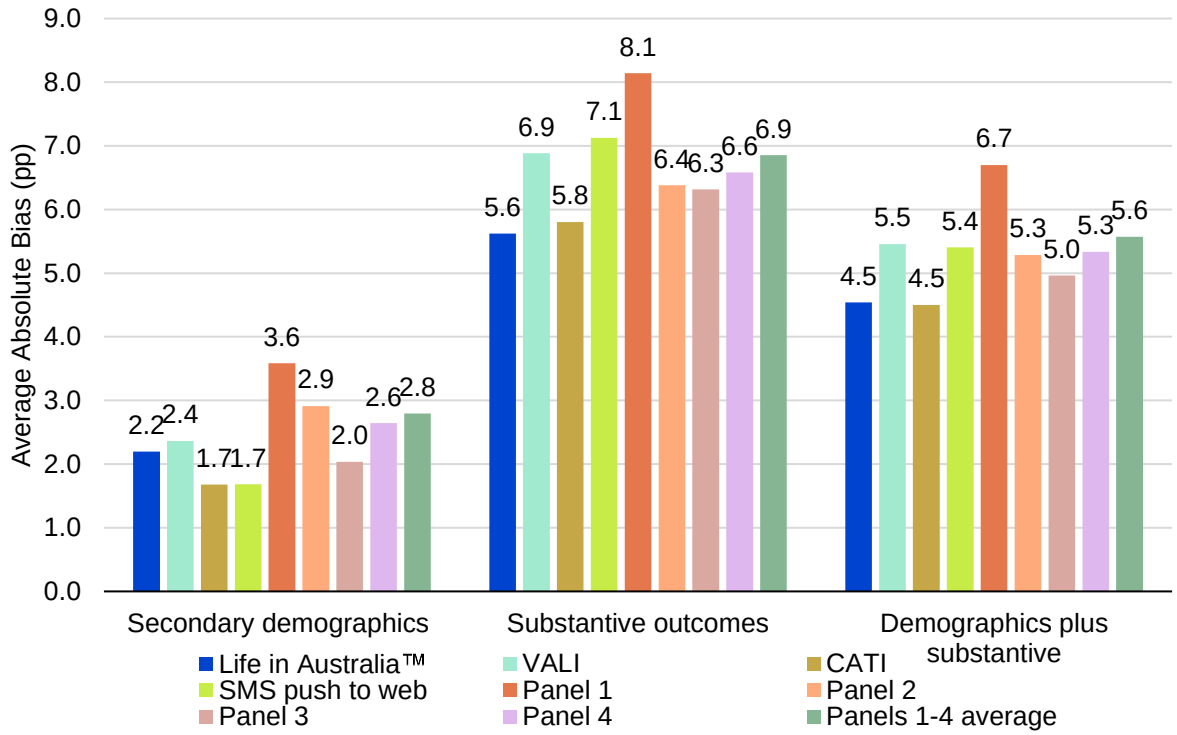
The relatively strong performance of non-probability online panels is not without precedent. The Pew Research Centre's 2016 comparative study of US panels and their probability based American Trends Panel, showed that Pew's American Trends Panel 'does not stand out in this study as consistently more accurate than the nonprobability samples' (Kennedy et al., 2016, 5). The authors of the study also concluded that online panels are not monolithic and choice of panel matters (Kennedy et al., 2016, 3).

Table 10 Bias for substantive variables (weighted)

	Life in Aust-ralia™	VALI	CATI	SMS push-to-web	Panel 1	Panel 2	Panel 3	Panel 4
Amount of daily physical activity	1.4	4.6	5.5	1.9	2.4	2.8	2.6	1.7
Daily smoking	2.5	4.3	0.8	0.5	11.8	4.9	1.5	6.9
Experienced discrimination in the last 12 months	10.1	10.1	13.0	20.5	14.5	10.6	9.2	10.6
Frequency of drinking alcohol in the last 12 months	2.5	2.6	2.7	2.1	1.5	1.6	1.8	1.9
Generalised trust in most people	4.1	3.7	5.0	7.9	5.6	7.4	4.4	6.7
Self-assessed health status	8.0	4.5	4.3	6.8	7.8	9.0	10.2	7.6
Kessler 6 measure of psychological distress	2.8	3.4	0.2	6.4	11.6	4.5	6.9	7.6
Overall life satisfaction	5.4	7.5	4.1	4.1	5.8	5.6	6.0	5.1
Level of agreement that multiculturalism is good for society	8.6	5.7	5.3	7.7	11.4	13.9	14.1	10.7
Have no long-term health conditions	13.3	18.7	18.3	17.6	12.0	8.2	12.5	11.9
How often rushed or pressed for time	3.6	2.9	2.3	3.8	2.7	4.6	3.6	2.7
Unpaid care provider	3.6	13.2	10.8	8.0	10.1	3.3	3.0	3.9
Vote choice at the previous election	7.2	8.3	3.3	5.4	8.7	6.6	6.5	8.4
Total	**5.6**	**6.9**	**5.8**	**7.1**	**8.1**‡	**6.4**†	**6.3**	**6.6**†
Ranking	1	6	2	7	8	4	3	5
Number of variables significantly different from benchmark	10	13	11	12	13	13	12	13
Largest average absolute bias	**13.3**	**18.7**	**18.3**	**20.5**	**14.5**	**13.9**	**14.1**	**11.9**

Note: Full descriptions of the benchmark variables are provided Appendix 2: ACSSM Benchmarks. ‡ and † indicate respectively that fewer than 1% and 5% of bootstrap resamples had a bias as different from Life in Australia™ as the observed difference, assuming that the true difference is 0.

Figure 4 Average absolute bias by variable category and survey: Weighted estimates



7.4 The impact of weighting on the survey estimates

The Cornesse et al. (2020, 20–21) review of comparative studies found that the application of standard weighting procedures generally resulted in a considerable bias reduction for the probability-based sample survey estimates but did not consistently reduce the bias in the non-probability online panel estimates. In some studies (e.g., Lavrakas et al., 2022; MacInnis et al., 2018; Yeager et al., 2011), weighting resulted in an increase in overall bias for some of the non-probability online panel surveys.

The impact of applying the weighting procedures as outlined in Section 5 are now considered.

7.4.1 Secondary demographics

Table 11 shows the variation in the impact of the weights on individual secondary demographic items. Weighting reduces the bias for 5 out of the 6 secondary demographic items for Life in Australia; 4 out of 6 for VALI, CATI, Panel 2, and Panel 3; 2 out of 6 for SMS push-to-web; and 1 out of 6 for Panel 1 and Panel 4.

The impact of weighting on the individual survey estimates for receipt of the aged pension is the most wide-ranging, from a 0.9pp reduction in bias for the VALI survey to an 8.2pp reduction for Panel 2.

The average reduction in bias across these 6 items ranges from a reduction of 3.3pp for Panel 2 to an increase of 0.3pp for Panel 1. Weighting had virtually no impact

on the estimates generated by Panel 4 or the SMS push-to-web survey.

Table 11 Percentage point change in bias due to weighting the secondary demographic items

Secondary demographics*	Life in Austr-alia™	VALI	CATI	SMS push-to-web	Panel 1	Panel 2	Panel 3	Panel 4
Receiving the aged pension	-5.7	-0.9	-2.5	0.4	3.7	-8.2	-3.0	1.5
Birthplace	-3.7	-5.8	-3.7	-3.2	-3.7	-4.3	-3.2	-3.3
Number of children in the household	-1.6	-2.4	-1.9	0.6	0.2	-2.1	-0.2	0.4
Personal income	0.9	0.1	0.0	0.1	0.0	0.3	0.2	0.0
Labour force status	-3.1	0.8	1.1	1.6	1.0	-5.8	-1.2	0.7
Marital status	-1.6	-1.8	-0.9	-0.1	0.3	0.2	0.1	0.7
Overall	-2.5	-1.7	-1.3	-0.1	0.3	-3.3	-1.2	-0.0
Number of items with reduced bias	5	4	4	2	1	4	4	1

Note: * Full descriptions of the benchmark variables are provided in Appendix 2: ACSSM Benchmarks.

7.4.2 Substantive outcomes

Table 12 shows the impact of weighting on the amount of bias present in the substantive outcome measures. It is only really for the estimate of 'no long-term health conditions' that weighting results in a substantial (4–5pp) reduction in bias for most of the surveys. For most of the substantive items, the reduction in bias is less than 1pp. That said, weighting still has a desirable effect on the majority of items for VALI (9 out of 13); Panel 1 (8 out of 13); Life in Australia™, SMS push-to-web, and Panel 2 (7 items); but not so for CATI and Panel 4 (6 items) or Panel 3 (3 items).

The average overall impact of the weights on bias (the bottom panel of Table 12) is uniformly small, meaning that these findings only partially support those of previous comparative studies which generally show that weighting was more effective in reducing bias for probability-based sample surveys than surveys conducted on non-probability online panels. Average overall bias for the ACSSM surveys across all 19 items varies very little, ranging from a very slight increase in bias for Panel 3 (0.5pp) and Panel 4 (0.1pp) to a 1.2pp decrease in bias for Panel 2. For the probability-based surveys the decrease in bias across all 19 variables ranged from 0.4pp for SMS push to web to 0.9pp for Life in Australia™.

Table 12 Percentage point change in bias due to weighting the substantive outcomes items

Substantive outcome	Life in Austr-alia™	VALI	CATI	SMS push-to-web	Panel 1	Panel 2	Panel 3	Panel 4
Amount of physical activity	-0.7	-0.9	0.1	-0.7	0.4	-0.6	0.7	0.4
Daily smoking	-0.8	-1.7	0.1	0.4	-0.6	0.6	0.9	-0.3
Experienced discrimination in the last 12 months	3.0	4.5	3.0	0.0	0.5	2.5	2.4	0.6
Frequency of drinking alcohol in the last 12 months	-0.5	-0.9	0.2	0.2	0.1	-0.1	0.5	0.2
Generalised trust in most people	0.8	-0.9	1.3	0.6	-0.8	0.7	0.4	0.1
Self-assessed health status	1.7	1.7	-0.1	0.9	-0.5	-0.6	0.4	-0.1
Kessler 6 measure of psychological distress	1.6	-1.1	-0.3	-0.3	-0.6	1.6	3.3	0.5
Overall life satisfaction	1.4	0.6	-0.4	-0.9	-0.6	0.2	0.4	-0.5
Level of agreement that multiculturalism is good for society	-0.8	1.9	0.1	0.7	-0.4	-0.2	0.4	-0.1
Have no long-term health conditions	-5.1	-4.2	-4.6	-4.3	-1.4	-5.3	-2.5	0.2
How often rushed or pressed for time	1.1	-0.5	0.0	-0.1	0.5	-2.7	-0.1	-0.2
Unpaid care provider	-1.7	-2.2	-1.1	-2.0	1.3	2.2	0.9	0.7
Vote choice at the previous election	-1.6	-0.5	-1.4	-1.2	-0.2	-1.5	-0.7	-0.2
Overall (+/- pp) substantive items	-0.1	-0.3	-0.2	-0.5	-0.2	-0.2	0.5	0.1
Number of items with reduced bias (out of 13)	7	9	6	7	8	7	3	6
Overall (+/- pp) demographic and substantive items (19 variables)	-0.9	-0.7	-0.6	-0.4	0.0	-1.2	0.0	0.1
Number of items with reduced bias (out of 19)	12	13	10	9	9	11	7	7

However, in terms of the impact of standard weighting on individual items, we do see a differential impact across the probability-based sample surveys and the non-probability panels. Bias reduces for only 7 of the 19 variables for Panels 3 and 4 compared to 9 for SMS push-to-web and Panel 1; 10 for CATI; 11 for Panel 2; 12 for Life in Australia™; and 13 for VALI.

So, overall, although the amount of bias reduction attributable to weighting is small, the probability-based sample surveys tend to gain the most benefit.

7.5 Bias and variance

By combining bias and variance to produce a measure of RMSE, as described in Section 6.3, we can compare the

surveys in terms of their total error (i.e., bias and variance). On this basis, the most accurate survey in terms of secondary demographics is CATI (2.3pp), followed by SMS push-to-web (2.5pp), and Panel 3 (2.6pp).

The rank order of the surveys in terms of having the least amount of RMSE error for the substantive measures of interest is Life in Australia™ and CATI (both 6.2pp); Panel 3 (6.6pp); Panel 2 (6.7pp); Panel 4 (6.9pp); VALI (7.4pp); SMS push-to-web (7.6pp); and Panel 1 (8.4pp).

When the secondary demographic variables are combined with the substantive variables, the CATI survey has the lowest total error (5.0pp), followed by Life in Australia™ (5.1pp) and then Panel 3 (5.4pp).

Table 13 Root mean squared error by survey (pp)

Weighted comparison RMSE	Life in Austr-alia™	VALI	CATI	SMS push-to-web	Panel 1	Panel 2	Panel 3	Panel 4	Panel aver-age
Secondary demographics	2.9	3.4	2.3	2.5	3.9	3.4	2.6	3.1	3.3
Substantive outcomes	6.2	7.4	6.2	7.6	8.4	6.7	6.6	6.9	7.2
Secondary plus substantive	5.1	6.2	5.0	6.0	7.0	5.7	5.4	5.7	5.9

8 Historical comparisons

Three comparisons between the OPBS+ and ACSSM are provided in Table 14. All are based on a like-for-like comparison which uses a common approach to calculating bias, measured by the average absolute bias (AAB) for each study, and is limited to the non-weighting variables common to both studies (i.e. only seven variables).[9] We compare the AAB for each variable and overall and the largest AAB generated by each survey.

Following the method used throughout this report, the AAB calculations for the OPBS+ measures have been recalculated so that they reflect the average error for each response category relative to its benchmark value, not just the modal response category (which was the approach used in OPBS+).

These historical comparisons are limited to the comparable methodologies, that is, CATI, Life in Australia™, and the three non-probability online panel providers that provided sample in both 2015 and 2022.

All five of the surveys included in this historical comparison produced more accurate measurements of these survey items in 2022 than 2015. This comes as somewhat of a surprise in the case of CATI, given the steep decline in response rates between 2015 and 2022, but serves as a reminder that response rates are generally a poor predictor of survey accuracy (Kennedy & Hartig, 2019). We are also surprised that the Life in Australia™ estimates are more accurate in 2022 than 2015, given the cumulative effects of panel attrition. Based on the seven measures common to both studies, that is, excluding the Kessler 6 item, Table 14 shows that, on average, bias reduced from 3.9pp to 3.6pp (0.3pp) between 2015 and 2022 for the weighted estimates generated from the Life in Australia™. This compares with a 0.9pp reduction in bias for CATI and 0.7pp, 1.7pp, and 1.8pp for the three non-probability online panels (an average bias reduction across the non-probability panels of 1.4pp).

All the surveys, except Panel 1, generated improved estimates for birthplace (Australian born, overseas born from an English-speaking background, overseas born from a non-English speaking background). The estimates of daily smoking rates were less accurate for Life in Australia™ and marginally so for CATI, and less accurate for the panels overall

[9] Estimates of AAB for each survey have been produced both with and without the Kessler 6 measure. For reasons we have been unable to establish, the Kessler 6 estimates were very inaccurate in 2015. So as not to overstate the change over time we have produced AAB measures both with and without the Kessler 6 item.

due to a 3pp increase in error for this estimate for Panel 1.

The measures of alcohol consumption improved slightly for each of the survey methods across the years matched by an across-the-board improvement in the accuracy of the personal income measure.

Labour force estimates were more accurate for all of the surveys, excepting Life in Australia™, for which bias increased from 1.1 to 1.6pp. The three non-probability panels all produced a more accurate measure of life satisfaction, not so the probability-based sample surveys.

For four of the five 2015 surveys, the largest absolute error was recorded with respect to the Kessler 6 measure, with errors ranging from 12.4pp for the Life in Australia™ survey to 17.2pp for Panel 1. The exception to this was CATI, with error for the Kessler 6 of 5.4pp. In 2022, the largest errors across the surveys ranged from 4.3pp (the largest error for the CATI survey with respect to self-assessed general health) to 11.8 (the largest error for Panel 1's daily smoker estimate).

Panel 3, the only panel which reported including telephone as an offline recruitment method, is the least biased of the non-probability online panels in both 2015 and 2022.

Table 14 Comparisons between comparable OPBS+ and ACSSM: Average absolute bias (AAB) and largest absolute error

Outcome	Life in Australia™		CATI		Panel 1		Panel 2		Panel 3		Three Panel Average	
	OPBS+ 2015	ACSSM 2022	OPBS+ 2015	ACSSM 2022	OPBS+ 2015	ACSSM 2022	OPBS+ 2015	ACSSM 2022	OPBS+ 2015	ACSSM 2022	OPBS+ 2015	ACSSM 2022
Birthplace	7.5	1.8	2.3	2.0	2.3	5.1	2.3	2.2	2.3	0.4	2.3	2.6
Daily smoker	1.4	2.5	0.6	0.8	8.8	11.8	5.6	4.9	1.6	1.5	5.4	6.1
Frequency of drinking alcohol	2.7	2.5	5.0	2.7	1.6	1.5	4.4	1.6	3.3	1.8	3.1	1.6
General health	6.3	7.9	3.8	4.3	6.4	7.8	7.5	8.9	7.0	10.2	7.0	9.0
Personal income	5.0	3.6	5.4	2.9	5.8	2.0	6.1	1.2	5.8	2.1	5.9	1.8
Kessler 6	12.4	2.8	5.4	0.2	17.2	11.6	15.7	4.5	16.6	6.9	16.5	7.7
Labour force status	1.1	1.6	7.9	3.0	12.5	7.4	8.3	5.2	10.7	2.2	10.5	4.9
Life satisfaction	3.4	5.4	0.9	4.1	8.5	5.8	7.1	5.6	6.6	6.0	7.4	5.8
AAB (pp)	5.0	3.5	3.9	2.5	7.9	6.6	7.1	4.3	6.7	3.9	7.3	4.9
AAB excluding Kessler 6 (pp)	3.9	3.6	3.7	2.8	6.6	5.9	5.9	4.2	5.3	3.5	5.9	4.5
Largest AAB, excl. K6 (pp)[#]	7.5	7.9	7.9	4.3	12.5	11.8	8.3	8.9	10.7	10.2	10.5	9.0
AAB for the non-shared items		4.0		3.9		5.2		4.3		4.2		4.6

Note: # Estimates of AAB for each survey have been produced both with and without the Kessler 6 measure. For reasons we have been unable to explain the K6 estimates were very inaccurate in 2015. So as not to overstate the change over time we have also produced an AAB measure which excludes the K6 item.

[#][#] Measures of statistically significant error relative to benchmarks are not available for the 'birthplace' variable for the OPBS. As such, 'birthplace has been excluded from the count of the number of items for which there is a statistically significant difference relative to benchmarks. Also, the measure used for the OPBS is based on comparing the modal survey response to the corresponding benchmark value whereas in 2022 significance was calculated uses all response categories relative to benchmarks.

It is apparent from this analysis that changes in accuracy did not happen uniformly across all variables and, as such, if we were able to undertake a series of comparisons using another set of items, we might get a different result in terms of the specific and overall changes in bias over time. To help illustrate this point, the bottom row of Table 14 shows the amount of error in the ACSSM estimates for those measures not shared with the OPBS. Across these 12 items the average absolute bias is generally higher than it was for the 7 shared items.

This allows for the possibility that had a different set of comparative variables been available to us, we might have seen a different result, that is, non-probability online panel estimates having lower error than probability-based survey estimates. We feel, however, that, if such a result was to eventuate, it would be the exception to the rule. Our rationale for this assertion is based upon the results of the many previous comparative studies that demonstrated the superior accuracy of probability-based sample survey estimates for a wide array of variables. The review by Cornesse et al. (2020) documents the various topics covered by previous studies (see p. 1, this report) and the findings from the large replication study undertaken by MacInnis et al. (2018) give us confidence that cautious generalisations can be made from our findings. MacInnis et al. (2018) replicated and extended Yeager et al. (2011), increasing the number of variables included in the probability/non-probability comparisons from 18 to 38 and covering non-demographic issues such as 'characteristics of housing structures, consumption behavior, economic expenditures, health quality, health-related behaviors, and health care utilization' (MacInnis et al., 2018, 712).

They found that despite the deterioration in response rates for probability-based sample surveys during the intervening years, 'the probability samples interviewed by telephone or the internet were (still) the most accurate. Internet surveys of a probability sample combined with an opt-in sample were less accurate; least accurate (still) were internet surveys of opt-in panel samples. These results were not altered by implementing poststratification using demographics' (MacInnis et al., 2018, 707).

Table 15 shows selected comparisons between some of the survey measures over time, that is, the differences in bias between, for example, the CATI survey and the most accurate non-probability panel in 2015 compared to the same gap in 2022. This gives an indication of the changing relativities between the surveys over time.

In 2015, Life in Australia™ had 1.4pp less bias than the most accurate non-probability panel. In 2022, Life in Australia™ had, on average, only 0.2pp less bias than the most accurate non-probability online panel. The gap between

Life in Australia™ and the three-panel average was 2.0pp in 2015, down to 0.9pp in 2022.

Comparisons between CATI and the non-probability online panels reveal a similar narrowing of the gap. In 2015, CATI had 1.6pp less bias than the best performed non-probability panel survey but by 2022 CATI was, on average, only had 0.6pp less bias than the most accurate non-probability online panel and 1.7pp less bias than the three-panel average.

Within the limitations of this comparative analysis, we see an across the board decrease in the performance gap enjoyed by the probability-based sample surveys over the non-probability online panel surveys.

Table 15 Average absolute bias: Selected comparisons, OPBS+ and ACSSM

AAB gap between …	OPBS+ 2015	ACSSM 2022
Life in Australia™ and the least biased non-probability panel	-1.4	-0.2
Life in Australia™ and the three-panel average	-2.0	-0.9
CATI and the least biased non-probability panel	-1.6	-0.6
CATI and the three-panel average	-2.2	-1.7

9 Survey costs and survey quality

To decide whether a particular survey solution is going to meet their needs, the person or agency funding or undertaking the survey should consider the cost of a particular survey method relative to the survey quality. The ABS (2009) Data Quality Framework (DQF)[10] provides a useful way of framing this assessment. According to the ABS, data quality is comprised of the following seven elements:

- Institutional Environment: The institutional and organisational factors which may have a significant influence on the effectiveness and credibility of the agency producing the statistics. (We exclude the Institutional Environment from our review because it is not related to survey methods or sampling frames.)
- Relevance: How well the statistical product or release meets the needs of users in terms of the concept(s) measured, and the population(s) represented. (This is also excluded from consideration because the concepts measured are not related to the choice of survey methods or sampling frames. Coverage is addressed in Section 10.1.)
- Timeliness: The delay between the reference period (to which the data pertain) and the date at which the data become available; and the delay between the advertised date and the date at which the data become available (i.e., the actual release date).
- Accuracy: The degree to which the data correctly describe the phenomenon they were designed to measure. This is an important component of quality as it relates to how well the data portray reality, which has clear implications for how useful and meaningful the data will be for interpretation or further analysis.
- Coherence: The internal consistency of a statistical collection, product, or release, as well as its comparability with other sources of information, within a broad analytical framework and over time.
- Interpretability: The availability of information to help provide insight

[10] The DQF is based on the Statistics Canada (2002) Quality Assurance Framework and European Statistics Code of Practice (Eurostat, 2023).

into the data. Information available which could assist interpretation may include the variables used, the availability of metadata, including concepts, classifications, and measures of accuracy.

- Accessibility: The ease of access to data by users, including the ease with which the existence of information can be ascertained, as well as the suitability of the form or medium through which information can be accessed. The **cost** of the information may also represent an aspect of accessibility for some users (ABS, 2009). For our purposes, the relevant dimension of accessibility is cost; we provide a comparative assessment of survey costs (presented as cost ratios) under this heading.

9.1 Accessibility (cost) and survey accuracy

The fifth and sixth columns of Table 16 show the relative unadjusted and quality adjusted differences between each ACSSM survey and the survey with the least total error (CATI, RMSE = 5.0) calculated as shown below:[11]

$$UaCR_i = \left[\frac{C_i}{n_i}\right] / \left[\frac{C_B}{n_B}\right]$$

$$QaCR_i = \left[\frac{C_i}{n_{eff,i}}\right] / \left[\frac{C_B}{n_{eff,B}}\right]$$

where

$UaCR_i$: Unadjusted cost per interview ratio

$QaCR_i$: Quality adjusted cost per interview ratio

C_i: Survey cost for survey i

n_i: Achieved sample size (n) for survey i

$n_{eff,i}$: Effective sample size for survey i

C_B: Survey cost for survey with the least RMSE (i.e., CATI)

n_B: Number of interviews completed for survey with the least RMSE

$n_{eff,B}$: Effective base for survey with the least RMSE

The unadjusted cost per interview ratio for each survey (column 5) is calculated by dividing the survey cost (not reported for reasons of commercial confidentiality) by

[11] The components that make-up the data collection costs for each of the OPBS+ and ACSSM surveys are provided in Appendix 5: . Actual dollar values are used to calculate these cost ratios, but the dollar values are not provided in this paper for reasons of commercial confidentiality.

the achieved sample size (n) to get cost per interview and showing this as a ratio of the CATI survey's cost per interview. The quality adjusted ratio (column 6) is calculated in the same way, but the effective sample size (n_{eff}) replaces the achieved sample size as the denominator used to calculate per interview costs.

As it happens, the unadjusted cost for undertaking a VALI interview is the same as for a CATI interview. However, when using the quality adjusted cost ratio, VALI is 1.84 times the cost of CATI. The large change between the unadjusted and quality-adjusted cost ratios in this instance is due to the relatively low effective sample size for the VALI survey.

In 2022, Life in Australia™ was about one-quarter of the cost of CATI (0.26) using unadjusted cost ratios and 0.32 times the cost of CATI based on quality-adjusted cost ratios. These same metrics are 0.35 and 0.36 for SMS push-to-web and 0.09 and 0.10 for the non-probability online panel surveys.

The three right-hand columns of the table show the sample size, AAB, and unadjusted cost ratios, relative to CATI, for OPBS+ 2015. The effective sample size and the RMSE could not be calculated given the weighting methods used in 2015 and, as such, nor could a quality adjusted cost ratio. Nonetheless, based on the comparative data we have at hand, we see that Life in Australia™ is 0.40 times the unadjusted cost of CATI in 2015 compared to 0.26 times the cost of CATI in 2022. This speaks to both efforts to reduce the cost of Life in Australia™ as well as the increasing cost of CATI.

With respect to reducing the cost of Life in Australia™, there is a lower proportion of Life in Australia™ interviews completed by phone in 2022 relative to 2015, 4.8 per cent vs 7.3 per cent, as well as the use of SMS push-to-web for recruitment, which is considerably less expensive than other modes (Phillips et al., 2022).

In terms of the increasing cost of CATI, the difficulty, and hence, cost, associated with conducting CATI surveys increased dramatically between 2015 and 2022. One indicator of this is the number of telephone records called per interview obtained. For the OPBS+ DFRDD survey, this ratio is 6.8 telephone numbers per interview, for the ACSSM mobile RDD, the equivalent ratio for the high-effort CATI survey is 16.3 records per interview.

Based on unadjusted cost ratios and considering that both RDD CATI and Life in Australia™ have an almost identical RMSE, it is evident that the value-for-money proposition for Life in Australia™ over CATI is stronger in 2022 than in 2015.

In terms of the difference between Life in Australia™ and the non-probability online panels, in 2015 Life in Australia™ was 3.1 times the average unadjusted cost of the non-probability online panels. The cost differences are virtually unchanged in 2022, with the Life in Australia™ survey being 2.9 times the unadjusted cost of the non-probability online panels.

In 2015, Life in Australia™ had, on average, 1.7pp less bias than the non-probability online panels. In 2022, the gap in error in favour of Life in Australia™ over the non-probability online panels had reduced to 1.1pp.[12]

To sum up, in 2022, Life in Australia™, at 0.26 times the unadjusted cost of CATI and with the same amount of error (4.5pp), is clearly the best value-for-money of the probability-based sample surveys covered in this study. The cost of Life in Australia™ relative to non-probability online panel surveys remains largely unchanged. The question those who are considering undertaking online panel surveys should be considering is, whether, given the current cost versus accuracy relativities, the higher direct cost for Life in Australia™ over non-probability online panels is worth the, on average, 1.1pp reduction in bias. A consideration of the other elements of the DQF may help resolve this issue.

Table 16 Direct costs and quality adjusted costs by ACSSM survey component

	ACSSM (2022)						OPBS+ (2015)		
Survey	n	n_{eff}	**AAB**	**RMSE**	$UaCR$	$QaCR$	n	**AAB**	$UaCR$
VALI	600	242	5.5	6.2	1.00	1.84	-	-	-
Life in Australia™	582	343	4.5	5.1	0.26	0.32	2,580	4.8	0.40
CATI	498	594	4.5	5.0	1.00	1.00	553*	5.1	1.00
SMS push-to-web	596	425	5.4	6.0	0.35	0.36	-	-	-
Panel 1/A	850	684	6.7	7.0	0.08	0.08	601	7.2	0.11
Panel 2/B	852	536	5.3	5.7	0.09	0.10	600	6.5	0.11
Panel 3/D	891	629	5.0	5.4	0.13	0.14	640	6.3	0.13
Panel C	-	-	-	-	-	-	636	6.0	0.13
Panel 4	853	657	5.3	5.7	0.07	0.07	-	-	-
Panel E	-	-	-	-	-	-	601	6.5	0.16
Panel average	-	-	5.6	6.2	0.09	0.10	-	6.5	0.13

Note: The same panel companies provided the samples for panel surveys 1/A, 2/B and 3/D for both studies. *Excludes refusal conversion interviews as these were not undertaken in 2022.

[12] The bias relativities used for these analyses differ from those presented in the previous section (Table 15).

9.2 Timeliness

The non-probability sample surveys used in the OPBS and ACSSM studies required less time in field to complete the required number of interviews than the probability-based surveys. For the ACSSM surveys, the fieldwork durations in days are: VALI (28); Life in Australia™ (15); CATI (14); SMS push-to-web (13); Panel 1 (10); Panel 2 (9); Panel 3 (9); and Panel 4 (12).

The gap between the probability-based and non-probability sample surveys might not be as great as first thought. However, the relationship between probability and non-probability samples and timeliness is very dependent on mode of interview.

Due to their reliance on a finite resource – interviewers – CATI and VALI are most subject to decreasing timeliness as sample sizes increase or there is a need to sample rare or hard-to-reach sub-populations.

Non-probability online panels will generally be faster, although time in field will still be driven to a degree by sample size or sub-populations, particularly if the vendor needs to work with partners to achieve the sample size or sub-population or for hard quotas.

SMS push-to-web is not constrained by the need for interviewers and has a short field period. In theory, a very large number of records can be released in a short space of time to yield large samples very quickly, although a staged approach that required the release of sample in replicates was adopted for this study.

9.3 Coherence

The fact that survey estimates generated from probability-based sample surveys are, generally, both closer to benchmarks and less variable than those produced via non-probability online panels, means that they are more 'coherent' (i.e., comparable with other sources).

9.4 Interpretability

While there is no theoretical reason for there to be a distinction between probability-based sample surveys and non-probability online panels with respect to which their results can be presented in a fashion that is easy to interpret, the practical reality is somewhat different.

The reason for this is that, by and large, non-probability panel companies are not transparent about the methods used to recruit their samples but, instead, couch them as proprietary, and rely on generic descriptions of sampling processes.

Mercer et al. (2017, 219) note that the most common forms of recruitment (for non-probability online panels) are 'directly through a panel website, clicking on banner advertisements, or when corporations grant panel vendors access to members of their customer loyalty programs'.

The AAPOR Taskforce Report on Online Panels (Baker et al., 2010, 719) notes that 'there is no generally accepted best method for building a (non-probability) panel, and many companies protect the

proprietary specifics of their methods with the belief that this gives them a competitive advantage'. The same report also notes that 'panel companies rarely disclose the success rates from their recruitment strategies' (Baker et al., 2010, 721).

Cornesse et al. (2020, 25) similarly note that the 'lack of information available from some online panel vendors can unfortunately make it impossible for researchers to comply with their own codes or certification' and the AAPOR task force report *Evaluating Quality in Today's Complex Environment,* notes that 'transparency in all phases of a study is essential if we are to fully assess survey quality' (Baker et al., 2016, 2) and this applies equally regardless of whether probability or non-probability sampling methods are being used.

The material provided from the panels included in this study matches these descriptions, giving only very broad descriptions of their recruitment techniques, without, for instance, detailing the balance of panellists recruited via online and offline means or reporting how each panellist is recruited.

Due to the relative paucity of methodological disclosure typically seen from non-probability panel companies, the resultant survey estimates are less accessible and more difficult to interpret.

9.5 Summary

Those commissioning survey research must decide which survey method is fit for their specific purpose. The decision-making criteria can be broadly collapsed into making trade-offs between cost (accessibility), timeliness and quality (accuracy) and, ultimately, the weight given to these somewhat competing demands will determine the optimal survey method. What this study has shown is that non-probability online sample surveys are much cheaper, somewhat quicker, and generally less accurate, but sometimes only slightly so, than the probability-based alternatives. Within the limitations of this comparative analysis (see Section 11), this study also shows that the accuracy gap in favour of probability-based sample surveys over the non-probability online panel surveys has reduced.

However, it is still the case that estimates produced by probability-based sample surveys are generally less variable that those produced by non-probability online panel surveys. This, along with the increased methodological disclosure generally associated with probability-based sample surveys, provides survey researchers with grounds to be more confident in the results generated from probability-based sample surveys than those generated from non-probability online panels.

An important problem persists for those choosing to fund non-probability sample

surveys whereby, for any given survey, or any given items within a survey, researchers have a less firm basis from which to attest to the accuracy and generalisability of their results than if the same questionnaire had been administered to a probability-based sample. Nor will they have the same basis for confidence as to whether they should be using weighted or unweighted data.

10 Discussion

Lavrakas et al. (2022) use the Total Survey Error (TSE) framework (see Groves, 1989; Groves et al., 2009; Groves & Lyberg, 2010) to undertake a comparative assessment of the sources of survey error most likely to afflict probability-based sample surveys and non-probability online panels. The TSE paradigm provides a useful context to frame our discussion of the results from the current study. This section draws heavily on Lavrakas et al. (2022).

10.1 Coverage and coverage errors

The CATI and SMS push-to-web surveys used randomly generated mobile phone telephone numbers as sampling frames. Due to the availability of the relevant official statistics in Australia, the coverage gaps associated with the use of mobile RDD frames are knowable. The most recent official estimates relating to the use of mobile phones for voice calls in Australia is that 63 per cent of Australian adults are mobile-only for voice communications, 34 per cent have a landline and a mobile-phone and fewer than 2 per cent of adults rely solely on a landline (ACMA, 2023).[13] As such, the gap in the coverage of the RDD mobile frame comprises the less than 2 per cent of adults only contactable via a landline plus the 2 per cent of adults without a telephone (Phillips et al., 2019) and the 1 per cent error positive rate of working number look-ups. We consider the resulting 95 per cent coverage rate adequate for most research purposes.

Most of the Life in Australia™ panellists included in the VALI and probability-based online surveys were recruited via either RDD CATI (29%) or A-BS push-to-web (64%). These are among a suite of recruitment methods that have been used to build Life in Australia™: RDD CATI, A-BS push-to-web (with CATI follow-up for non-responding addresses that can be linked to a phone number), RDD SMS push-to-web, and RDD Interactive Voice Response (for further details, see Philips et al., 2022b, 2023). The sampling frames used to build Life in Australia™ at various times have covered the landline and mobile phone populations, the mobile phone population only, and all persons able to receive mail at their residential address. Given these overlapping sampling frames, the coverage properties of Life in Australia™ are likely slightly better than

[13] AMCA's estimates of the use of telephone for voice calls are derived from a survey conducted on Life in Australia™.

the mobile RDD frame and should, in our judgement, have adequate coverage for most research purposes.

The four surveys that were fielded on non-probability online panels used a variety of convenience frames to build their respective panels. The latest official estimates produced by ACMA (2023, 3)[14] suggest that online panels have the *potential* to cover the Australian adults very well with '95 per cent (of Australian adults) having used a communication or social media website or app for personal purposes in the six months to June 2022'. However, the reality of the convenience-based sampling methods used by panel providers to recruit their panellists, is that only a small unrepresentative and non-random slice of web users will ever be approached to join a panel. This non-coverage is inherent in the design of these panels is undoubtedly very large and differential (non-random) in nature. It is differential because those who are exposed to an invitation to join non-probability panels are different in many non-ignorable ways from those not exposed to such invitations. These differences are expected to often be correlated with what is being measured in surveys, such as the substantive measures gathered in this study. For example, Fahimi et al. (2015) identified significantly different responses between members of probability and non-probability online panels, after controlling for confounding effects, in relation to factors such as social engagement, self-assertion, shopping habits, happiness and security, politics, sense of community, altruism, survey participation, and internet and social media usage. In this study we see quite large differences between the estimates generated from probability-based sample surveys and non-probability online panels with respect to daily smoking prevalence, the prevalence long-term health conditions, self-assessed health, experiences of discrimination, and attitudes to multiculturalism.

In summary, uncorrected coverage error in the non-probability panels is a probable contributing factor to the level of bias and variance found in such surveys.

10.2 Sampling and sample errors

Increasingly lower (single figure) response rates for probability-based surveys undertaken outside of the official statistical agencies, have raised questions as to whether random sampling from a sampling frame with unbiased coverage of the population of interest is sufficient to

[14] ACMA's estimate of the online population are derived from a survey conducted on Life in Australia™.

calculate a known probability of selection, and therefore design weights, which along with further post-stratification adjustments, make it possible to calculate the level of precision of the sample estimates with a known degree of confidence. As illustrated in a discussion paper by Wu (Survey Methodology, 2022, 257-283) model-based approaches that are not dependent on the strict assumptions of the frequentist design-based methodology are frequently being used to calculate the precision of estimates, as we have done in this study.

If these frequentist assumptions no longer apply to probability-based sample surveys, then it can no longer be claimed that probability-based sample surveys have inherently superior statistical properties than non-probability sample surveys. This is not to say, however, as we have already seen, that probability-based sample surveys do not have other desirable features not shared by non-probability sample surveys such as the very important attribute of random selection and, typically, much better coverage of the population.

10.3 Non-response and non-response errors

The degree of the non-response that occurs in probability-based sample surveys can be readily calculated. Even when a survey is of members of a probability-based panel, such calculations are easy to make and are the product of the response rate that was achieved when building the panel, the retention rate within the panel, and the completion rate for the questionnaire for which panel members were sampled (Callegaro & DiSogra, 2008). For probability sample surveys, including those conducted within a probability panel, a number of approaches can be pursued to estimate the extent of non-response bias. This also is a function of the nature of the non-response that occurred when building the panel, the non-response from panel attrition, and the nature of the non-response that occurred within the sample/panel for a particular questionnaire. The four probability-based surveys that were conducted as part of this study encountered a very high level of unit non-response with the CATI and Life in Australia™ surveys both having considerably higher rates of non-response than was the case in 2015. The AAPOR response rates for the probability-based sample surveys in the OPBS+ study are DFRDD CATI (17.9% RR3) and Life in Australia™ (12.1% Cumulative Response Rate 2) as compared to 7.7 per cent and 5.6 per cent, respectively, in the ACSSM. The response rates for the other two ACSSM probability-based surveys are lower still (SMS push-to-web, 4.0%; VALI, 1.0%).

For the non-probability online panel surveys, it is essentially impossible to compute a response rate for the time when the panel was established. That is

because it is not known how many persons were exposed to invitations to join the panel. It is commonly understood, however, that far less than one per cent of all persons who were exposed to invitations to join a non-probability panel end up joining (Tourangeau et al., 2013, 42). Although a completion rate can sometimes be calculated for non-probability panel surveys, this rate does not account for the 'response rate' that was experienced when the panel was established or for the attrition rate that occurred during the life of the panel. As such, with opt-in non-probability panel surveys, there is no well-accepted scientific approach to account for the amount or nature of the non-response biases that may have occurred for a given survey.

On this basis, in addition to the large amount of non-coverage associated with non-probability online panel surveys, they also have an appreciably (non-ignorably) higher level of non-response than do probability sample surveys, even when allowing for the very large decline in response rates for probability-based sample surveys. The much greater amount of non-response for non-probability panel surveys, compared to surveys using probability samples, occurs at the stages when the panels are built, during the lifetime of the panel (i.e., panel attrition), and each time that panellists are invited to complete a questionnaire. The latter form of non-response can occur due to problems associated with the contact information of panellists when email invitations to complete a questionnaire are sent out and with gaining cooperation from contacted panellists (see Callegaro et al., 2015, 132–135). Although a considerable amount of non-response in probability samples occurs when contact is first made with sample members, this amount is small when compared to that which occurs in the recruitment of non-probability panels. Non-response at the retention and questionnaire-completion stages within probability samples and probability panel surveys is also far less than with non-probability samples and non-probability panel surveys. Differential non-response, which is one of the two primary mechanisms that makes non-response bias possible, is likely to be more of a problem with non-probability surveys than with probability surveys. For example, little or no effort is made in non-probability panels to try to motivate ongoing cooperation among those exposed to the initial recruitment invitation for a particular questionnaire or among those who join but attrite from the panel. In contrast, with probability samples/panels, considerable resources are typically committed to counter differential non-response in an effort to minimise its effects on non-response biases. Therefore, in the case of the probability sample surveys in our study, differential non-response bias is likely less of a contributing factor to bias than is the

case for non-probability online panel surveys.

10.4 Weighting and adjustment errors

Identical weighting schemes were applied to all of the ACSSM surveys, so the use of different weighting schemes is not a contributing factor to the differences in the amount of bias observed. The fact that the non-probability sample surveys applied quotas (with varying degrees of enforcement) to control the distribution of their samples, should, however, mean that the bias reduction for the variables used in quotas should be less for the non-probability panel surveys than it is for the probability-based sample surveys. Evidence for this is provided in

Figure 2 (see p.27, this report).

In line with the effects noted in most previous research in this field, weighting, on average, reduced the bias, albeit only marginally, for the substantive variables measured by probability-based sample surveys, whereas weighting had a negligible effect on the accuracy of the estimates produced by the non-probability online panel surveys and, in the case of Panel 3, increased the amount of bias for the substantive outcome variables by 9.3 per cent.

10.5 Measurement errors

Apart from some very slight adjustments to accommodate the different modes of data collection, the questions used in the eight ACSSM surveys were almost identical. As a result, there is little reason to expect any differential questionnaire-related measurement error across the eight surveys.

There is, however, the prospect of differential respondent-, interviewer- and mode-related measurement errors across the surveys.

As was the case with this study, it is common for surveys that are based on probability samples for considerable care to be given to data quality. This includes attention to interviewer training and monitoring when using interviewer-administered data collection. Despite this, the two interviewer-administered surveys are likely affected by a combination of interviewer and respondent errors.

The interviewer-administered modes are more likely to generate social desirability bias, especially when sensitive questions are asked, than are self-administered modes (Kreuter et al., 2008).

Respondents and interviewers also may contribute to measurement error in the form of recency effects, where response alternatives that are heard most recently by the respondent are more likely to be chosen than those heard earlier (Holbrook, 2008). However, in self-administered data collection, primacy effects are more of a problem, where answers read first by the respondent (i.e., at the beginning of a list of response choices) are more likely to be chosen than

those at the end of the list of choices (Scanlan, 2008).

The fact that Life in Australia™ uses a mixed mode of data collection – overwhelmingly CAWI but with a small component of CATI to enable the participation of offline panellists, almost certainly leads to a small amount of differential measurement error, not present in the other surveys, due to combining data from the different data collection modes. This is a disadvantage of mixed-mode data collection.

Another measurement error that may affect panel surveys, but not one-off surveys, is panel conditioning. The concern is that repeated interviewing over time may change panellists' attitudes and the way in which they respond to survey questions in a way that is detrimental to data quality. Research has found both harmful and beneficial data quality effects arising from panel conditioning (Amaya et al., 2021; Clinton, 2000; Pennay et al., 2023) and it is difficult to know whether probability-based online panels or non-probability online panels would be differentially affected. On the one hand, the higher retention rates achieved by probability-based online panels would result in a higher proportion of panellists being long-term panellists, increasing the potential impact of panel conditioning. On the other hand, members of non-probability online panels are generally interviewed more frequently than members of probability-based online panels, and are often members of multiple panels, increasing the potential for panel conditioning.

One final emerging measurement error and one that is particular concern to non-probability online panels given their opt-in nature, is the threat posed by fraudulent survey data generated by survey bots. A recent US study undertaken by the Pew Research Center found that the various measures they put in place to detect bogus responding from survey bots classified between 3 and 7 per cent of responses across the various opt-in online panels as bogus compared with 1 per cent of responses for a survey conducted on an address-based sample (Kennedy et al., 2020).

Finally, previous research shows that members of general population non-probability online panels, as a group, are more likely to generate certain respondent-related measurement errors than are respondents to probability-based sample surveys (see, Baker et al., 2014; Greszki et al., 2014; Hillygus et al., 2014). To try and combat this, our non-probability panel providers exercised what have become standard practices for them and took steps to exclude 'poor quality' responses from the final data. These steps include removing 'straight-liners,' removing 'junk'/poor quality responses to open ended questions, and removing speeders (as variously defined by the panel providers). The effectiveness

of these steps in improving overall data quality is not known.

10.6 The special case of the VALI survey

A separate evaluation report of the experimental VALI survey is to be prepared, so just a few summary comments are provided below.

The two-stage recruitment process used for the VALI survey, which involved seeking consent to being interviewed via video-conferencing prior to issuing a survey invitation, resulted in a very pronounced self-selection bias towards panellists with university (i.e., bachelor's degree and above) qualifications (see Figure 2). While post-stratification to educational attainment benchmarks re-aligned the VALI estimates on this characteristic to those of the population, this came at the cost of introducing more variance into the VALI estimates. This is reflected in the relatively high RMSE for VALI of 3.4pp, the highest of the probability-based survey methods and higher or on a par with all but one of the non-probability online panels.

As an interviewer-administered mode of data collection, there is scope for interviewer-related measurement error being present in the VALI data, as is the case for the CATI survey and for a small proportion of Life in Australia™ interviews. For VALI, the potential for interviewer and respondent-related measurement error may be greater than the other interviewer-administered modes in this study, given that, for VALI, the interviewer and respondent are visible to each other and also because both parties were unfamiliar with the format.

Despite initially thinking that the Life in Australia™ panel would prove to be a good platform for VALI, given the extensive relationship that exists between the panellists and the Social Research Centre, ultimately this turned out not to be the case. Although the findings from a round of interviewer and respondent de-briefing interviews showed that VALI generally works very well and is well-received, panellists' post-survey preference was still for CAWI.[15] Respondents see little added value in VALI and identify an increased respondent burden due to the need to set and keep appointments and to be 'seen' by the interviewer. It was felt that VALI interviews warrant a higher incentive payment to respondents.

This experiment showed VALI is a viable alternative data collection mode. Its best use is probably as an alternative to face-to-face data collection in situations where

[15] The de-briefing interviews were conducted by Philip Carmo of the ABS.

there is an established relationship with respondents, e.g., subsequent waves of a longitudinal survey program.

10.7 Overall assessment

A summary of what the ACSSM tells us about these comparative/complementary/competing survey methodologies is now provided.

10.7.1 Accuracy

Overall, the CATI and Life in Australia™ surveys produced the most accurate results, followed by Panel 3, SMS push-to-web, VALI, and Panels 1, 2, and 4, with Panel 1 generally showing the largest biases. As previously noted, Panel 3 reportedly used outbound CATI as one of its recruitment methods, but whether this contributed to their superior accuracy is not known. The finding that non-probability online panels sometimes produce results that are more accurate than those produced by probability-based sample surveys, while not common, is consistent with findings reported by the Pew Research Center (Kennedy et al., 2016).

One dimension of accuracy that does consistently favour probability-based sample surveys over non-probability online panels is that probability-based sample surveys routinely produce more consistent (i.e., less variable) results than non-probability online panel surveys.

The historical comparisons presented in this paper were limited to CATI, Life in Australia™ and the three non-probability panel providers used in both studies and to a common set of variables. On average, there was a reduction in AAB for the three survey methods for the measures common to all surveys over time. In 2015, Life in Australia™ produced estimates for these variables that had, on average, 2.0pp less error than the equivalent non-probability online panel estimates, on average. This gap shrank to 0.9pp for the same comparison in 2022. The largest AAB across the surveys over time decreased from 7.9pp to 4.3pp for CATI and from 12.4pp to 7.9pp for Life in Australia™ and from 16.5pp to 9.0pp for the non-probability online panels, on average.

Based on the limited data available to us, we find that the gap between probability-based sample surveys and non-probability online panels has narrowed since 2015.

10.7.2 Survey costs and survey quality

The substantial cost differential between probability-based sample surveys and non-probability online panels is harder to justify in 2022 than it was in 2015. Of the probability-based surveys tested, the probability-based online panel (Life in Australia™) emerges as best value for money for survey researchers placing a premium on generating the most accurate estimates.

Ultimately, those who commission or undertake surveys must decide which survey method is fit for their specific

purpose. This study shows that non-probability online sample surveys are much cheaper and somewhat quicker than probability-based sample alternatives and that the accuracy advantage enjoyed by probability-based sample surveys over non-probability panel surveys may have narrowed.

On balance, bearing in mind all aspects of data quality (Section 9) and survey error (this section), it still does seem to be the case that if one wishes to generalise from a sample to an inferential population, that probability-based sample surveys, undertaken by a reputable provider committed to a high-level of transparency, allow one to do so with more confidence than do non-probability online panel surveys, on average. It is also true, however, that those who commission survey research are continuing to find the price premium required to undertake probability-based sample surveys too high.

11 Limitations of the study

11.1 Sample size

Due to the self-funded nature of the ACSSM and the desire to cover a range of methods, sample sizes were relatively small. This impacts sampling error for the probability samples. Although sampling error is not applicable to non-probability samples (see, e.g., Baker et al., 2013), similar concerns apply to our ability to generalise to the broader universe of non-probability online panels from the non-probability samples used in the ACSSM.[16]

11.2 Generalisability

The ACSSM and similar comparative studies have a different focus to normal surveys. Estimands from a normal survey are intended to generalise to a specific population (e.g., Australian residents over 18 years) for the constructs measured in the survey; the difference between survey estimates and the true value of each construct measured for the population of interest is survey error. By contrast, estimands from a comparative study like the ACSSM are intended to generalise about the cost and error properties of a population of *surveys* that are, were or might be fielded. This has impacts on how we think of the limitations of the design.

11.2.1 What sampling frames and modes does the ACSSM generalise to?

The ACSSM does not speak to all types of surveys. Methods not covered in the ACSSM that are in use in Australia include address-based sampling with push-to-web, face-to-face surveys (although these are becoming less common; see, e.g., increasing use of mixed-mode by the ABS) and IVR telephone surveys. CATI surveys of landline sample are likely to be very rare due to rapid declines in landline usage; thus, the omission of landline CATI from the ACSSM is unlikely to limit its utility.

Although we did not use the Integrated Public Number Database (IPND) as a sampling frame for CATI surveys, ACSSM results for Mobile RDD CATI are likely to apply to IPND CATI surveys as well, as, based on our experience, there are minimal differences (Phillips et al., 2022).[17] The primary advantage offered

[16] Comparative studies may be an exception to the rule that inferential statistics are not applicable to non-probability samples, as inference is to the population of non-probability samples rather than, e.g., Australian adults.

[17] The IPND is a sampling frame which provides postcodes for mobile numbers that is available for Commonwealth public policy, public health and Federal, state and local government electoral matters (ACMA, 2022).

by the IPND is the ability to sample local areas.

Findings from the ACSSM CATI surveys cannot be generalised to CATI surveys using listed sample. Listed sample surveys of the general population are further from benchmark values than are RDD surveys but cost less.

Other more novel data collection approaches are also not addressed in the ACSSM. We did not trial the use of chat bots, use of sensors on mobile devices, or SMS surveys (where the mode of interview is the SMS), for instance.

11.2.2 How well does the ACSSM generalise to other implementations of the included methods?

VALI

VALI is an emerging mode of data collection, making it difficult to generalise about other implementations. Broadly speaking, the following points should be borne in mind when evaluating the generalisability of findings from the ACSSM to other implementations of VALI (see Schober et al., 2020 for a useful listing of design considerations):

- Is the sample cross-sectional or longitudinal? Early findings from other research indicates that VALI can struggle with cross-sectional sample and seems to be work better in a longitudinal context, like Life in Australia™, where there is a pre-existing relationship between the survey research organisation and the respondents.
- Is VALI the sole data collection mode or is part of a sequential multi-mode design? Due to the expense of VALI (see previous discussion of cost), it may be reserved for use after less expensive alternatives (e.g., push-to-web) have been exhausted. In the present case, VALI was the sole data collection mode.

Other potential limitations of generalisations from VALI are the fact that the ACSSM was the first time the Social Research Centre had conducted VALI. This lack of prior experience with VALI is, oddly enough, more likely to enhance than detract from generalisability to other contemporary implementations because no survey research organisation globally has extensive experience with VALI, due to it being a very recently developed mode of data collection. Over the longer term, the degree to which the ACSSM findings can be generalised is likely to be compromised by advances in the field, as organisations gain more experience with VALI and best practices are emerge. See, e.g., the development of norms of data collection from mobile phones (Lavrakas et al., 2010) and as interviewers gain experience in administering questionnaires using VALI.

Life in Australia™

Life in Australia™ is currently Australia's only probability-based online panel, beside developmental work conducted by

the ANU Centre for Social Research & Methods (Hahn, 2022). Any future Australian probability-based online panels are likely to differ from Life in Australia™ with respect to some of the methods used for recruiting panellists and the many decisions that must be made about how the panel operates. Much of the way Life in Australia™ was designed was informed by the manner the GESIS Panel and the Pew Research Center's American Trends Panel operated circa 2015. Elements of this include discrete monthly waves, incentives paid each wave rather than a points-based system, and the use of an alternative data collection mode to accommodate offline panellists.

Looking internationally to other probability-based online panels, Life in Australia™ is unusual in several aspects:

- Use of CATI for interviewing offline panellists. Generally, members of the offline population are either unable to join or are given a device with internet access to enable them to complete questionnaires. It should be noted, however, that the offline fraction of interviews in the ACSSM (4.8%) is small and therefore unlikely to have a large impact on results.
- Use of CATI for reminders. It is extremely rare for panels to use CATI for reminders. This is unlikely, however, to have much of an impact on results.
- Use of a wide variety of sampling frames and invitation modes for recruitment (RDD CATI, A-BS push-to-web and CATI, RDD IVR, RDD SMS push-to-web). Most panellists in the ACSSM (93%) were, however, recruited via either RDD CATI (29%) or A-BS push-to-web (64%). Life in Australia™ mirrors US panels' similar evolution for RDD CATI to A-BS push-to-web. The number of surveys completed by panellists recruited via IVR and SMS push-to-web is low and unlikely to harm the ability to generalise to other probability panels recruited via RDD CATI and A-BS push-to-web approaches.

Readers will need to draw their own conclusions about the generalisability of the results based on the degree to which the manner of operation of Life in Australia™ differs to other panels of interest.

CATI

The performance of CATI from a cost and potentially quality perspective is potentially affected by a host of decisions made as to whether a pre-notification SMS is sent, the call cycle (number of calls, intervals between calls, time of day of calls), use of an autodialler and autodialler settings and recruitment, training, retention and supervision of

interviewers.[18] However, the similarity in the responses between the high- and low-effort arms (refer back to Section 0) suggests that findings should be generalisable across a reasonable range of these settings. Caution should, however, be exercised at generalising from the ACSSM to cross-sectional studies using a far higher number of call-backs, noting that any such survey would be extremely expensive to conduct; we are not aware of any such surveys being fielded in Australia nowadays.

SMS push-to-web

SMS push-to-web with RDD sample is in limited use in Australia (Hahn, 2022; Kocar, 2022), which makes it difficult to understand the degree to which the ACSSM may be generalisable to other implementations.[19] Due to the limitations inherent to SMS: messages must be short, both due to social expectations and the fact that SMS providers charge based on length.

Non-probability panels

The ACSSM's use of non-probability panels does not replicate all possible approaches used in non-probability panels. This potentially limits the generalisability of results, although care was taken to include multiple non-probability panels to be able to provide some evidence of the degree of variability between panels.

The ACSSM instructed panels to use soft quotas. Clients may require hard quotas, forcing panels to supply completed surveys in proportion to the client's quota scheme. This will increase cost but may reduce bias, although supporting evidence for the efficacy of quotas is limited. A moderate degree of caution is required when generalising the ACSSM's findings to studies using hard quotas.

In many cases, panels will share sample. For large samples, repeated cross-sectional studies with re-contact restrictions, studies focused on low incidence or hard-to-reach populations or studies with hard quotas, panels may need to supplement their own panellists with those from other panels. This was not the case for the ACSSM, where panels were able to fulfil study requirements using only their own panellists. Given the poor performance of non-probability panels in comparative studies, there is little reason to believe that sharing sample will meaningfully reduce total survey error.

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[18] Most firms conducting CATI interviews in Australia are ADIA members and pay interviewers the same rates, removing this as a potential variable.

[19] There is more non-RDD use of SMS for survey invitations. For example, the Victorian government surveyed recipients of the COVID-19 vaccine via SMS survey. As there was a very clear nexus between a specific event (vaccination) and survey, the context is very different from an RDD survey invitation that comes 'out of the blue' without warning.

The selection criteria used for non-probability panels in the ACSSM (see Section 0, p. 17), with a strong focus on ISO certification, membership in industry bodies and answering ESOMAR questions, means that the panels selected represent the middle to top tier of the market. If there is a bias from this focus, it would tend to overstate the accuracy of the broader population of non-probability panels.

Although individual non-probability panels claim unique features that distinguish them from their competitors, it is not clear to what extent these claims of uniqueness hold up to scrutiny and – to the extent that they do – that they reduce total survey error. We address this point because meaningful quality distinctions between panels would tend to lessen the ACSSM's generalisability; on the other hand, if panels are a fungible commodity, the ACSSM's findings should be more easily generalisable. The material received from non-probability panels in the course of the ACSSM is free of the kind of supporting methodological detail that we usually expect to see in survey research.[20] This is not a new observation. Callegaro et al. (2014, 6) note that 'Companies that created nonprobability panels tend to be secretive about the specifics of their recruiting methods, perhaps believing that their methods provide them a competitive advantage (Baker et al., 2010). For this reason, there are few published sources to rely on when describing recruitment methods.' The international comparative literature casts a harsh light on claims of uniqueness, as – although there is indeed panel-to-panel variation – whatever unique attributes panels have nevertheless seem to fail to bring them to the same level as probability samples with respect to total survey error. Supporting the contention that non-probability panels are – to a large degree – fungible, is the nature of the market. As indicated by the very low cost of research on non-probability panels, it is highly cost-competitive and unlikely to support product differentiation. Moreover, the exchange of sample between panels indicate that in deeds – if not in words – panels themselves believe their samples are fungible.

One possible exception to the above is YouGov. The panel's Chief Scientist has articulated a principled approach to non-probability sample selection (Rivers, 2007) and the panel was an early user of multi-level regression with poststratification (MRP) in political polling (Bailey & Rivers,

[20] An example of meaningful supporting detail was Panel 3's description of their practice of only sending incentives by physical mail and the resulting benefits in reducing the likelihood of fraud. By contrast, most descriptions were very broad and lacking specific detail (e.g., vague references to 'affiliate networks' in recruitment).

2020). It also has had notable success in calling elections (YouGov, 2022) and in a Pew Research Center comparative study, where it was more accurate across a range of benchmarks than the Pew Research Center's own probability-based online panel (Kennedy et al., 2016; Rivers, 2016). The extent to which YouGov's unique approach is adopted by YouGov in Australia is unclear. There have been notable departures in Australia from its global norms, such as using IVR alongside non-probability sample in election polling (White, 2019 cited in Pennay et al., 2020). YouGov has made limited use of MRP in Australia, with most Australian YouGov polls not using this method (YouGov, 2023), despite the notable success when doing so, of correctly calling in advance the Treasurer's loss of his blue-ribbon Liberal seat (see, e.g., Maiden, 2022). This suggests that, although YouGov may offer superior performance in the United Kingdom and the US, the same may not apply in Australia, outside of surveys using MRP. ACSSM findings may therefore generalise to non-MRP YouGov surveys fielded in Australia.

The ACSSM exclusively uses commercial non-probability panels. Different response dynamics are likely for volunteer panels that do not offer incentives, such as the ABC's (2021) Australia Talks survey and the University of Tasmania's (n.d.) Tasmania Project or cross-sectional volunteer samples like smartvote (ANU, n.d.). Results from the ACSSM cannot be generalised to such panels or cross-sectional samples.

11.2.3 How well does the ACSSM generalise internationally?

The findings of previous comparative studies of probability and non-probability samples across Australia, Canada, Europe, and the US have broadly been consistent in indicating the inferiority of non-probability samples and the failure of weighting to remediate bias (Cornesse et al., 2020, Table 1), suggesting that findings from the ACSSM are likely to generalise to at least these societies and, likely, others of similar ilk where, to the best of our knowledge, no comparative studies have been conducted (e.g., Israel, New Zealand).

With that said, some elements of potential difference between Australia and other nations should be borne in mind:

- The legal environment regarding the use of SMS and autodiallers notably differs from the US, where these are restricted by the Telephone Consumer Protection Act (47 U.S.C. § 227) (Ballon et al., 2021). Sending SMS messages and the use of an autodialler for mobile sample without prior consent is legal in Australia, without the need to use workarounds (e.g., manually sending SMS). This impacts SMS push-to-web. Although the CATI surveys did send an advance SMS, there is no consistent evidence

showing the impact of such an SMS on the characteristics of the achieved sample of respondents (Dal Grande et al., 2016; Pennay et al., 2016).

- Unlike some European countries, Australia does not have population registries that are accessible for use in sampling.[21]
- Due to the lack of a single dominant non-English language in Australia (c.f. Spanish in the US), all modes were fielded in English only.
- In general, use of face-to-face modes of interview is less common in Australia than the US and Europe. This reflects Australia's low population density, which makes face-to-face interviewing outside of capital cities extremely expensive.

11.2.4 What topics do the findings from the ACCSM generalise to?

A comparative study focused on benchmarks will necessarily be focused on the available benchmarks. The ACSSM is therefore focused on topics primarily found in ABS products. Although we attempted to include a broad range of topic areas, attitudinal questions are relatively under-represented in the questionnaire due to the focus of most ABS surveys on collecting information on behaviours and characteristics of individuals, families, households and dwellings.

11.3 Comparisons between the ACSSM and OPBS+

The fact that both the OPBS and the ACSSM were designed to evaluate contemporary approaches to survey research is, necessarily, a factor that limits direct comparisons between the two studies.

As previously discussed, the foremost limitation of the historical comparative analysis is that it is limited to only seven directly comparable variables common to both studies. Clearly, this is too few from which to draw firm conclusions as to the general performance of the various survey methods over time. Again, as previously noted, it is possible, although unlikely given the range of variables that have been tested in the various similar comparative studies around the world, that another set of variables would yield different results. The findings of previous

[21] There are analogues to population registries in Australia: the electoral roll (under the control of the AEC) and the Medicare database (under the control of Services Australia). While neither have full coverage of the population, they have still have very high coverage rates. Access for research is, however, limited. The electoral commission has increasingly scrutinised applications and the Medicare database generally requires consent of individuals before passing contact information to researchers, which likely increases non-response error.

surveys summarised by Cornesse et al. (2020) and the large replication study by MacInnis et al. (2018) provide us with confidence that cautious generalisations can be made from our findings with respect to the relative performance of probability-based sample surveys and non-probability online panel surveys in 2015 and 2022.

Comparisons of the relative performance of the standalone CATI surveys included in the OPBS and ACSSM also require some caution. Both studies used methods contemporary to their time, which means that differences in their conduct need to be borne in mind. These differences include the transition from DFRDD in 2015 to the use of a mobile RDD frame in 2022. Approaches to survey weighting also evolved over this period. That said, while the approaches adopted for the CATI surveys are different, it is nonetheless possible to compare the bias and variance of these two approaches as examples of 'typical' CATI surveys for their time.

Some context is also needed when comparing the relative accuracy of the survey estimates generated by Life in Australia™ over time. The OPBS replication study (undertaken in January 2017) was just the second survey conducted on the then new Life in Australia™ panel. Recruitment was undertaken in November 2016 using a DFRDD sampling frame with a 30:70 landline to mobile phone split resulting in 3,203 panellists. The ACSSM was conducted in December 2022 drawn from a much larger pool of Life in Australia™ panellists (*n*=7,396) with the panel having been replenished using a variety of different methods and the proportion of offline panellist completing via the telephone having about halved.

When comparing the performance of the non-probability online panels over time it is necessary to consider, but hard to know, weather the panel providers are using the same or different recruitment methods and avenues from which to source panellists. It is also important to note that only three of the four panels used in the OPBS were also used in ACSSM.

12 Concluding remarks and next steps

This study shows that non-probability online sample surveys are much cheaper and quicker and generally less accurate, but sometimes only slightly so, than the probability-based alternatives. There is also evidence to suggest that the accuracy gap in favour of probability-based sample surveys over the non-probability online panel surveys may have narrowed.

Despite this narrowing of the accuracy gap in favour of probability sample surveys over non-probability online panel surveys, it is still the case that the estimates produced by probability-based sample surveys are generally less variable that those produced by non-probability online panel surveys. This, along with the greater methodological disclosure generally associated with probability-based sample surveys, provides survey researchers with grounds to be more confident in the results generated from probability-based sample surveys than those generated from non-probability online panels.

An important problem persists for those choosing to fund non-probability sample surveys in that, for any given survey, or any given items within a survey, researchers have a less firm basis from which they can confidently assert the accuracy and generalisability of their results than if the same questionnaire had been administered to a probability-based sample. Nor will they have the same degree of confidence as to whether they should be using weighted or unweighted data.

It still does seem to be the case that if one wishes to generalise from a sample to the inferential population, that probability-based sample surveys allow one to do so more accurately and with much more confidence than do non-probability online panel surveys. Increasingly, however, those who commission survey research are deciding that such confidence comes at a price they are not prepared to pay, particularly if there is a chance that less expensive approaches may only be slightly less accurate (but could be considerably less accurate).

There are many issues arising from the ACSSM study left to explore. For this reason, and in the interests of transparency, the Technical Report from the study, the data file, and all explanatory documentation will be lodged with the Australian Data Archive. Once lodged, these will be made available to researchers via an application process and subject to Australian laws governing privacy and confidentiality.

Among the issues left to explore include the following:

- Can survey-specific optimal weighting reduce the bias in the estimates generated from the probability and non-probability samples used in this

study without unduly added to the variance?

- Can blending and calibration improve the estimates generated from the non-probability online panel surveys?
- Are there discernible differences in the amount of measurement error in responses provided by panellists when responding in probability-based and non-probability sample surveys as measured by metrics such as speeding, straight-lining, satisficing, use of non-substantive response options, and non sequiturs in verbatim responses?
- Are there differences in the multivariate relationships within and across sampling frames?
- Are the motivations of survey respondents recruited through different modes and via different sampling frames different and how, if at all, re these differences associated with variations in data quality?

We conclude with a plea for transparency, especially about the recruiting and sampling practices used by non-probability panel providers. Methodological disclosure can only enhance the credibility of the method overall and may lead to methodological insights that further improve the accuracy of the estimates generated from such panels. If this happens survey researchers may be able to use non-probability online panels with more confidence.

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Appendix 1: Questionnaire

Sample field name	Description	Values
s_ORDER	Flag order of selected code frames	1=Normal 2=Reverse
PREFERRED_INCENTIVE	Incentive chosen	Blank for all Life in Australia™ and updated once completed
PREFERRED_CHARITY	Charity chosen	Blank for all Life in Australia™ and updated once completed
s_MODE	Survey mode	1=CATI 2=Online 3=VALI
s_METHOD	Frame and mode of invitation/administration	1=Life in Australia™ CATI 2=Life in Australia™ CAWI 3=Life in Australia™ VALI 4=NP CAWI 5=RDD CATI 6=RDD SMS P2W
s_ASKVOTE	Flag for whether or not to ask vote in 2022 Federal election. Will not re-ask Life in Australia™ panellists with valid answers	1=Ask vote question 2=Do not ask vote question
d_EDUCATION	Highest educational qualification for Life in Australia™ panellists	
p_AGE	Age in single years for Life in Australia™ panellists	
p_AGE_GROUP	Age group for Life in Australia™ panellists	
p_GENDER	Gender for Life in Australia™ panellists	
p_COB	Country of birth for Life in Australia™ panellists	

GENERAL PROGRAMMING INSTRUCTIONS

***GENERAL PROGRAMMER NOTES**

*If online: for most questions, 'not sure' (and similar) will only be shown when a question is left unanswered, on a second screen (see other Life in Australia™ projects). For a few other questions 'not sure' (and similar) will be shown straight away. To show which option applies, it will say either (NS ON REPEAT SCREEN) or (NS SHOWN).

*Please display all don't know/not sure codes below the main code frame with an empty row in between and in grey. When in a grid, please display don't know/not sure in the last columns, in grey.

[PROGRAMMER NOTE: FOR ALL QUESTIONS, PLEASE HIDE CODE 98 AND 99 FOR ONLINE (INTERVIEWMODE=WEB). THEN, IF SKIPPED, DISPLAY AS A POP UP WITH THE MESSAGE: "You have not provided a response. Is that because you're not sure or you would prefer not to answer?"]

[PROGRAMMER NOTE: FOR GRIDS. MESSAGE TO DISPLAY: "You have not answered these questions. Is that because you're not sure or you would prefer not to answer?"]

[USE STANDARD CALL OUTCOMES LIST]
[USE STANDARD RR1 LIST]

*(PROGRAMMER NOTE: ALL QUESTION TEXT IN BLUE IS CATI+VALI ONLY, IN ORANGE IS WEB ONLY, GREEN IS VALI ONLY AND PURPLE IS CATI ONLY)

*(PROGRAMMER NOTE: SHOW ALL VALI INTERVIEWER INSTRUCTIONS IN RED)

*(ALL)
S_ORDER DUMMY VARIABLE, RANDOM ASSIGNMENT
1. Normal code frame order [50%]
2. Reverse code frame order [50%]

RDD CATI INTRODUCTION

*(s_METHOD=5, RDD CATI)
WELCOME SCREEN

TryCount: <TryCount>
Letter: <MailName>
EndQ: <EndQ>

*(s_METHOD=5, RDD CATI)
RDD_CATI_INTRO Good afternoon/evening my name is <SAY NAME> and I'm calling from the Social Research Centre, part of the Australian National University. You would have recently received an SMS about the 2022 Health and Wellbeing Survey, a short study on the lifestyles, health and wellbeing of Australians. Your telephone number has been chosen at random from all possible telephone numbers in Australia.

IF NECESSARY: Your telephone number has been chosen at random from all possible telephone numbers in Australia.

*(s_METHOD=5, RDD CATI)
RDD_CATI_AMFLAG Are you leaving an answering machine message?

1. No – Continue to introduction (GO TO RDD_CATI_INTRO1)
2. No message left
3. Yes – Left answering machine message (GO TO RDD_CATI_ANSM3)

*(s_METHOD=5, RDD CATI)

RDD_CATI_ANSM3 Good morning. My name is (…) from the Social Research Centre, part of the **Australian National University**. Getting in touch about the Life in Australia™ study. Sorry we missed you, we'll try again later. Please call 1800 023 040 to make an appointment or to opt out.

*(RDD_CATI_AMFLAG=1, NOT LEAVING ANSWERING MACHINE MESSAGE)

RDD_CATI_ALLOWMONITORING This call may be monitored or recorded for quality assurance purposes. Is that ok?

1. Yes
2. No

*(RDD_CATI_ALLOWMONITORING=1,2, DOES OR DOES NOT ALLOW RECORDING)

RDD_CATI_INTRO1 **(RE-INTRODUCE IF NECESSARY)** Good (…) My name is (…) from the Social Research Centre, part of the **Australian National University**. You would have recently received an SMS about the 2022 Health and Wellbeing Survey, a short study on the lifestyles, health and wellbeing of Australians and their use of technology. By participating in this research, your views and experiences will influence Australian researchers, policymakers, and academics.

IF NECESSARY: The primary focus of this research is on the health & wellbeing of Australians, however it will also form part of a larger academic project to determine the best means of obtaining a representative sample of the Australian population.

IF NECESSARY: Your telephone number has been chosen at random from all possible mobile telephone numbers in Australia.

For this survey, we are interested in talking to people aged 18 or over. Can I check, are you aged 18 years or over?

1. Yes
2. No (GO TO TERM4)
3. Refusal (ATTEMPT CONVERSION / RECORD REASON) (GO TO RR1)
4. Queried why mobile was called (POP UP RDD_CATI_TELINFO)
5. Language difficulty (GO TO LANG)

*(RDD_CATI_INTRO1=1, AGED 18+)

RDD_CATI_SAFE May I just check whether it is safe for you to take this call at the moment? If not, we'd be happy to call back when it is more convenient for you.

1. Safe to take call
2. Not safe to take call
3. Respondent refusal (GO TO RR1)

*(RDD_CATI_SAFE=2, NOT SAFE TO TAKE CALL)

RDD_CATI_MOBAPPT Do you want me to call you back on this number or would you prefer I call back on another phone?

1. This number (MAKE APPOINTMENT)
2. Home phone (MAKE APPOINTMENT, RECORD HOME PHONE NUMBER)
3. Respondent refusal (GO TO RR1)

*(RDD_CATI_SAFE=1, Safe to take call)
RDD_CATI_INTRO2 This interview should take around 10 to 15 minutes depending on your answers. I'll try and make it as quick as I can.

This survey is mainly about your experiences. There are no right or wrong answers. If I come to any question you prefer not to answer, just let me know and I'll skip over it. The survey is voluntary and you can withdraw at any point, or you may complete the rest of the interview at another time. All responses are completely confidential and your information is protected by Australian Privacy Laws.

Are you happy to continue?

1. Yes – Continue
2. Respondent refusal (ATTEMPT CONVERSION / RECORD REASON) (GO TO RR1)
3. Queried why phone number was called (POP UP RDD_CATI_TELINFO)
4. Language difficulty (GO TO LANG)

*(RDD_CATI_INTRO1=5 OR RDD_CATI_INTRO2=3, QUERIED WHY NUMBER WAS CALLED)
RDD_CATI_TELINFO Your telephone number has been chosen at random from all possible telephone numbers in Australia. We find that this is the best way to obtain a representative sample and to make sure we get opinions from a wide range of people.

*(PROGRAMMER NOTE: SNAPBACK TO PREVIOUS QUESTION)

LIFE IN AUSTRALIA™ CAWI INTRODUCTION

SPLASH SCREEN

*(s_METHOD=2, LIFE IN AUSTRALIA™ CAWI)

*(PROGRAMMER NOTE: DISPLAY Life in Australia™ LOGO IN TOP LEFT: Z:\Consulting\Jobs\L-Z\Life in Australia™\Branding and comms\Life in Australia™ Branding\Logo\For Dimensions

Life in Australia™ survey

Thank you for taking part in the current Life in Australia™ survey. The survey is being conducted by the Social Research Centre, part of the Australian National University.

[DISPLAY IF PREFERRED_INCENTIVE<>"Prefer not to receive reward"] To thank you for taking part in this survey, you will receive a $<amount> reward.

The survey should take no more than <length> minutes to complete and there are no right or wrong answers. Participation in this survey is voluntary and you can withdraw at any point.

If you don't wish to answer any question, you can just click 'Next' to move to the next question.

The information collected will be treated in strict confidence.

Please click 'Next' to start the questionnaire.

*(PROGRAMMER NOTE: DISPLAY THROUGHOUT THE SURVEY IN GREY SCALE)

For any queries, please call the Social Research Centre on 1800 023 040 or email LifeInAus@srcentre.com.au. You are able to stop the survey at any time by clicking save and return to complete it later. You can re-start the survey by clicking on the same link, it will take you to where you left.

SAVE SCREEN

*(S_METHOD = 2, 4, or 6, Life in Australia™ CAWI, NP CAWI or RDD SMS P2W and SAVE_SCREEN = 1)

Thanks for your time so far. Your answers have been saved. You can use your original survey link to return to the survey and continue from where you left off.

[PROGRAMMER NOTE: PLEASE INCLUDE 'PREVIOUS' BUTTON ON SAVE SCREEN]

LIFE IN AUSTRALIA™ CATI INTRODUCTION

*(s_METHOD=1, LIFE IN AUSTRALIA™ CATI)

WELCOME SCREEN
Name: <firstname>
PopulationTXT: <populationtxt>
EndQ: <EndQ>
Email outcome: <email_outcome>
Previous wave call outcome <PREV_WAVE_OUTCOME>

Good (…), my name is (…) from the Social Research Centre, part of the Australian National University. May I please speak with <title> <firstname> <surname>?

IF NECESSARY: <title, firstname, surname> is a participant in our Life in Australia™ study and today we are calling to follow-up on that.

*(s_METHOD=1, LIFE IN AUSTRALIA™ CATI)
LIFE IN AUSTRALIA™_CATI_AM_FLAG Are you leaving an answering machine message?

1. No – continue to introduction
2. No message left
3. Yes (Left answering machine 1 message) [DISPLAY IF SAMPLETYPE=LANDLINE]
4. Yes (Left mobile answering machine message) [DISPLAY IF SAMPLETYPE=MOBILE]

*(s_METHOD=1, LIFE IN AUSTRALIA™ CATI, AND SAMPLETYPE=LANDLINE)
LIFE IN AUSTRALIA™_CATI_ANSM1 Good morning. My name is (…) from the Social Research Centre, part of the **Australian National University**. Getting in touch about the Life in Australia™ study. Sorry we missed you, we'll try again later. Please call 1800 023 040 to make an appointment or to opt out.

*(s_METHOD=1, LIFE IN AUSTRALIA™ CATI AND SAMPLETYPE=MOBILE)
LIFE IN AUSTRALIA™_CATI_ANSM3 Good morning. My name is (…) from the Social Research Centre, part of the **Australian National University**. Getting in touch about the Life in Australia™ study. Sorry we missed you, we'll try again later. Please call 1800 023 040 to make an appointment or to opt out.

*(PROGRAMMER NOTE: IF LIFE IN AUSTRALIA™_CATI_AMFLAG=2 STOP AS ANSWERING MACHINE NO MESSAGE LEFT)

*(s_METHOD=1, LIFE IN AUSTRALIA™ CATI)

LIFE IN AUSTRALIA™_CATI_INTRO1 REINTRODUCE IF NECESSARY: Good (…), my name is (…) from the Social Research Centre, part of the Australian National University. Can I confirm I am speaking with <**TITLE> <FIRSTNAME> <SURNAME>?**

[DISPLAY IF POPULATION=1] You may recall we recently contacted you about the Life in Australia™ study and invited you to take part in the <month> survey.

[DISPLAY IF POPULATION=2] The reason I've called is to invite you to participate in the <month> Life in Australia™ survey.

This survey will only take <length> minutes. Participation in this survey is voluntary and you can withdraw at any point.

For completing this survey, you'll receive a $<amount> thank you or you can donate the same amount to one of our selected charities. This will be processed in the next few weeks.

All responses are completely confidential and your information is protected by Australian Privacy Laws.

(**IF NECESSARY:** We understand that some of the questions have been asked multiple times. We do this to make sure we collect the most up to date opinions and circumstances of our participants. This also helps us understand how views change over time. Please bear with us if you feel you're repeating yourself!)

[DISPLAY IF POPULATION=1] Would you be willing to help us out by completing the survey online?

[DISPLAY IF POPULATION=2] Would you be willing to help us out by completing the survey today?

1. Requested to do survey over the phone now
2. Wants to go online to do survey
3. Household refusal (ATTEMPT CONVERSION / RECORD REASON) (GO TO RR1)
4. Respondent refusal (ATTEMPT CONVERSION / RECORD REASON) (GO TO RR1)
5. Queried about how telephone number was obtained
6. Refused participation in Panel (GO TO TERM2)
7. Away from Panel (RECORD RETURN DATE) (GO TO AWAY)

*(LIFE IN AUSTRALIA™_CATI_INTRO1=5, QUERIED HOW TELNUM OBTAINED)

LIFE IN AUSTRALIA™_CATI_TELINFO <FIRSTNAME, SURNAME> is a participant in our Life in Australia™ study and today we are calling to conduct the <month> survey.

*(LIFE IN AUSTRALIA™_CATI_INTRO1=2, REQUESTED LINK TO COMPLETE ONLINE)

LIFE IN AUSTRALIA™_CATI_EC1 No problem, I can send you an email with the link to the survey. Can I please confirm your email address?

Email: <email>
First name: <firstname>
Surname: <surname>

1. Email address shown is correct [ONLY DISPLAY IF EMAIL IS NOT NULL]
2. Email address: [TEXT BOX FOR EMAIL]

*(PROGRAMMER NOTE: SHOW TERM1 AND FLAG AS TRANSFER_TO_WEB)
*(API KEY: 4F5403DFC9A24F460651645851A207F14F556CC4E2ED479F0D9EB4B051A2FA78)
*(PROGRAMMER NOTE: INSERT INTO V6 LIST: 738122)

*(LIFE IN AUSTRALIA™_CATI_INTRO1=7, REFUSED PARTICIPATION IN PANEL ONGOING)
LIFE IN AUSTRALIA™_CATI_QTERM3 What are the reasons why you have decided to leave the Life in Australia™ study?

INTERVIEWER NOTE: COLLECT AS MUCH INFORMATION AS POSSIBLE.

1. <verbatim text box> (GO TO QUAL)

*(LIFE IN AUSTRALIA™_CATI_INTRO1=7, REFUSED PARTICIPATION IN PANEL ONGOING)
LIFE IN AUSTRALIA™_CATI_QUAL Thanks for being part of Life in Australia™, your contribution has been greatly appreciated.

From time to time, the Social Research Centre conducts paid focus groups, in-depth interviews over the phone or in-person, and online discussion boards. The payment is generally between $50-$100.

Would you be interested in occasionally being invited to take part in this type of research?

1. Yes
2. No

*(LIFE IN AUSTRALIA™_CATI_INTRO1=7, AWAY)
LIFE IN AUSTRALIA™_CATI_AWAY No worries, remember you can either participate online or over the phone. When will you be able to take part again?

1. Enter date: DD MM YYYY (GO TO TERM2)
2. (Refused) (GO TO TERM2)

*(LIFE IN AUSTRALIA™_CATI_INTRO1=1, DO SURVEY OVER THE PHONE)
LIFE IN AUSTRALIA™_CATI_PRESAFE (INTERVIEWER: Are you calling a mobile number?)

1. Yes
2. No

*(LIFE IN AUSTRALIA™_CATI_PRESAFE=1, CALLING MOBILE NUMBER)
LIFE IN AUSTRALIA™_CATI_SAFE1 May I just check whether it is safe for you to take this call at the moment? If not, we'd be happy to call back when it is more convenient for you.

1. Safe to take call
2. Not safe to take call
3. (Respondent refusal)

*(LIFE IN AUSTRALIA™_CATI_SAFE1=2, NOT SAFE)
LIFE IN AUSTRALIA™_CATI_MOBAPPT Do you want me to call you back on this number or would you prefer I call back on another phone?

1. This number (MAKE APPOINTMENT)
2. Alternative number (MAKE APPOINTMENT)

*(LIFE IN AUSTRALIA™_SAFE1=1, SAFE TO TAKE CALL)
LIFE IN AUSTRALIA™_CATI_ALLOWMONITORING This call may be monitored or recorded for quality assurance purposes. Is that ok?

1. Yes
2. No

*[TIMESTAMP]

NONPROBABILITY ONLINE INTRODUCTION

*(s_METHOD=4, NP CAWI)
NP_INTRO Welcome to the 2022 Society and Health Survey.

The survey is being conducted by the Social Research Centre, part of the Australian National University.

The survey should take no more than 10 minutes to complete and there are no right or wrong answers. Participation in this survey is voluntary and you can withdraw at any point. The information collected will be treated in strict confidence.

*(PROGRAMMER NOTE: DISPLAY THROUGH OUT THE SURVEY IN GREY SCALE)
For any queries, please call the Social Research Centre on 1800 023 040 or email SHS2022@srcentre.com.au. You are able to stop the survey at any time and return to complete it later. When you re-start the survey, using the same log in details / link, it will take you to where you left.

VALI INTRO

*(s_METHOD=3, Life in Australia™ VALI)

WELCOME_VALI
Good (…), my name is (…). Can I confirm I am speaking with **<TITLE> <FIRSTNAME> <SURNAME>?**
(INTERVIEWER: START SURVEY TO CODE OF NO SHOW)

*(s_METHOD=3, Life in Australia™ VALI)
LIFE IN AUSTRALIA™_VALI_PREINTRO Information for video-assisted live interview.

Good (…), my name is (…). Can I confirm I am speaking with **<TITLE> <FIRSTNAME> <SURNAME>?**

Thank you very much for agreeing to participate in a Life in Australia™ video interview.

Video link:	<link>
Contact number:	<phone number>
Email address:	<email>
Name:	<title> <firstname> <surname>

Did <firstname> <surname> join the meeting within 5 minutes of the scheduled start time?

* INTERVIEWER NOTE: select option 3 after 5 minutes if there is an appointment booked after this timeslot, e.g. If this is a 10am appointment and you have an appointment at 10:30am

1. Yes
2. No (wait another 5 minutes)
3. No (terminate the meeting)

*(LIFE IN AUSTRALIA™_VALI_PREINTRO=2 AND SAMPLETYPE=MOBILE, PANELLIST DIDN'T JOIN MEETING AND MOBILE NUMBER)
LIFE IN AUSTRALIA™_VALI_REM_SMS

*PROGRAMMER: TRIGGER SMS SEND ON V6
*(PROGRAMMER NOTE: Insert into V6 list: 738123)

We're waiting for you on your Life in Australia™ video call on Teams. To join in next 5 mins, use the link we sent you. To reschedule, go to <link>. For help or to opt out 1800 083 037.

*(LIFE IN AUSTRALIA™_VALI_PREINTRO=3 AND SAMPLETYPE=MOBILE, PANELLIST DIDN'T JOIN MEETING AND MOBILE NUMBER)
LIFE IN AUSTRALIA™_VALI_REM_SMS

*PROGRAMMER: TRIGGER SMS SEND ON V6
*(PROGRAMMER NOTE: Insert into V6 list: 739036)

Sorry we missed you for your Life in Australia™ video call on Teams. To reschedule, go to <link>. For help or to opt out 1800 083 037.*(LIFE IN AUSTRALIA™_VALI_PREINTRO=2 OR 3 AND SAMPLETYPE=LANDLINE, PANELLIST DIDN'T JOIN MEETING AND NO MOBILE)

LIFE IN AUSTRALIA™_VALI_REM_EMAIL

*PROGRAMMER: TRIGGER EMAIL SEND ON V6
*(PROGRAMMER NOTE: Insert into V6 list: 738124)

Subject line: Life in Australia™ interview: missed you on Teams

Email body:

Life in Australia™
Be heard | Be represented

Dear [NAME],

We missed you on the *Life in Australia*™ video interview you scheduled for <date> on Teams.

To reschedule, please go to <link> or contact the Social Research Centre on 1800 083 037.

Did you have problems connecting? For help, contact the Social Research Centre on 1800 083 037 or LifeinAus@srcentre.com.au

Thank you very much for being part of *Life in Australia*™.

Yours sincerely,

The *Life in Australia*™ team

To unsubscribe from all future Life in Australia™ surveys, please call 1800 083 037.

*(LIFE IN AUSTRALIA™_VALI_PREINTRO=2, WAITING 5 MINUTES)
LIFE IN AUSTRALIA™_VALI_PREINTRO2 Information for video-assisted live interview.

Good (…), my name is (…). Can I confirm I am speaking with **<TITLE> <FIRSTNAME> <SURNAME>?**

Thank you very much for agreeing to participate in a Life in Australia™ video interview.

Video link: <link>
Contact number: <phone number>
Email address: <email>
Name: <title> <firstname> <surname>

Did <firstname> <surname> join the meeting within 10 minutes of the scheduled start time?

1. Yes
2. No (TERMINATE AND MARK AS NO SHOW)

*(LIFE IN AUSTRALIA™_VALI_PREINTRO = 1 OR LIFE IN AUSTRALIA™_VALI_PREINTRO2 = 1)
LIFE IN AUSTRALIA™_VALI_ALLOWMONITORING This call may be monitored or recorded for quality assurance purposes. Is that ok?

1. Yes, OK to record – INTERVIEWER, PLEASE START RECORDING
2. No, not OK to record

*(LIFE IN AUSTRALIA™_VALI_PREINTRO=1, PANELLIST JOINED MEETING)
LIFE IN AUSTRALIA™_VALI_INTRO

INTERVIEWER NOTE: Use generic prompt card #1

Good (…), my name is (…). Can I confirm I am speaking with **<TITLE> <FIRSTNAME> <SURNAME>?**

Thank you very much for agreeing to participate in a Life in Australia™ video interview.

For this month only, we're testing video conferencing as a way to complete surveys in partnership with the Australian Bureau of Statistics. All responses are completely confidential and your information is protected by Australian Privacy Laws. In future months, you'll be able to complete surveys online or over the phone

This survey will only take 15 minutes. Participation in this survey is voluntary and you can withdraw at any point.

For completing this survey, you'll receive a $10 thank you or you can donate the same amount to one of our selected charities.

(**IF NECESSARY:** We understand that some of the questions have been asked multiple times. We do this to make sure we collect the most up to date opinions and circumstances of our participants. This also helps us understand how views change over time. Please bear with us if you feel you're repeating yourself!)

1. Requested to do survey over video interviewing now
2. Household refusal (ATTEMPT CONVERSION / RECORD REASON) (GO TO RR1)
3. Respondent refusal (ATTEMPT CONVERSION / RECORD REASON) (GO TO RR1)
4. Refused participation in Panel (GO TO TERM2)
5. Away from Panel (RECORD RETURN DATE) (GO TO AWAY)

*(LIFE IN AUSTRALIA™_VALI_INTRO=1, OK TO START VIDEO INTERVIEW)
LIFE IN AUSTRALIA™_VALI_VIDSAFE DO NOT READ ALOUD: Can you hear the respondent and are they in a safe location?

1. Yes, OK to start call
2. No, not OK to start call

*(LIFE IN AUSTRALIA™_VALI_VIDSAFE=2, NOT OK TO START CALL)
LIFE IN AUSTRALIA™_VALI_REAPPT Can I make an appointment for a time when you'll have somewhere quiet and comfortable to complete the interview?

1. Yes (INSERT LINK TO SCHEDULING TOOL)
2. No, does not want to complete video interview (TERM2)

*(LIFE IN AUSTRALIA™_VALI_VIDSAFE=1, OK TO START CALL)
LIFE IN AUSTRALIA™_VALI_RECONNECT1 If we experience any connection issues during this interview, please try leaving the meeting and joining it again with the same link you used before.

Programmer note: If phoneNumber is unavailable, continue without showing following text and response frame:
If there are still issues, I will call you.

Can I confirm your number again please? I have your number as <number>. Is that correct?

1. Yes, number is correct
2. Number isn't correct (RECORD NUMBER)

*(LIFE IN AUSTRALIA™_VALI_VIDSAFE=1, OK to start call)
LIFE IN AUSTRALIA™_VALI_RECONNECT2 And just in case you need it, you can call the number in the appointment email, 1800 083 037

INTERVIEWER NOTE: Use prompt card #2, RECONNECT.

1. Continue

*(LIFE IN AUSTRALIA™_VALI_VIDSAFE=1, OK TO START CALL)
LIFE IN AUSTRALIA™_VALI_RESTART Please let me know if you need to take a break for your comfort or wellbeing. We can stop and restart the interview at any time.

INTERVIEWER NOTE: Go BACK to blank prompt card #1

1. Continue

SMS ONLINE INTRO

*(s_METHOD=6, RDD SMS P2W)
SMS_WELCOME SCREEN Thank you for taking part in the 2022 Society and Health Survey, a survey being conducted by the Social Research Centre, part of the Australian National University.

The survey asks questions about the lifestyles, health and wellbeing of Australians.

The survey should take no more than 10 minutes to complete and there are no right or wrong answers. Participation in this survey is voluntary and you can withdraw at any point. The information collected will be treated in strict confidence.

We will send you a $10 Coles electronic gift voucher as a thank you for completing the entire survey.

Your responses will be de-identified, held in the strictest confidence and will not be disclosed to other organisations for marketing or research purposes. The responses of everyone who participates in this survey will be combined for analysis.

*(PROGRAMMER NOTE: DISPLAY THROUGH OUT THE SURVEY IN GREY SCALE)
For any queries, please call the Social Research Centre on 1800 023 040 or email SHS2022@srcentre.com.au. You are able to stop the survey at any time and return to complete it later. When you re-start the survey, using the same link, it will take you to where you left.

*(TIMESTAMP)

INTRODUCTION

*(ALL)
DEMO_INTRO First, just a couple of questions about yourself.

1. Continue

*(s_METHOD=4, 5 or 6, NP CAWI, RDD CATI OR SMS P2W)
GENDER How do you describe your gender?

Gender refers to your current gender, which may be different to your sex recorded at birth and may be different to what is indicated on legal documents.

*PROGRAMMER INSTRUCTION: PLEASE FILL USING P_GENDER FOR LIFE IN AUSTRALIA™ PANELLISTS.

1. Man or male
2. Woman or female
3. Non-binary
4. I use a different term (please specify)

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(s_METHOD=4, 5 or 6, NP CAWI, RDD CATI OR RDD SMS P2W)
AGE How old are you today?

*PROGRAMMER INSTRUCTION: PLEASE FILL USING P_AGE FOR LIFE IN AUSTRALIA™ PANELLISTS.

1. (_____) years [IF UNDER 18 – GO TO TERM4]

999. (Refused) / Prefer not to say

*(AGE=999, REFUSED AGE)
AGE_GROUP Which age group would you fall into?

*PROGRAMMER INSTRUCTION: PLEASE FILL AGE_GROUP FOR RESPONDENTS WHO ANSWER AGE.
*PROGRAMMER INSTRUCTION: PLEASE FILL USING P_AGE_GROUP FOR LIFE IN AUSTRALIA™ PANELLISTS.

0. Under 18 years [GO TO TERM4]
1. 18-24 years
2. 25-34 years
3. 35-44 years
4. 45-54 years
5. 55-64 years
6. 65-74 years
7. 75 or more years

99. (Refused) / Prefer not to say [GO TO TERM5]

*(ALL)
STATE Which state or territory you live in?

1. NSW
2. VIC
3. QLD
4. SA
5. WA
6. TAS
7. NT
8. ACT

99. (Refused)

*(ALL)
POSTCODE What is the postcode of the place you usually live?

1. Enter postcode (SPECIFY, 800 - 7999)

98. (Don’t know) / Not sure
99. (Refused) / Prefer not to say

*(POSTCODE=98 or 99, DK/REF POSTCODE)
SUBURB What suburb you live in?

(INTERVIEWER NOTE: Type in at least the first 3 letters of suburb)

Enter suburb

98. (Don't know)
99. (Refused)

*(TIMESTAMP)

DEVICE TYPE

*(S_METHOD=3, LIFE IN AUSTRALIA™ VALI)
DEVICE_TYPE To help us better understand how people are participating in video surveys, which of the following best describes the type of device you are using for this survey?

1. Desktop computer
2. Laptop computer
3. Tablet (like an Apple iPad or Samsung Galaxy Tab)
4. Phone (like a Google Pixel or Apple iPhone)
5. Something else (please specify) <text box>

98. (Don't know)
99. (Refused)

*(S_METHOD=3, LIFE IN AUSTRALIA™ VALI)
CARD_CHECK I'll be showing some text on screen for more complicated questions. I just want to check that you'll be able to read them. Can you read this text?

INTERVIEWER NOTE: Use prompt card #2, RECONNECT.

1. Yes
2. No

*(IF CARD_CHECK=2, CAN'T READ PROMPT CARD)
DEVICE_SWITCH Are you able to join this call from a device with a larger screen, like a tablet, laptop or desktop computer, so that you will be able to see text that I'll be showing? I'm able to hang on for a few minutes.

1. Respondent switching device now — CONTINUE WITH DEVICE_TYPE2
2. Respondent needs to reschedule — SKIP TO APPROPRIATE TERM
3. Respondent doesn't have device — SKIP TO POLINTRO
4. Respondent has device but won't switch — SKIP TO POLINTRO

*(DEVICE_SWITCH, LIFE IN AUSTRALIA™ VALI)
DEVICE_TYPE2 Which of the following best describes the type of device you are using for this-survey now?

INTERVIEWER NOTE: Use blank prompt card #3

(READ OUT)
1. Desktop computer
2. Laptop computer
3. Tablet (like an Apple iPad or Samsung Galaxy Tab)
4. Phone (like a Google Pixel or Apple iPhone)
5. Something else (please specify) <text box>

98. (Don't know)

99. (Refused)

*(TIMESTAMP)

SOCIETY AND POLITICS

*(ALL)
POLINTRO To start with, the first questions will be about politics and society.
INTERVIEWER NOTE: Use blank prompt card #3

*(ALL)
IMPPROB What do you think is the most important problem facing Australia today?

1. [VERBATIM]

99. (Refused) / Prefer not to say

*(ALL)
POLINT Generally speaking, how much interest do you usually have in what's going on in politics?

(READ OUT)
1. A good deal
2. Some
3. Not much
4. None

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(s_METHOD = 4-6 OR s_ASKVOTE=1, NOT LIFE IN AUSTRALIA™ PANELLIST OR LIFE IN AUSTRALIA™ PANELLIST WHO DIDN'T ANSWER QUESTION)
VOTE Some people were unable to vote or chose not to vote in the last federal election.

Did you vote in the federal election held on Saturday 21 May 2022?

1. Yes
2. No

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(VOTE=1, VOTED IN FEDERAL ELECTION)
VOTE_PARTY In the Federal election for the House of Representatives on Saturday 21 May 2022, which party did you vote for **first** in the **House of Representatives**?

1. Liberal Party
2. National Party
3. Labor Party (ALP)
4. Greens
5. Liberal National Party (LNP) [ONLY DISPLAY FOR STATE='QLD']
6. An independent
96. Some other party (please specify) <text box>

98. (Don’t know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)

MULTICULT To what extent do you agree or disagree that it is a good thing for a society to be made up of people from different cultures?

Please choose from the options on the screen.

INTERVIEWER NOTE: Use prompt card #4, MULTICULT. Do not read out responses.

(READ OUT)

[CODE FRAME ORDER BASED ON ‘S_ORDER’ VARIABLE]

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

98. (Don’t know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)

DISCRIMThe next question is about discrimination. Discrimination may happen when people are treated unfairly because they are seen as being different from others.

In the last 12 months, do you feel that you have experienced discrimination or have been treated unfairly by others?

Please exclude discrimination experienced overseas.

INTERVIEWER NOTE: Use blank prompt card #5

1. Yes
2. No

98. (Don’t know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)

LETDIE1YG When a person has a disease that cannot be cured, do you think doctors should be allowed by law to end the patient's life by some painless means if the patient and the patient's family request it?

1. Yes
2. No

98. Not sure / Not sure
99. (Refused) / Prefer not to say

*(TIMESTAMP)

HEALTH AND DISABILITY

*(ALL)
PREHEALTH The next few questions are about your health and wellbeing.

1. Continue

*(ALL)
LIFE_SATISFACTION The following question asks how satisfied you feel about life in general, on a scale from 0 to 10. Zero means you feel 'not at all satisfied' and 10 means 'completely satisfied'.

Overall, how satisfied are you with life as a whole these days?

Please choose from the options on the screen.

INTERVIEWER NOTE: Use prompt card #6, LIFE_SATISFACTION. Do not read out.

0. 0 - Not at all satisfied
1. 1
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 - Completely satisfied

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)
HEALTH In general, would you say that your health is…?

INTERVIEWER NOTE: Use blank prompt card #7

[CODE FRAME ORDER BASED ON 'S_ORDER' VARIABLE]
(READ OUT)
1. Excellent
2. Very good
3. Good
4. Fair
5. Poor

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(s_METHOD=1,2,3,4,6 Life in Australia™ CATI, Life in Australia™ CAWI, Life in Australia™ VALI, NP CAWI, RDD SMS P2W)
HEALTHCON Have you been told by a doctor or nurse that you have any of these long-term health conditions?

Please choose from the options on the screen.

INTERVIEWER NOTE: Use prompt card #8, HEALTHCON. Do not read out.

INTERVIEWER NOTE: Allow enough time to consider all of them, and say to the QR 'let me know when you are finished'.

Please select all that apply.
(READ OUT)
1. Arthritis
2. Asthma
3. Cancer (including remission)
4. Dementia (including Alzheimer's)
5. Diabetes (excluding gestational diabetes)
6. Heart disease (including heart attack or angina)
7. Kidney disease
8. Lung condition (including COPD or emphysema)
9. Mental health condition (including depression or anxiety)
10. Stroke
11. Any other long-term health condition(s)
12. No long-term health condition *(EXCLUSIVE)

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(s_METHOD=5, RDD CATI)
HEALTHCON Have you been told by a doctor or nurse that you have any of these long-term health conditions?

(READ OUT)
1. Arthritis
2. Asthma
3. Cancer - including remission
4. Dementia - including Alzheimer's
5. Diabetes - excluding gestational diabetes
6. Heart disease - including heart attack or angina
7. Kidney disease
8. Lung condition - including COPD or emphysema
9. Mental health condition - including depression or anxiety
10. Stroke
11. Any other long-term health condition(s)
12. No long-term health condition *(EXCLUSIVE)

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)
HELP_CARE Do you ever need someone to help with, or be with you for, **self-care activities**?

For example: doing everyday activities such as eating, showering, dressing or toileting.

Please choose from the options on the screen.

INTERVIEWER NOTE: Use prompt card #9, HELP_CARE.

(READ OUT)
1. Yes, always
2. Yes, sometimes
3. No

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)
HELP_MOVE Do you ever need someone to help you with, or be with you for, **body movement activities**?

For example: getting out of bed, moving around at home or at places away from home.

Please choose from the options on the screen.

INTERVIEWER NOTE: Use prompt card #10 HELP_MOVE.

(READ OUT)
1. Yes, always
2. Yes, sometimes
3. No

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)
K6 The following questions ask about how you have been feeling during the past 4 weeks. For each question, please indicate how often you had this feeling. During the past 4 weeks, about how often did you feel…?

Please choose from the options on the screen.

INTERVIEWER NOTE: Use prompt card #11, K6. Do not read out.

[STATEMENTS]
a) Nervous
b) Hopeless
c) Restless or fidgety
d) That everything was an effort
e) So sad that nothing could cheer you up
f) Worthless

(READ OUT)
[CODE FRAME ORDER BASED ON 'S_ORDER' VARIABLE]
1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(TIMESTAMP)

LIFESTYLE

*(ALL)
LIFE_INTRO Next, some questions about your lifestyle.

INTERVIEWER NOTE: Use blank prompt card #12

1. Continue

*(ALL)
RUSHED How often do you feel rushed or pressed for time?

Please choose from the options on the screen.

INTERVIEWER NOTE: Use prompt card #13, RUSHED. Do not read out.
(READ OUT)

[CODE FRAME ORDER BASED ON 'S_ORDER' VARIABLE]
1. Always
2. Often
3. Sometimes
4. Rarely
5. Never

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)
HELP How strongly do you agree or disagree with the following statement:

"When I need someone to help me out, I can usually find someone."

Please choose from the options on the screen.

INTERVIEWER NOTE: Use prompt card #14, HELP. Do not read out.
(READ OUT)

[CODE FRAME ORDER BASED ON 'S_ORDER' VARIABLE]
1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)
GENTRUST How strongly do you agree or disagree with the following statement:

"Most people can be trusted."

Please choose from the options on the screen.

INTERVIEWER NOTE: Use prompt card #15, GENTRUST. Do not read out responses.
(READ OUT)

[CODE FRAME ORDER BASED ON 'S_ORDER' VARIABLE]
1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)
INTERNET How often do you…?

[STATEMENTS] *(PROGRAMMING NOTE: PLEASE LOOP THROUGH ONE STATEMENT AT A TIME FOR *(s_METHOD=5, RDD CATI))

a) Look for information over the Internet
b) Comment or post images or video to social media (for example: Facebook, TikTok, Instagram, Twitter)
c) Post to blogs / forums / interest groups
d) View posts, images, and videos on social media sites

Please choose from the options on the screen.

INTERVIEWER INSTRUCTION: Use prompt cards #16-19, INTERNET_a-INTERNET_d. Do not read out. Flashcards go through every option

(READ OUT)
[CODE FRAME ORDER BASED ON 'S_ORDER' VARIABLE]
1. More than once a day
2. About once a day
3. Three to five days a week
4. One to two days a week
5. Every few weeks
6. Once a month
7. Less than once a month
8. Never

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)
TV_TIME On **average**, how many **hours per week** do you spend watching each of the following?

(READ OUT)

[STATEMENTS] *(PROGRAMMING NOTE: PLEASE LOOP THROUGH ONE STATEMENT AT A TIME FOR *(s_METHOD=5, RDD CATI))

a. **Free video streaming services** - e.g. YouTube, Twitch, Tubi
b. **Online subscription services** - e.g. Netflix, Binge, YouTube Premium, Amazon Prime, Disney+, Stan
c. **Pay TV** - e.g. Foxtel, Fetch TV, including recorded content but excluding streaming
d. **Free on-demand TV** - e.g. ABC iview, 9Now, 10 play, 7plus, SBS On Demand, ABC News, ABC Kids
e. **Publicly owned free-to-air TV** - e.g. ABC, SBS, including recorded content but excluding on-demand TV
f. **Commercial free-to-air TV** - e.g. Seven, Nine, Ten, WIN, Imparja, NBN Television, GWN, including recorded content but excluding on-demand TV

Please choose from the options on the screen.

INTERVIEWER NOTE: Use prompt cards #20-25, TV_TIME_a-TV_TIME_f. Do not read out responses.

(READ OUT)
[CODE FRAME ORDER BASED ON 'S_ORDER' VARIABLE]
1. 0 hours per week
2. 1-5 hours per week
3. 6-10 hours per week
4. 11-15 hours per week
5. 16-20 hours per week
6. More than 20 hours per week

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)
INTRO_SMOKE Now some questions about smoking and alcohol.

1. Continue

*(ALL)
CURRENT_SMOKE Do you currently smoke?
Please exclude vaping, E-cigarettes and Cannabis

INTERVIEWER NOTE: Use blank prompt card #26

1. Yes
2. No

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(CURRENT_SMOKE=1, CURRENT SMOKER)
DAILY_SMOKE Do you smoke regularly, that is, at least once a day?
Please exclude vaping, E-cigarettes and Cannabis

1. Yes
2. No

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)
DRINK_FREQ In the **last 12 months**, how often did you have an **alcoholic** drink?

Please choose from the options on the screen.

INTERVIEWER NOTE: Use prompt card #27, DRINK_FREQ. Do not read out responses.

(READ OUT)
[CODE FRAME ORDER BASED ON 'S_ORDER' VARIABLE]
1. Every day
2. 5-6 days a week
3. 3-4 days a week
4. 1-2 days a week
5. 2-3 days a month
6. About 1 day a month
7. Less often than 1 day a month
8. Do not drink alcohol

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)
FIRSTDRINK How old were you the very first time you ever drank an alcoholic beverage – including either beer, wine, or spirits?

INTERVIEWER NOTE: Use blank prompt card #28

1. <RANGE 1-100> (Specify)

997. Have never had an alcoholic beverage
998. (Don't know) / Not sure
999. (Refused) / Prefer not to say

*(ALL)
ACTIVITY In general, how often do you participate in moderate or intensive physical activity for at least 30 minutes?

Moderate level physical activity will cause a slight increase in breathing and heart rate, such as brisk walking.

Please choose from the options on the screen.

INTERVIEWER NOTE: Use prompt card #29, ACTIVITY. Do not read out.

(READ OUT)
[CODE FRAME ORDER BASED ON 'S_ORDER' VARIABLE]
1. Not at all
2. Less than once a week
3. 1 to 2 times a week
4. 3 times a week

5. More than 3 times a week (but not every day)
6. Every day

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(TIMESTAMP)

EMPLOYMENT AND FINANCIAL

*(ALL)
EMPINTRO The next questions will ask about employment, caring for other people, housing and benefits.

INTERVIEWER NOTE: Use blank prompt card #30

1. Continue

*(ALL)
EMP1 Last week, did you have a job of any kind?

Please choose from the options on the screen.

INTERVIEWER NOTE: Use prompt card #31, EMP1. Do not read out.

(READ OUT)
1. Yes, worked for payment or profit
2. Yes, but absent on holidays, on paid leave, on strike, or temporarily stood down
3. Yes, unpaid work in a family business
4. Yes, other unpaid work
5. No, did not have a job

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL) [CENSUS 2021]
EMP2 Did you actively look for work at any time in the last four weeks?

INTERVIEWER NOTE: Use blank prompt card #32(READ OUT)
1. Yes, looked for work
2. No, did not look for work

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)
UNPAIDCARE In the last two weeks, did you spend time providing unpaid care, help or assistance to family members or others because of a disability, a long-term health condition or problems related to old age?

IF NEEDED:
If you receive Carer Allowance or Carer Payment, please select 'Yes'.

If you sometimes provide help (such as shopping), please select 'Yes' **only** if the person needs it because of their condition.

Do not include volunteer work.

Please choose from the options on the screen.

INTERVIEWER NOTE: Use prompt card #33, UNPAIDCARE. Do not read out.

.

1. Yes, did provide unpaid care, help or assistance
2. No, did not provide unpaid care, help or assistance

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)
HOMEOWNER Do you own outright, are you buying or renting the dwelling in which you now live?

Please choose from the options on the screen.

INTERVIEWER NOTE: Use prompt card #34, HOMEOWNER. Do not read.
(READ OUT)

1. Own outright
2. Own with a mortgage
3. Purchasing under a shared equity scheme (IF NEEDED: A shared equity scheme is a way to share the cost of buying a home with an equity partner, such as a private investor, not-for profit organisation or government housing authority.)
4. Renting
5. Occupying rent free
6. Occupying under a life tenure scheme (IF NEEDED: A life tenure scheme is a contract to live in the dwelling for the term of your life without the full rights of ownership. This is a common arrangement in retirement villages.)
7. Some other arrangement (please specify)

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)
BENTYPE Do you currently receive any of the following government pensions, benefits or allowances?

Please choose from the options on the screen.

INTERVIEWER NOTE: Use prompt card #35, BENTYPE. DO NOT READ.

[STATEMENTS]
1. Age pension
2. Newstart Allowance / Jobseeker Payment
3. Disability Support Pension
4. Carer Allowance / Carer Payment
5. Parenting payment

[CODE FRAME]

1. Yes
2. No

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(TIMESTAMP)

SURVEY PARTICIPATION

*(ALL)

PANELMEMBER Are you a member of any online survey panels (IF s_METHOD=4, NP CAWI: besides <FILL IN CURRENT SAMPLE SOURCE>; IF s_METHOD=1, 2, 3, LIFE IN AUSTRALIA™ CATI, LIFE IN AUSTRALIA™ CAWI, LIFE IN AUSTRALIA™ VALI: besides Life in Australia™)?

Online survey panels are websites that provide members who sign up with the opportunity to complete surveys online for a reward. They offer surveys on a range of different topics on behalf of different organisations.

INTERVIEWER NOTE: Use blank prompt card #36

1. Yes
2. No

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(PANELMEMBER=1, BELONG TO ONLINE PANEL)

PANELNUM How many [IF s_METHOD=1, 2, 3 or 4, NP CAWI, LIFE IN AUSTRALIA™ CATI, LIFE IN AUSTRALIA™ CAWI, LIFE IN AUSTRALIA™ VALI: other] online panels do you belong to?

0. None
1. One [IF s_METHOD=1, 2, 3 or 4, NP CAWI, LIFE IN AUSTRALIA™ CATI, LIFE IN AUSTRALIA™ CAWI, LIFE IN AUSTRALIA™ VALI: other) panel
2. Two [IF s_METHOD=1, 2, 3 or 4, NP CAWI, LIFE IN AUSTRALIA™ CATI, LIFE IN AUSTRALIA™ CAWI, LIFE IN AUSTRALIA™ VALI: other) panels
3. Three [IF s_METHOD=1, 2, 3 or 4, NP CAWI, LIFE IN AUSTRALIA™ CATI, LIFE IN AUSTRALIA™ CAWI, LIFE IN AUSTRALIA™ VALI: other] panels
4. Four [IF s_METHOD=1, 2, 3 or 4, NP CAWI, LIFE IN AUSTRALIA™ CATI, LIFE IN AUSTRALIA™ CAWI, LIFE IN AUSTRALIA™ VALI: other] panels
5. Five [IF s_METHOD=1, 2, 3 or 4, NP CAWI, LIFE IN AUSTRALIA™ CATI, LIFE IN AUSTRALIA™ CAWI, LIFE IN AUSTRALIA™ VALI: other] other panels
6. Six or more [IF s_METHOD=1, 2, 3 or 4, NP CAWI, LIFE IN AUSTRALIA™ CATI, LIFE IN AUSTRALIA™ CAWI, LIFE IN AUSTRALIA™ VALI: other] panels

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(PANELMEMBER=1, BELONG TO ONLINE PANEL)

PANELREASON Which best describes your main reason for joining online survey panels?

(READ OUT)

1. I want my voice to be heard
2. Completing surveys is fun
3. To earn money
96. Other (please specify)

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(TIMESTAMP)

DEMOGRAPHICS

*(ALL)

EDU_INTRO Now, some questions about you and other people in your household. The answers to these questions will be used to better understand your other answers.

1. Continue

*(s_METHOD=1, 2 or 3 & d_EDUCATION ≠ 0, Life in Australia™ CATI, Life in Australia™ CAWI OR Life in Australia™ VALI AND d_EDUCATION IS NOT BLANK)

EDU_CHECK We have your highest level of school or educational qualification recorded as <d_EDUCATION>. Is that correct?

1. Yes
2. No

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*((s_METHOD=4, 5 or 6, NP CAWI, RDD CATI or RDD SMS P2W) or (EDU_CHECK=2, 98 or 99, Life in Australia™ panellist and education recorded is not correct))

HIGHEST_SCHOOLING What is the highest year of primary or secondary school you have **completed**?

INTERVIEWER NOTE: For people currently at school, select the highest year of schooling they have completed, not the year they are currently undertaking.

1. Year 12 or equivalent
2. Year 11 or equivalent
3. Year 10 or equivalent
4. Year 9 or equivalent
5. Year 8 or below
6. Did not go to school

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*((s_METHOD=4, 5 or 6, NP CAWI, RDD CATI or RDD SMS P2W) or (EDU_CHECK=2, 98 or 99, Life in Australia™ panellist and education recorded is not correct))

FURTHER_EDU Have you completed a trade certificate or other educational qualification?

1. Yes
2. No

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(FURTHER_EDU= 1, COMPLETED TRADE CERTIFICATE OR OTHER EDUCATIONAL QUALIFICATION)

HIGHEST_QUALIFICATION What is the level of the highest qualification you have completed?

(READ OUT)
1. Postgraduate Degree Level (incl. master degree, doctoral degree, other postgraduate degree)
2. Graduate Diploma and/or Graduate Certificate Level
3. Bachelor Degree Level
4. Advanced Diploma and/or Diploma Level
5. Certificate III and/or IV Level
6. Certificate I and/or II Level
7. Other (please specify)

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)
DEMO_INTRO2 The next few questions are about your background.

1. Continue

*(s_METHOD=4, 5 or 6, NP CAWI, RDD CATI or RDD SMS PW)
COB In which country were you born?

(PROBE TO CODE FRAME)
1. Australia
2. England
3. New Zealand
4. China
5. India
6. Philippines
7. Other (please specify)

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)
LOTE Do you use a language other than English at home?

1. Yes
2. No

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)
MARITAL What is your present marital status?

(READ OUT)
1. Never married

2. Widowed
3. Divorced
4. Separated but not divorced
5. Married

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)
NO_OF_ADULTS And now for some questions about your household.

Including yourself, how many people aged 18 years and over live in your household?

[PROGRAMMER NOTE: ALLOW RESPONSES 1-20. DISPLAY 'That seems like an unlikely response. Please check and re-enter.' IF ANSWER IS GREATER THAN 10]

1. <RANGE 1 TO 20, WHOLE NUMBERS>

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)
NO_OF_CHILDREN How many children are currently living in your household (at least 50% of the time)? Please only include children under the age of 18.

1. <RANGE 1-10, WHOLE NUMBERS>
2. None

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)
INCOME What is the total of all income you usually receive?

Do not deduct tax, superannuation, salary sacrifice. Please include wages and salaries, government pensions, benefits and allowances, and income from interest, dividends or other sources.

Please choose from the options on the screen.

INTERVIEWER NOTE: Use prompt card #37, INCOME. Do not read.

INTERVIEWER NOTE: Seeking estimate only – especially if unsure. Probe with categories

IF NEEDED: *If on an age pension or disability support pension, select $20,800 to $25,999 per year.*

1. $156,000 or more per year ($3,000 or more per week)
2. $104,000 to $155,999 per year ($2,000 - $2,999 per week)
3. $91,000 to $103,999 per year ($1,750 - $1,999 per week)
4. $78,000 to $90,999 per year ($1,500 - $1,749 per week)
5. $65,000 to $77,999 per year ($1,250 - $1,499 per week)
6. $52,000 to $64,999 per year ($1,000 - $1,249 per week)
7. $41,600 to $51,999 per year ($800 - $999 per week)
8. $33,800 to $41,599 per year ($650 - $799 per week)

9. $26,000 to $33,799 per year ($500 - $649 per week)
10. $20,800 to $25,999 per year ($400 - $499 per week)
11. $15,600 to $20,799 per year ($300 - $399 per week)
12. $7,800 to $15,599 per year ($150 - $299 per week)
13. Less than $7,800 per year ($1 - $149 per week)
14. Nil
15. Negative income

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(s_METHOD=3, Life in Australia™ VALI)
VALI_LOCATION Which of the following best describes where you were during this interview?

Please choose from the options on the screen.

INTERVIEWER NOTE: Use prompt card #38, VALI_LOCATION. Do not read.

1. At home
2. At work
3. Another public place beside work
4. Somewhere else (specify)

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*((s_METHOD=3 or 5) or ((s_METHOD=1 or 2) AND interview mode = phone), Life in Australia™ VALI or RDD CATI or Life in Australia™ CATI or Life in Australia™ CAWI and interview mode = phone)
VALI_OVERHEAR And could anyone overhear your answers to questions I asked?

INTERVIEWER NOTE: Use blank prompt card #39

1. Yes
2. No

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(ALL)
EXPERIENCE Overall, how do you rate your experience of this survey?

Please choose from the options on the screen.

INTERVIEWER NOTE: Use prompt card #40, EXPERIENCE. Do not read.

[CODE FRAME ORDER BASED ON 'S_ORDER' VARIABLE]
(READ OUT)
1. Excellent
2. Very good
3. Good
4. Fair
5. Poor

98. (Don't know) / Not sure

99. (Refused) / Prefer not to say

*(s_METHOD=3, Life in Australia™ VALI)
VALI_FURTHER Would you be willing to participate in further video interviews in the future?

INTERVIEWER NOTE: Use blank prompt card #41

1. Yes
2. No

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(s_METHOD=5 or 6, RDD CATI or RRD SMS P2WI)
RECONTACT1 Would you be willing to participate in similar research studies in the future?

1. Yes
2. No

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say*(RECONTACT1=1, WILLING TO PARTICPATE IN FUTUR RESEARCH)

RECONTACT2 So that we can contact you about future studies, can I / we please have your name, confirm the best number to contact you on and an email address?

All information is kept confidential and is bound by the Privacy Act. If necessary, the name provided can be an alias or any other name that you will recognise when we contact you.

*(PROGRAMMER NOTE: all fields can be left blank)
1. First name: (or nickname / alias) <Firstname>
2. Phone number: <FROM SAMPLE>
3. Email address: <email> [USE LIVE VALIDATION]

98. (Don't know) / Not sure
99. (Refused) / Prefer not to say

*(TIMESTAMP)

RR AND TERMS TO BE ADDED

CLOSING SCRIPT

*(s_METHOD=6, RDD SMS P2W)
RDD_INCENT Thank you for taking the time to participate. You are now eligible for the $10 Coles e-voucher. Would you like that sent to you via email or SMS?

1. Email
2. SMS to <PhoneNumber> (Add to list 740209)
3. Prefer not receive voucher

*(RDD_INCENT=1, WANTS INCENTIVE EMAILED)
INCENT_EMAIL [s_METHOD=5, RDD CATI: Can you please tell me your email address / s_METHOD=6, RDD SMS P2W: Please provide your email address below] and we will send the e-voucher there.

IF NEEDED: *Please note, we will only use your email for the purpose of sending the e-voucher and will delete it after that.*

1. <email> [USE KICKBOX] (Add to list 740211)

*(s_METHOD=4,6, NP CAWI or RDD SMS P2W) OR ((s_METHOD=1 or 2) AND interview mode = web, Life in Australia™ CATI or Life in Australia™ CAWI and interview mode = Web)
CLOSE1. Thank you for taking the time to participate. This survey was conducted by the Social Research Centre in partnership with the Australian Bureau of Statistics. The results will be used to inform the development of survey research methods.

[DISPLAY IF s_METHOD=2 & INCENTIVE=1-3: Your reward will be processed and sent in the next few weeks.]

This research study has been carried out in compliance with the Privacy Act and the Australian Privacy Principles, and the information you have provided will only be used for research purposes. Our Privacy Policy is available via our website, www.srcentre.com.au/research-participants#privacy

For further information you can contact the Social Research Centre on 1800 023 040 or LifeinAus@srcentre.com.au.

If you would like to talk to someone about any issues that have arisen from participating in this survey, about how you have been feeling, or if you have any concerns about your mental health, please seek support from one of the services listed below:

Beyond Blue	www.beyondblue.org.au
	Phone: 1300 22 4636
Lifeline	www.lifeline.org.au
	Phone: 13 11 14
1800RESPECT	www.1800respect.org.au
	Phone: 1800 737 732

Your answers have been submitted. You may now close the page.

*(s_METHOD=3,5,Life in Australia™ VALI or RDD CATI) or ((s_METHOD=1 or 2) AND interview mode = phone, Life in Australia™ CATI or Life in Australia™ CAWI and interview mode = phone)
CLOSE2 INTERVIEWER NOTE: Use prompt card #42, CLOSE. Do not read.

Thank you for taking the time to participate. Just in case you missed it, my name is (…) and this survey was conducted by the Social Research Centre in partnership with the Australian Bureau of Statistics.

[DISPLAY IF s_METHOD=1,3,5 & INCENTIVE=1-3: Your reward will be processed and sent in the next few weeks.]

This research study has been carried out in compliance with the Privacy Act and the Australian Privacy Principles, and the information you have provided will only be used for research purposes. Our Privacy Policy is available via our website, https://www.srcentre.com.au/research-participants#privacy

For further information you can contact the Social Research Centre on 1800 023 040 [DISPLAY IF s_METHOD=1,3 Life in Australia™ CATI or Life in Australia™ VALI: or LifeinAus@srcentre.com.au].

If you would like to talk to someone about any issues that have arisen from participating in this survey, about how you have been feeling, or if you have any concerns about your mental health, I can give you the details of support services you can contact?

Beyond Blue	www.beyondblue.org.au

	Phone: 1300 22 4636
Lifeline	www.lifeline.org.au
	Phone: 13 11 14
1800RESPECT	www.1800respect.org.au
	Phone: 1800 737 732

1. Complete

Life in Australia™ TERMINATION SCRIPTS

No.	Detailed outcome	Text to display
Term1	Transfer to web	You'll receive the email with the link to complete this survey shortly. If you haven't received it by tomorrow please contact the Social Research Centre on 1800 023 040 or at LifeinAus@srcentre.com.au
Term2	Refused	Thank you for participating in the Life in Australia™ study. If you change your mind and would like to be included please contact the Social Research Centre on 1800 023 040 or at LifeinAus@srcentre.com.au
Term3	Away duration	Thanks for that, we'll get back in contact when you're ready.
Term4	Below 18	Thanks for being prepared to help out, but for this survey we need to talk to / interview people aged 18 years and over.
Term5	Refused	Thank you for your interest, unfortunately you do not qualify for this study. If you have any questions, please contact the Social Research Centre on 1800 023 040.

Appendix 2: ACSSM Benchmarks

Raw population benchmarks were acquired from several reputable data sources, including the Australian Bureau of Statistics (ABS), Australian Electoral Commission (AEC), Commonwealth Department of Social Services (DSS) and the Melbourne Institute as shown in Table 17. These benchmarks are the best estimates of 'true' population distribution for the characteristics of interest. Filters were applied to the benchmarks at the time of extraction to only include individuals in scope for the surveys, i.e., those over the age of 18 and living in one of the Australian States or Territories. Additionally, the benchmarks were extracted at the highest possible level of aggregation to minimise the effect of any perturbation added to the benchmark by the supplying organisation as part of data confidentialisation processes.

In certain cases, the extracted benchmarks only covered a particular segment of the total population. For instance, the benchmarks relating to voting behaviour sourced from the AEC only accounted for the number of enrolled voters rather than the total population. This meant that the benchmarks needed to be expanded to cover the entire population of interest. To do this, a balance category was introduced to 'complete' the benchmarks to add to the target population total. For instance, a new category called 'Not Enrolled' was added to the benchmarks sourced from the AEC to account for individuals who were not enrolled to vote, necessarily assuming that all those not included in the AEC counts were not eligible to vote.

All benchmark sources experience some extent of non-response, at the level of item or collection unit (e.g., person and household). Without access to detailed person-level data, however, it is not possible to use the same imputation approach as applied to the survey data. Instead, it was assumed that person and item non-response occurred completely at random so that missing cases could be assigned non-missing categories in proportion to the occurrence of the latter. Refer again to Templ et al. (2011) for an overview of concepts in missing data imputation and for references to some of the important literature in the field. The same treatment was applied to "not stated" and "don't know" response categories in the benchmarks.

Since the data sources used related to different collection periods, the benchmarks were not all snapshots of the total population at the same point in time. As a result, the sum of their categories did not all add up to the same number, meaning that the total population count differed across the benchmarks. To eliminate this issue, the benchmarks were all scaled so that they added up to the same figure, in our case, ABS estimated resident population (ERP) State totals in relation to June 2022.[22] This

[22] ABS (2022) 'Quarterly Population Estimates (ERP), by State/Territory, Sex and Age', People, Population, (https://api.data.abs.gov.au/data/ABS,ERP_Q/1.1+2.100+18+19+20+21+22+23+24+25+26+27+28+29+30+31+32+33+34+35+36+37+38+39+40+41+42+43+44+45+46+47+48+49+50+51+52+53+54+55+56+57

amounts to assuming that the relative proportions falling into each benchmark category have not changed appreciably across the window from the date at which the data underlying the benchmark was collected and the date covered by the relevant ERP figure.

+58+59+60+61+62+63+64+65+66+67+68+69+70+71+72+73+74+75+76+77+78+79+80+81+82+83+84+85+86+87+88+89+90+91+92+93+94+95+96+97+98+99.1+2+3+4+5+6+7+8..?startPeriod=2021&endPeriod=2022), accessed 15 December 2022.

Table 17 ACCSM Benchmarks

Variable name	Variable label	Variable type	Benchmark source
B_ADULTS	Number of adults in the household	weighting	ABS (2020–21), Number of adults in household (HHADULT) for ages 18 and up (AGE99) excluding external territories (GCCSA16) [National Health Survey TableBuilder], accessed 12 December 2022.
B_AGE7	Age group	weighting	ABS (2022) 'Quarterly Population Estimates (ERP), by State/Territory, Sex and Age', People, Population (https://api.data.abs.gov.au/data/ABS,ERP_Q/1.1+2.100+18+19+20+21+22+23+24+25+26+27+28+29+30+31+32+33+34+35+36+37+38+39+40+41+42+43+44+45+46+47+48+49+50+51+52+53+54+55+56+57+58+59+60+61+62+63+64+65+66+67+68+69+70+71+72+73+74+75+76+77+78+79+80+81+82+83+84+85+86+87+88+89+90+91+92+93+94+95+96+97+98+99.1+2+3+4+5+6+7+8..?startPeriod=2021&endPeriod=2022), accessed 15 December 2022.
B_EDUCATION5	Highest educational qualification	weighting	ABS (2021), Level of Highest Educational Attainment (HEAP) for ages 18 and up (AGEP) excluding external territories (GCCSA UR), [Census TableBuilder], accessed 12 December 2022.
B_GENDER	Gender	weighting	ABS (2022) 'Quarterly Population Estimates (ERP), by State/Territory, Sex and Age', People, Population (https://api.data.abs.gov.au/data/ABS,ERP_Q/1.1+2.100+18+19+20+21+22+23+24+25+26+27+28+29+30+31+32+33+34+35+36+37+38+39+40+41+42+43+44+45+46+47+48+49+50+51+52+53+54+55+56+57+58+59+60+61+62+63+64+65+66+67+68+69+70+71+72+73+74+75+76+77+78+79+80+81+82+83+84+85+86+87+88+89+90+91+92+93+94+95+96+97+98+99.1+2+3+4+5+6+7+8..?startPeriod=2021&endPeriod=2022), accessed 15 December 2022.
B_GEOGRAPHY	Capital city / rest of state by State	weighting	ABS (2021), Greater Capital City Statistical Area of usual residence (GCCSA UR) for ages 18 and up (AGEP) [Census TableBuilder], accessed 12 December 2022.
B_HIGHESTSCHOOLING	Highest year of school completed[23]	weighting	ABS (2021), Highest Year of School Completed (HSCP) for ages 18 and up (AGEP) excluding external territories (GCCSA UR) [Census TableBuilder], accessed 12 December 2022.
B_LOTE	Language other than English spoken at home	weighting	ABS (2021), Language Used at Home (LANP) for ages 18 and up (AGEP) excluding external territories (GCCSA UR) [Census TableBuilder], accessed 12 December 2022.
B_AGEPENSION	Age pension	non weighting demographics	Department of Social Services (2022), Number of Recipients aged 18 years and over, Located Outside of External Territories, Receiving Age Pension (https://www.dss.gov.au/contact/data-request-form), [Blue Book Data], accessed 24 June 2022.

[22] Not used in weighting directly but included in unweighted demographic comparisons and is part of derivation of the highest educational qualification

Variable name	Variable label	Variable type	Benchmark source
B_BIRTHPLACE	Country of birth	non weighting demographics	ABS (2022) 'Estimated resident population, Country of birth, Age and sex', People, Population (https://api.data.abs.gov.au/data/ABS,ERP_COB/.1+2..AUS..?startPeriod=2021), accessed 15 December 2022. Adjusted using ABS (2021), Country of Birth of Person (BPLP) by age (AGEP), [Census TableBuilder], accessed 4 October 2022.
B_CHILDREN	Number of children living in the household	non weighting demographics	ABS (2020–21), Number of children aged 0-17 years in household (N0TO17HH) for ages 18 and up (AGE99) excluding external territories (GCCSA16), [National Health Survey TableBuilder], accessed 12 December 2022.
B_LFS	Labour force status	non weighting demographics	ABS (2022) 'Labour Force', Labour, Employment and unemployment, (https://api.data.abs.gov.au/data/ABS,LF/M1+M10+M2+M4+M5.1+2..10.1+2+3+4+5+6+7+8..?startPeriod=2021), accessed 22 November 2022. Adjusted using ABS (2021), Labour Force Status (LFSP) by age (AGEP) [Census TableBuilder], accessed 4 October 2022.
B_MARITAL	Marital status	non weighting demographics	ABS (2021), Registered Marital Status (MSTP) for ages 18 and up (AGEP) excluding external territories (GCCSA UR) [Census TableBuilder], accessed 12 December 2022.
B_INCOME	Person's income	non weighting demographics	ABS (2021), Total Personal Income (INCP) for ages 18 and up (AGEP) excluding external territories (GCCSA UR) [Census TableBuilder], accessed 12 December 2022.
B_ACTIVITY	Moderate or intense physical activity	substantive outcomes	Department of Social Services; Melbourne Institute of Applied Economic and Social Research, 2022, 'The Household, Income and Labour Dynamics in Australia (HILDA) Survey, GENERAL RELEASE 21 (Waves 1–21)', doi:10.26193/KXNEBO, ADA Dataverse, V3
B_DAILYSMOKE	Daily smoker	substantive outcomes	ABS (2020–21), Daily smoker status (SMKDAILY) for ages 18 and up (AGE99) excluding external territories (GCCSA16) [National Health Survey TableBuilder], accessed 12 December 2022.
B_DISCRIM	Have experienced discrimination	substantive outcomes	ABS (2023), Customised report based on General Social Survey (2020), Whether experienced discrimination or been treated unfairly (EXPDISCR) for ages 18 and up, accessed 25 January 2023
B_DRINKFREQ	Consumed alcohol in last 12 months	substantive outcomes	ABS (2020–21), Frequency of alcohol consumption in the last 12 months (ALCUSUQ2) for ages 18 and up (AGE99) excluding external territories (GCCSA16) [National Health Survey TableBuilder], accessed 12 December 2022.
B_GENTRUST	Most people can be trusted	substantive outcomes	ABS (2023), Customised report based on General Social Survey (2020), Level of trust in most people (TRUMTPPL) for ages 18 and up, accessed 25 January 2023
B_HEALTH	General health status	substantive outcomes	ABS (2023), Customised report based on General Social Survey (2020), Self-assessed health status (SAHQ01) for ages 18 and up, accessed 25 January 2023
B_K6	Psychological Distress	substantive outcomes	ABS (2023), Customised report based on General Social Survey (2020), Kessler 6 score (K6SCORE) for ages 18 and up, accessed 25 January 2023
B_LIFESATISFACTION	Life satisfaction	substantive outcomes	ABS (2023), Customised report based on General Social Survey (2020), Overall life satisfaction (OLIFESAT) for ages 18 and up, accessed 25 January 2023

Variable name	Variable label	Variable type	Benchmark source
B_MULTICULT	Multiculturalism is good for a society	substantive outcomes	ABS (2023), Customised report based on General Social Survey (2020), Tolerance of society being comprised of different cultures (TOLSOCIE) for ages 18 and up, accessed 25 January 2023
B_NOHEALTHCONDITION	No long-term health condition	substantive outcomes	ABS (2021), Type of Long-term Health Condition (LTHP) for ages 18 and up (AGEP) excluding external territories (GCCSA UR) [Census TableBuilder], accessed 12 December 2022.
B_RUSHED	Feel rushed or pressed for time	substantive outcomes	ABS (2023), Customised report based on General Social Survey (2020), Frequency of feeling rushed or pressed for time (FREQFEEL) for ages 18 and up, accessed 25 January 2023
B_UNPAIDCARE	Provide unpaid care in last two weeks	substantive outcomes	ABS (2021), Unpaid Assistance to a Person with a Disability, Health Condition, or due to Old Age (UNCAREP) for ages 18 and up (AGEP) excluding external territories (GCCSA UR) [Census TableBuilder], accessed 12 December 2022.
B_VOTEMAJOR	First preference for the party vote on Saturday 21 May 2022	substantive outcomes	Australian Electoral Commission (2022), House of representatives first preferences by party (https://results.aec.gov.au/27966/Website/Downloads/HouseFirstPrefsByPartyDownload-27966.csv) [2022 Federal election], accessed 13 December 2022.

Appendix 3: Final dispositions and response rates

Discussion of final dispositions and response rates is split by sampling frame, as the calculations required for the cross-sectional RDD samples differ from those used for Life in Australia™, which was also used for the VALI arm. For non-probability panels, even basic information like the number of people invited to complete the survey is not necessarily available.

Life in Australia™

We describe Life in Australia™ outcome rates prior to those of VALI because they form the basis of the calculation of VALI rates.

For Life in Australia™, we report response rates following Callegaro and DiSogra's (2008) paper on computing response metrics for online panels. Because non-response occurs at multiple stages in a panel, including recruitment, panel attrition prior to the survey and non-response for panellists invited to complete the survey, the Cumulative Response Rate 2 ($CUMRR2$) is the product of four separate rates: the Recruitment Rate ($RECR$; the estimated proportion of eligible individuals invited to join the panel who gave initial consent, which is calculated as RR3), the Profile Rate ($PROR$; the proportion of individuals who gave individual consent who actually joined the panel, by means of completing the panel profile), the Retention Rate ($RETR$; the proportion of enrolled panellists who remained active at the time of the invitation to complete the specific survey) and the Completion Rate ($COMR$; the proportion of invited panellists who completed the survey):

$$CUMRR2 = RECR \times PROR \times RETR \times COMR$$

Because Life in Australia™ is made up of individuals recruited in multiple batches, all rates but the Completion Rate are weighted by the number of completes from each batch. The dispositions for invitations to participate in the ACSSM are shown in Table 19 and the resulting rates are shown in Table 19.

Table 18 Life in Australia™ final dispositions

Code	Final disposition	n	%
1.1	Interview	582	73.1
2.112	Known-respondent refusal	15	1.9
2.113	Implicit refusal	29	3.6
2.12	Break-off	12	1.5
2.21	Respondent never available	65	8.2
2.221	Answering machine—message left	5	0.6
2.222	Answering machine—no message left	84	10.6
2.32	Physically or mentally unable/incompetent	1	0.1

2.39	Completed but removed for data quality	3	0.4
	Total	796	100.0

Notes: Implicit refusals consist of panellists who said they would complete online (but did not). Break-offs include midway termination and timed out or stopped case codes. Respondent never available includes case codes for no answer, engaged (busy signal), number disconnected and named person/organisation not known.

Table 19 Life in Australia™ outcome rates

Code	Outcome rate	%
RECR	Recruitment Rate	11.3
PROR	Profile Rate	93.3
RETR	Retention Rate	73.0
COMR	Completion Rate	73.1
CUMRR2	Cumulative Response Rate 2	5.6

VALI

As of the time of writing, there are no broadly accepted standards for dispositioning VALI surveys. The situation is further complicated by the fact that the VALI arm was fielded on Life in Australia™ and therefore the need for the various outcome rates discussed above still applies. In addition to the steps above, the nature of invitations to the VALI arm contain additional opportunities for non-response; specifically, the consent to participate in VALI sent in July 2022 and the need for panellists to select an appointment as a necessary prerequisite to completing an interview. To capture these additional layers of non-response, we therefore add a Consent Rate ($CONR$) and Appointment Rate ($APPR$). The Cumulative Response Rate ($CUMRR$) is therefore the product of these six rates:

$$CUMRR = RECR \times PROR \times CONR \times RETR \times APPR \times COMR$$

Consent to participate in VALI is shown in Table 20, final dispositions for appointments in Table 21, final dispositions for interviews in Table 22 and outcome rates in Table 23. The final dispositions used for appointments and interviews are analogous to those defined for other data collection modes in AAPOR (2016). Because the standard Life in Australia™ invitation and reminder schedule was used for appointment setting, refusals manifest at the appointment stage rather than the interview stage. At the interview stage, the primary form of non-response was missed appointments, where the panellist did not join the interview at the time they had selected. A final disposition of technical problems captures cases where the panellist attempted to participate but ran into various barriers, either technological ones or with ability to use technology.

The Cumulative Response Rate for the VALI arm was 1.0 per cent.

Table 20 Consent to participate in VALI

Outcome	n	%
Provided consent	2,340	31.9
Did not provide to consent	3,221	43.9
Did not respond to wave	1,779	24.2
Total	7,340	100.0

Table 21 Appointment dispositions for VALI

Code	Final disposition	n	%
1.1	Made appointment	715	51.1
2.111	Explicit refusal	168	12.0
2.12	Cancelled appointment	34	2.4
2.36	Physically or mentally unable/incompetent	1	0.1
2.39	Nothing ever returned	481	34.4
	Total	1,399	100.0

Table 22 Interview dispositions for VALI

Code	Final disposition2	n	%
1.1	Interview	600	83.9
2.12	Break-off	2	0.3
2.211	Missed appointment	101	14.1
2.212	Appointment outstanding at close of field	2	0.3
2.34	Technological problems	10	1.4
	Total	715	100.0

Table 23 Outcome rates for VALI

Code	Outcome rate	%
RECR	Recruitment Rate	11.0
PROR	Profile Rate	93.6
CONR	Consent Rate	31.9
RETR	Retention Rate	73.4
APPR	Appointment Rate	51.1
COMR	Completion Rate	83.9
CUMRR2	Cumulative Response Rate 2	1.0

CATI

Final dispositions and response rates for RDD surveys are shown in Table 24. Dispositions follow AAPOR (2016), where numeric codes are for dispositions and letter codes show summary dispositions, which are used in the calculation of response rates.[24] The mapping of case codes to final dispositions is shown in **Error! Reference source not found.**. A APOR Response Rate 3 (RR3; AAPOR 2016) was calculated for the RDD surveys in order to facilitate comparison with similar international studies.[25] The calculation of RR3 relies on estimating the proportion of cases of unknown eligibility that may have been eligible for the survey and including this estimate in the denominator for the calculation of the survey response rate. RR3 was calculated using the following formula from AAPOR (2020):

$$RR3 = \frac{I}{I + R + NC + O + e_1 \times e_2 \times UH + e_1 \times UO}$$

where the summary dispositions I, R, NC, O, UH and UO are as shown in **Error! R eference source not found.** and e_1 and e_2 are the percentage of known-residential cases estimated to have an eligible respondent and the percentage of unknown if residential cases that are estimated to be residential, respectively.[26] They are calculated following AAPOR (2020) as follows:

$$e_1 = \frac{I + R + NC + O}{I + R + NC + O + INR}$$

$$e_2 = \frac{I + R + NC + O + INR}{I + R + NC + O + INR + INNR}$$

where INR is the count of telephone numbers that are residential but ineligible for the survey (AAPOR codes 4.6–4.8) and $INNR$ is the count of telephone numbers that are non-residential (AAPOR Codes 4.1–4.5).

The RR3 for the high effort RDD survey was 7.7 per cent. This rate is comparable to similar national dual-frame RDD studies conducted by the Social Research Centre;

[24] As AAPOR (2016) has not promulgated standards for dispositioning SMS push-to-web surveys, it was necessary to reason by analogy from standards for internet surveys of specifically named persons and RDD telephone surveys. 3.19 nothing returned was adapted from dispositions of internet surveys of specifically named persons and used where there was no evidence of non-delivery and no reply. 3.21 no screener completed was used when eligibility could not be determined (e.g., refusals where age was unknown, SMS replies with *non sequiturs* and where the link had been clicked but no questions answered). 4.31 non-working number was used for hard bounces (i.e., undeliverable SMS). 4.5 non-residence is used for automated error messages sent by cellular modems in, for example, medical devices. Although AAPOR (2023) has subsequently released an updated edition of the Standard Definitions, AAPOR (2016) was current at the time.

[25] It is not possible to calculate response rates for the non-probability panels as the chances of being selected into a panel are not known (Tourangeau et al., 2013, p.38).

[26] The use of e_1 and e_2 follows AAPOR (2020).

RR3 for the low effort arm was 1.3 per cent. RR3 for SMS push-to-web was 3.0 per cent.

Table 24 Final dispositions and response rates for CATI and SMS push-to-web

Code	Disposition	CATI (high effort)		SMS push-to-web	
I	**Interview**	**498**	**5.6**	**599**	**3.0**
1.1	Complete	498	5.6	599	3.0
R	**Refusal and break-off**	**24**	**0.3**	**164**	**0.8**
2.112	Known respondent refusal	14	0.2	3	0.0
2.113	Implicit refusal	0	0.0	0	0.0
2.12	Break-off	10	0.1	161	0.8
NC	**Non-contact**	**21**	**0.2**	**0**	**0.0**
2.21	Respondent never available	14	0.2	0	0.0
2.221	Answering machine--message left	3	0.0	0	0.0
2.222	Answering machine--no message left	4	0.0	0	0.0
O	**Other**	**2**	**0.0**	**1**	**0.0**
2.32	Physically/mentally unable/incompetent	2	0.0	0	0.0
2.9	Miscellaneous	0	0.0	1	0.0
UH	**Unknown if housing unit**	**6,573**	**73.4**	**16,555**	**82.8**
3.12	Always busy	170	1.9	0	0.0
3.13	No answer	2,596	29.0	0	0.0
3.14	Answering machine--don't know if household	3,807	42.5	0	0.0
3.15	Call blocking	0	0.0	0	0.0
3.16	Technical phone problems	0	0.0	0	0.0
3.19	Nothing returned	0	0.0	16,555	82.8
UO	**Unknown, other**	**1,557**	**17.4**	**1,908**	**9.5**
3.21	No screener completed	1,557	17.4	1,908	9.5
INNR	**Not eligible, non-residential**	**108**	**1.2**	**737**	**3.7**
4.2	Fax/data line	1	0.0	0	0.0
4.31	Non-working number	30	0.3	715	3.6
4.5	Non-residence	0	0.0	21	0.1
4.51	Business, government, other	77	0.9	1	0.0
INR	**Ineligible, residential**	**175**	**2.0**	**36**	**0.2**
4.7	No eligible respondent	175	2.0	36	0.2
4.8	Quota filled	0	0.0	0	0.0
	Total	**8,958**	**100.0**	**20,000**	**100.0**
RR3	**Response Rate 3**		**7.7**		**4.0**
	Sample yield		**5.6**		**3.0**

Notes: Final dispositions and summary dispositions are defined by AAPOR (2016).

Table 25 Mapping of cases to final disposition

Summary disposition		Final disposition		Call outcome (eligibility)
I	Interview	1.1	Complete	Completed (eligible)
R	Refusal and break-off	2.112	Known respondent refusal	Refused age (eligible)
				Refused screening questions (eligible)
				Remove number from list (eligible)
				Respondent refusal (eligible)
				SMS refusal (eligible)
		2.113	Implicit refusal	Claims to have done survey (eligible)
		2.12	Break-off	Midway termination (eligible)
				Timed out or stopped (eligible)
NC	Non-contact	2.21	Respondent never available	Away for duration (eligible)
				Hard appointment (eligible)
				No answer (eligible)
				Not a residential number (eligible)
				Number disconnected (eligible)
				Soft appointment (eligible)
		2.221	Answering machine—message left	Answering machine – message left (eligible)
		2.222	Answering machine—no message left	Answering machine – no message left (eligible)
O	Other	2.32	Physically or mentally unable/incompetent	Too old/frail/ill (eligible)
				Unreliable respondent (eligible)
		2.9	Miscellaneous	Completed but removed (eligible)
UH	Unknown if household	3.12	Always busy	Engaged (unknown)
		3.13	No answer	No answer (unknown)
		3.14	Answering machine—unknown if household	Answering machine – message left (unknown)
				Answering machine – no message left (unknown)
		3.15	Call blocking	Incoming call restriction (unknown)
		3.16	Technical phone problems	Timed out or stopped (unknown)
		3.19	Nothing returned	SMS delivered but no response (unknown)
				SMS soft bounce but no response (unknown)
UO	Unknown, other	3.21	No screener completed	Away for duration (unknown)
				Claims to have done survey (unknown)
				Clicked SMS link, did not answer question (unknown)
				Hard appointment (unknown)
				ICS hard refusal (unknown)
				ICS refused all future surveys (unknown)
				ICS soft refusal (unknown)
				Hard appointment (unknown)
				Hold drop* (unknown)

Summary disposition		Final disposition		Call outcome (eligibility)
				Named person / organisation not known (unknown)
				Refused age (unknown)
				Refused screening questions (unknown)
				Remove number from list (unknown)
				Respondent refusal (unknown)
				SMS reply *non sequitur*† (unknown)
				SMS refusal (unknown)
				Soft appointment (unknown)
				SMS refusal (unknown)
				Too old / frail / ill (unknown)
				Unreliable respondent (unknown)
INNR	Not eligible, not residential	4.2	Fax/data line	Fax (unknown)
		4.31	Non-working number	Number disconnected (unknown)
				SMS hard bounce (unknown)
		4.5	Non-residence	Automated SMS error message (unknown)
		4.51	Business, government office, other organisations	Not a residential number (unknown)
INR	Not eligible, residential	4.7	No eligible respondent	LOTE – no follow-up (ineligible)
				Soft appointment (ineligible)
				Under 18 (ineligible)
		4.8	Quota filled	Over quota (eligible)

Notes: * Live person reached by the autodialler but not transferred to interviewer as none available. † Non-refusal replies to the SMS (e.g., describing the survey invitation as a scam and *non-sequitur* responses like '. M'). ‡ These are what appear to be automated messages sent by non-telephone uses of SIMs. Such replies included the following: '<ERROR>', 'MediMinderII v1.4' and '1.5' (MediMinder is an assistance device), 'message error', 'Something went wrong! We can't process your SMS. Reply from the phone you received the SMS or contact the sender directly. Call 1800 NNN for more info', 'The keyword you specified was not recognized', 'User code error' and 'We're sorry. We did not recognize that response. Please contact the business for help.'

Non-probability panels

Due to the incomplete information provided by the non-probability panels, we do not show AAPOR final dispositions or report response rates; see summary of available information in Table 26. Completion rates are calculated for Panels 2 and 3, which provide the total number of panellists invited (see Callegaro & DiSogra 2008).

Table 26 Non-probability panels: Invitations and outcomes

	Panel	Panel 2	Panel 3	Panel 4
Number invited	Unknown	8,952	11,070	Unknown
Number opened / clicked through	959	1,668	1,150	900
Screen-out	9	Unknown	Unknown	7
Quota full	18	Unknown	Unknown	11
Social Research Centre data quality removals	6	1	0	1
Number completed (excluding data quality removals)	850	852	891	853
Completion rate	N/A	9.5%	8.0%	N/A

Appendix 4: Updated OPBS benchmarks

As noted earlier, refer back to Section 2, the original OPBS was undertaken at the end of 2015, before the quinquennial Australian Census of Population and Housing in 2016. This meant comparisons were made to the quite dated 2011 benchmarks. The OPBS+ survey was undertaken in 2017, after some 2016 Census data had been released thereby allowing the more contemporaneous benchmarks to be used for the OPBS+ and for this study.

Table 27 Updated OPBS benchmarks

Benchmark	Citation	Website	Updated benchmark
b_birthplace	ABS (2016), Country of Birth of Person (BPLP) for ages 18 and up (AGEP) excluding external territories (GCCSA UR), [Census TableBuilder], accessed 20 April 2023.		Y
b_dailysmoke	ABS (2015), Daily smoker status (SMKDAILY) for ages 18 and up (AGE99), [National Health Survey TableBuilder], accessed 20 April 2023.		Y
b_drinkfreq	ABS (2015), Time since last had alcoholic drink (ALCQ02) for ages 18 and up (AGE99), [National Health Survey TableBuilder], accessed 20 April 2023.		Y
b_health	ABS (2015) 4364.0.55.001 – National Health Survey: First Results, 2014–15, ABS Website, accessed 21 April 2023.	4364.0.55.001 – National Health Survey: First Results, 2014-15 (abs.gov.au)	
b_income	ABS (2015) 4364.0.55.001 – National Health Survey: First Results, 2014–15, ABS Website, accessed 21 April 2023.		
b_k6	ABS (2015) 4364.0.55.001 – National Health Survey: First Results, 2014–15, ABS Website, accessed 21 April 2023.	4364.0.55.001 – National Health Survey: First Results, 2014–15 (abs.gov.au)	
b_lfs	ABS (2016), Labour Force Status (LFSP) for ages 18 and up (AGEP) excluding external territories (GCCSA UR), [Census TableBuilder], accessed 20 April 2023.		Y
b_lifesatisfaction	ABS (2014), General Social Survey: Summary Results, Australia, ABS Website, accessed 21 April 2023.	General Social Survey: Summary Results, Australia, 2014 | ABS (abs.gov.au)	

Appendix 5: Survey costs

The methods used to try and arrive at a position that enables survey costs to be calculated on a comparable basis both over time and between surveys conducted in the same year are set out below. The solutions we have settled upon are far from perfect, but we think are robust enough to support the drawing of broad conclusions about relative survey costs.

The cost ratios presented in Section 1.1 compare only the direct data collection costs for each survey at each point in time. Direct data collection costs include those relating to sample purchases, pre-survey contact, survey hosting, interviewing, supervision and field management fees and the fees charged to cover telephone costs. For those surveys conducted in-house by the Social Research Centre (i.e., all those other than the non-probability panels) the fee rate[27] not the cost rate is used in calculations. This enables a fairer comparison with the surveys (i.e., the non-probability online panels) purchased by the Social Research Centre from external suppliers. Where relevant we standardised the interview length over time to enable more accurate time series comparisons. This involves going back to original costing spreadsheets and adjusting the interview length parameter while holding all others constant. Different achieved sample are standardised by calculating fees on a per interview basis.

Given the number of assumptions implicit in this approach, the cost relativities presented in Section 1.1 are fairly rudimentary but, we think, nonetheless informative,

CATI 2015 and CATI 2022

The main cost drivers for the CATI surveys in 2015 and 2022 are shown below (Table 28). The fees included in the cost relativity calculations are those relating to sample purchases, pre-survey contact, interviewing, supervision and field management fees and the fees charged to cover telephone costs. It is not possible to isolate the costs for the refusal conversion interviews conducted in 2015, so, for the purposes of this comparison refusal conversion interviews are treated the same as regular interviews, even though this is unlikely to be the case (48 out of 601 interviews were converted refusals). Interview length is standardised for the time series comparison. This is done by adjusting the interview length cell in

[27] Cost plus profit margin.

survey fee calculator used for the 2015 study up from 9.5 to 18.3 minutes.

This provides a common basis for calculating the relative cost for the CATI surveys over time.

Table 28 Main cost drivers for the 2015 and 2015 CATI surveys

Design elements	2015	2022
Sample frame	Dual-frame RDD – 50:50 landline mobile split	Mobile RDD
Pre-notification	Landline – advance letters to addressed matched sample Mobile- Advance SMS	Advance SMS
Maximum non-contact call attempts	Landline – Max. non-contacts=6 Max non-contacts=3	Max. tries=6, Max. non-consecutive contacts=4
Voice messages left for unanswered calls	Yes	Yes
Reminder text messages to mobile phone numbers	No	Yes
Interviews completed	601	803
Median interview length	9.5 minutes	18.3 minutes
Refusal conversion calls	Yes	No
Language of interview	English only	English only

Life in Australia™ 2015 and Life in Australia™ 2022

Just as the fees for the CATI surveys only include those associated with purchasing and contacting the sample members and the direct data collection costs, so too the fees associated with deriving the price relativities for the OPBS+ and ACSSM Life in Australia™ surveys. No adjustment is made to standardise the time taken to complete the questionnaires used for the respective studies as the incentives paid to respondents remained constant. The fees taken into account to calculate a price for these surveys that is both comparable over time and comparable with the other sampling and survey modes used in the same year are;

Helpdesk operation, data collection/hosting surcharge, respondent incentives, fieldwork management, the CATI components as previously identified (covering interviewing, supervision and field management and the fees charged to cover telephone costs) and reminder activity consisting of emails, SMS and telephone follow-up.

Non-probability online panels 2015 and 2022

There was a change in the way this component of the studies was operationalised in 2022. In 2015, the panel companies were required to program the survey questionnaire and host it in within their own panel

environment and provide the Social Research Centre a data file and basic documentation. To enhance comparability across panel providers, in 2022 the Social Research Centre programmed the questionnaire and panel companies were simply required to email a link to their panellists directing them to the questionnaire which was hosted by the Social Research Centre. This had the effect of deflating the price paid for data collection by the non-probability online panel companies in 2022. Given that itemised costings were provided by all panel companies in 2015, the solution we adopted was to add an allowance to the 2022 non-probability panel providers' fees to cover survey hosting. This was done by reviewing the survey hosting fees charged in 2015, where itemised, and resulted in us applying a 15% mark-up to the 2022 fees charged by the non-probability panel providers. This is no more than an educated guess. This approach means that the adjusted fees calculated for the non-probability panel providers in 2022 are more directly comparable with the fees calculated for the other surveys in 2022 and, also, more comparable with the non-probability online panel prices paid in 2015.

VALI

The VALI questionnaire contained additional questions of interest to the ABS. This means that a fee adjustment is required to align the VALI costs with those of the other ACSSM surveys. The was done by adjusting the settings in the VALI budget spreadsheet to accommodate an average interview length of 10.9 minutes, refer back to Section 4.3, and applying the resultant proportional reduction in costs of 10% to the actual data collection costs incurred for VALI. As such, the adjusted cost ratios for VALI are based on the modal time taken by VALI respondents to complete the survey items common to all ACSSM surveys.

SMS push-to-web

The fees included in the SMS push-to-web survey cost comparisons are those relating to the purchasing of sample records, sending of bulk SMS messages and emails and payment of respondent incentives.

Appendix 6: Variables omitted from bias assessment

The following variables were excluded from the bias assessment:

- HELP. The question used a unique variation of the Likert scale within the General Social Survey, with the second and fourth response options of somewhat agree/disagree rather than simply agree/disagree; as asked in the ACSSM, the agree/disagree wording was used. The question was dropped from benchmarking as a result.
- HELP_MOVE and HELP_CARE. This block of questions omitted a question from the 2021 Census (Q28) on whether the person ever needs someone to help with, or be with them, for communications activities. As the Census disability measure includes communications, this prevented us from comparing results to Census disability statistics.
- HOMEOWNER. The question was intended to measure household tenure. The question stem used was 'Do you own outright, are you buying or renting the dwelling in which you now live?' The source item from the 2021 Census read 'Is this dwelling: owned outright, [etc.]' Looking at the verbatim responses to the other specify option, the reference to you rather than this dwelling was a red herring, with respondents reporting, for example, that they lived with their parents rent-free rather than on whether their parents owned outright, owned with a mortgage, or rented the dwelling.