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The Longitudinal Study of Australian Children

Evaluating mode effects in LSAC Wave 8

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Technical paper

The Longitudinal Study of Australian Children: LSAC Technical paper No. 29. Evaluating mode effects in LSAC Wave 8

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Glossary

Abbreviation	Term	Description
CATI	Computer-assisted Telephone Interview	Conducted by interviewer over telephone
CAPI/CAI	Computer-assisted Personal Interview	Face-to-face meeting with interviewer, survey programmed on tablet, mobile or computer device. Interviewer completes survey on device.
CASI	Computer-assisted Self-Interview	Face-to-face meeting with interviewer. Survey programmed on interviewer's tablet, mobile or computer device. The device given to respondent to complete independently.
CAWI	Computer-assisted Web Interview	Interviewer not present. Survey completed online.
F2F	Face-to-face	Face-to-face interview
LSAC	*Growing Up in Australia*: The Longitudinal Study of Australian Children	The name of this study
PAPI	Paper and Pencil Interview	Face-to-face meeting with interviewer, survey printed on paper
YP	Young person	Once the Study child reaches the age of 18, they are referred to as 'Young Person'.

Overview

Mixed modes of survey designs are common in longitudinal studies. Mixed-mode surveys may combine traditional ways of data collection, such as pen and paper questionnaires and telephone interviews, as well as newer methods including online or web-based instruments. Modes can differ in the level of involvement and presence of an interviewer, as well as the type of instrument used. Online surveys are typically completed by participants without an interviewer present, in contrast to modes involving face-to-face meetings. Researchers and survey administrators often modify methods of data collection within or across waves as studies progress to reduce costs, improve response rates and boost coverage of the population of interest.

Different modes of data collection can affect respondent engagement and answers to the same survey questions. Selection effects might occur where respondents with certain characteristics, such as lower socio-economic status, greater time constraints, or health difficulties, have a higher or lower likelihood of responding using one mode over another. Measurement error may arise where responses to an item differ depending on the mode of completion.

This paper examines differences in response patterns to wellbeing items asked in Wave 8 of *Growing Up in Australia*: The Longitudinal Study of Australian Children (LSAC). The study adopted a sequential design in that participants were first encouraged to respond via a computer-assisted web interview (CAWI), which allowed them to complete the survey online, in their own time and without an interviewer present. Then, in a follow-up contact attempt, those who did not respond using CAWI were asked to participate using computer-assisted web self-interview (CAWSI) in the home. CAWSI involved an in-home interview where adolescents independently completed the survey on a device handed to them by the interviewer.

The items examined concerned overall happiness, global health, the child health utility score, exercise, and sleep. The first aim was to determine whether the level of non-responses on each item varied between CAWI and CAWSI modes. The second aim was to examine selection effects and whether the sample of those who responded using CAWSI differed from the CAWI sample. Finally, we investigated measurement effects and whether responses given varied by mode.

Key messages

- Three-quarters of LSAC K cohort Wave 8 respondents (76.2%, *N* = 1,908) replied to the CAWI survey. The remainder (23.8%, *N* = 596) participated in the CAWSI follow-up.
- Differences between CAWI and CAWSI were minimal when it came to item non-response rates; both were low. Item non-response rates among individuals who responded using CAWI ranged from 0.10% for the overall happiness item to 3.67% on the number of days exercised. Rates on the CAWSI follow-up were zero, except for the days of exercise item, which had 0.67% missing responses.
- Different subgroups of the population – specifically, males and people living in regional or remote areas – were less likely to participate using CAWI and more likely to take part in the CAWSI follow-up.
- Individuals living in less disadvantaged neighbourhoods, with language other than English spoken at home or had at least one parent with a university degree were also more likely to respond via CAWI. They were, therefore, less likely to need to participate in the CAWSI follow-up.
- Whether CAWI or CAWSI was used made little difference to the responses provided for items for overall happiness, global health, exercise, and sleep quality and quantity, after accounting for selection effects.
- Individuals who responded via CAWSI had higher child health utility scores on average, compared with those who participated using CAWI. This measurement effect persisted after accounting for selection effects.

1 Introduction

Mixed-mode survey designs

A mixed-mode survey is defined as 'a survey in which two or more modes of data collection are used to collect the same data from different respondents' (Cernat & Sakshaug, 2021a). Modes can differ with respect to the level of interviewer involvement and the extent of computerisation (Groves et al., 2011; Jäckle, Gaia, & Benzeval, 2017). Different survey modes can be combined in longitudinal studies to achieve different goals (De Leeuw, 2005) and may be used either across individuals within one Wave or within individuals across multiple waves (Jäckle et al., 2017). Mixed-mode designs can reduce costs, improve data quality, increase response rates and improve sample composition (De Leeuw, 2005).

Table 1 summarises different data collection mode types used in *Growing Up in Australia*: The Longitudinal Study of Australian Children (LSAC). Modes used throughout the study varied by and within waves, primarily with respect to the nature of technology used and involvement of an interviewer. For example, pen and paper interviews (PAPI) were conducted using surveys printed on paper. Some were administered during a home face-to-face interview and others were completed after the interview and posted back by the respondent. Computer-assisted web interviews (CAWI) were completed online by respondents with no interviewer present, while computer-assisted web self-interviews (CAWSI) were completed by the respondent on a device (such as a laptop or tablet) but with an interviewer attending. Further details on LSAC and its study design are given below.

Table 1: Data collection modes in LSAC

Mode	Abbreviation	Description
Paper and Pencil Interview	PAPI	Survey printed on paper, completed either during the home face-to-face interview or afterwards and returned by respondent
Computer-assisted Telephone Interview	CATI	Conducted by interviewer over telephone
Computer-assisted Personal Interview	CAPI/CAI	Face-to-face meeting with interviewer, survey programmed on laptop. Interviewer completes survey on laptop.
Computer-assisted Self Interview	CASI	Face-to-face meeting with interviewer. Survey programmed on interviewer's laptop. Laptop given to respondent to complete survey independently
Computer-assisted Web Interview	CAWI	Interviewer not present. Survey completed online
Computer-assisted Web Self Interview	CAWSI	Same content as CAWI but completed at face-to-face meeting with interviewer. Laptop given to respondent to complete survey independently

Mixed-mode designs may introduce some forms of bias such as *selection effects* and *measurements effects*. *Selection effects* occur where the likelihood of response varies according to mode. The composition of the responding sample may change; it could become more representative of the population of interest (i.e. less biased) or, alternatively, bias could be introduced or exacerbated if subgroups of the population have differential response rates across modal types (Vannieuwenhuyze & Loosveldt, 2013). *Measurement effects* manifest during the response process and occur where different modes lead to different responses (Hox, Leeuw, & Klausch, 2017), such as where respondents interpret the same question differently, based on the mode. A mixed-mode design can give positive measurement effects – that is, improve the quality of measurement in some aspects of a survey (e.g. reduce interviewer bias if self-completion was used for sensitive questions) (Cernat & Sakshaug, 2021a; Jäckle et al., 2017; Mauz et al., 2018; Vannieuwenhuyze & Loosveldt, 2013). Negative measurement effects could occur where, for example, interviewer bias was introduced via face-to-face methods of data collection (Bowling, 2005).

There are challenges in separating selection effects and measurement effects as the two can be confounded (Vannieuwenhuyze & Loosveldt, 2013). Heterogeneity in responses could arise from differences in sample composition or differences in measurement error. For example, online surveys tend to attract younger respondents than traditional face-to-face interviews (this is the selection effect) but, additionally, online surveys tend to elicit more socially undesirable responses, introducing measurement error (Hox, Leeuw, & Klausch, 2017). However, there are methods available to help diagnose and disentangle them in survey data, including covariate adjustment, counterfactual approaches and multigroup methods (Hox, Leeuw, & Klausch, 2017).

Mixed-mode survey design in LSAC

LSAC provides unique insights into the individual, familial, social and environmental factors that shape the development of children growing up in contemporary Australia. It began with nationally representative samples at Wave 1 in 2004 and comprised two cohorts: the 'birth' or 'B' cohort who were aged 0–1 at that time (born between March 2003 and February 2004) and the 'kindergarten' or 'K' cohort, aged 4–5 (born between March 1999 and February 2000). This paper focuses on data collection in the K cohort.

Since Wave 1, data collection for the K cohort took place every two years and involved interviewers visiting the study child in their home to conduct interviews and assessments and record direct observations. However, as the study evolved over time, and technology along with it, modes of data collection also changed (see Mohal et al., 2022, for more information).

In Wave 8, respondents were encouraged to complete part of their interview online via CAWI prior to the home visit, with the incentive of making the interview at home shorter. For those who did not complete the online interview prior to the visit, the relevant modules were completed at the time of the interview, using CAWSI in the presence of the interviewer. In terms of modules, personal but non-sensitive questions were moved to CAWI, whereas sensitive questions reporting on drug use, suicidal ideation or other stigmatised behaviours were retained in CAWSI. This still provided respondents with greater opportunities for anonymity but the interviewer was present if they needed support. However, it is important to note that even though interviewers were instructed to do their own tasks (e.g. admin tasks) when the CAWSI was being completed, evidence suggests that interviewers can affect respondents' answers through their sheer presence, as well as their behaviours when overseeing the survey (Lavrakas, 2008). This could be especially true in LSAC because the interviewer might change at each Wave and as children become adolescents, their level of comfort with a new interviewer in the room might also change with changes in general social development.

Consequently, items from these modules were subject to potential mode effects including differential response rates, selection effects and measurement effects. Selection effects from the mode change could arise where respondents with certain characteristics, such as lower socio-economic status, greater time constraints, or health difficulties, were more or less likely to respond using one mode compared to the other. The presence of an interviewer for CAWSI but not CAWI might have introduced potential social desirability bias, a form of measurement error (Grimm, 2010), as well as recall bias if the interviewer affected the respondent's ability to remember past experiences or details.

Aims of this paper

This paper examines the possible impacts of the two different modes; that is, CAWSI and CAWI for Wave 8 K cohort participants on item response rates, sample composition/selection effects and measurement effects. The specific aims were to:

1. Determine whether the level of item non-response varied between the two survey modes at Wave 8.
2. Evaluate selection effects; that is, whether the sample of those who responded using CAWI differed from those who responded via CAWSI in terms of socio-demographic characteristics.
3. Investigate possible measurement effects and whether responses given using CAWSI at Wave 8 differed from those obtained via CAWI at the same wave.

2 Methods

Data

This paper uses data from the LSAC K cohort collected at Wave 8 in 2018 when respondents were aged 18–19 years. K cohort Wave 7 data are also used in relevant sections to make comparisons and to account for pre-existing patterns in analysing mode effects at Wave 8. The original sample at Wave 1 was selected from the Medicare Australia enrolment database using a two-stage stratified sampling design. In the first stage a sample of postcodes was selected, and in the second stage children (and their families) were selected from within those postcodes and invited to participate in the study. For more detailed information on the sampling procedures, refer to the Data User Guide (Mohal et al., 2022). The final sample size at Wave 1 was *N* = 4,983; at Wave 7, *N* = 3,089 and at Wave 8, *N* = 3,037 (61% of the Wave 1 sample).

We analyse responses given at Wave 8 to six measures (below). Responses obtained via CAWSI (*N* = 596) are compared to those from CAWI (*N* = 1,908). In all cases, data were collected from the Young Person. Throughout the study LSAC has collected data from various sources including the child's primary parent, secondary parents, carers and teachers of school-aged children but it is the adolescent responses that are the focus of this paper.

Measures

Table 2 summarises the measures included in this analysis. Indicators concerned aspects of wellbeing; four relating to health, happiness and exercise were asked via CASI in Wave 7, with two about sleep asked using CAI. In Wave 8, all could be answered either via CAWI or CAWSI depending on the respondent's mode. The wording of questions was the same irrespective of mode.

Table 2: Measures included in the analysis

Item/measure	Structure	Mode Wave 7	Mode Wave 8
Global health	Ordinal, 5 categories	CASI	CAWI or CAWSI
Overall happiness	Ordinal, 5-point Likert scale	CASI	CAWI or CAWSI
Child health utility scale	Continuous (score of 9 individual items, range 0–1)	CASI	CAWI or CAWSI
Physical activity: number of days each week with exercise of at least 30 minutes	Ordinal	CASI	CAWI or CAWSI
Sleep quality, sleep quantity	Two items, ordinal, four categories	CAPI/CAI	CAWI or CAWSI

Global health

Respondents were asked 'In general, how is your health?' Response options were 1 = Excellent; 2 = Very good; 3 = Good; 4 = Fair; 5 = Poor. Higher scores indicated poorer self-rated health.

Overall happiness

Respondents were asked 'How much do you agree or disagree with the following statement? In general, I am happy with how things are for me in my life right now.' Options were 1 = Strongly disagree; 2 = Disagree; 3 = Neither agree nor disagree; 4 = Agree; 5 = Strongly agree. Higher scores indicated greater happiness.

Child health utility scale

Using the Child health utility scale (Stevens, 2010), respondents were asked questions relating to their quality of life. Specifically, they were presented with the following stem: 'These questions ask about how you are today. For each question, read all the choices and decide which one is most like you today.' They were then asked to respond to 9 separate items, with each one relating to a different health domain (worry, sadness, pain, tiredness, annoyance, work, sleep, daily routine, and activities). Each item had 5 response options representing increasing degrees of severity within that domain. For example, the 5 response options for the 'worry' domain were 1 = I don't feel worried today; 2 = I feel a little bit worried today; 3 = I feel a bit worried; 4 = I feel quite worried today; 5 = I feel very worried today.

An overall quality of adjusted life years (QALY) scale score was derived for each respondent from their individual item responses. Possible scores ranged from 0 to 1, reflecting death to full health respectively (although the scaling algorithm allowed for negative scores). For detailed information on how the child health utility scale is scored see (Stevens, 2010).

Physical activity: days of exercise per week

Respondents were asked about their exercise habits with the following question: 'About how many days each week do you do at least 30 minutes of moderate or vigorous physical activity? This is all the time you spent in activities that increased your heart rate and made you breathe hard.' The responses were recorded as a number ranging from 1 to 7 days per week.

Sleep quality and quantity

Sleep quality was measured using an item that asked, 'During the last month, how well do you feel you have slept in general?' Response options were 1 = Very well; 2 = Fairly well; 3 = Fairly badly; 4 = Very badly.

Sleep quantity was assessed from a single item that asked, 'During the last month, do you think you usually got enough sleep?' Responses options were 1 = Plenty; 2 = Just enough; 3 = Not quite enough; 4 = Not nearly enough.

Analytical approach

Item response rates for the six wellbeing measures were compared between CAWSI and CAWI modes at Wave 8 (aim 1), and also with Wave 7, when the only available mode for the questions was CASI.

To examine selection effects (aim 2), we compared the attributes of individuals who responded via CAWSI with those who responded via CAWI in Wave 8. Pearson chi-square and t-tests were used to test for differences at the 5% level of significance. Additionally, invoking a covariate-adjusted modelling approach (Vannieuwenhuyze, Loosveld, & Molenberghs, 2014), a multivariate logistic regression was estimated to model the likelihood of response according to mode (binary dependent variable with CAWI = 1 and CAWSI = 0) with Wave 8 key socio-demographic factors as predictors. This model assumed selection effects were fully captured.

Aim 3 investigated measurement effects. For each of the six wellbeing outcomes we compared the distribution of responses between the CAWI and CAWSI samples. Pearson chi-square tests were used for categorical items (global health, overall happiness, physical activity, sleep quality, sleep quantity). T-tests with Bartlett's test for equal variance was used for the child health utility scale, which was a continuous measure. For each item that showed differences in responses across modes, we constructed a model that regressed a set of covariates on the relevant outcome, continuing with the covariate-adjusted approach to disentangling selection and measurement effects. These models assumed independence between the mode of data collection and the set of covariates used (Vannieuwenhuyze, Loosveld, & Molenberghs, 2014). The exact specification for each depended on the structure of the outcome variable in question and is stated in the results below.

Analysis was conducted using STATA 17.0.

3 Results

Aim 1: Item non-response by mode

Table 3 shows Wave 7 and Wave 8 non-response rates for each of the measures of interest, separated according to mode of interview. Non-response rates were low when collected in Wave 7 using CASI, at less than half a per cent across all measures.

At Wave 8, overall non-response remained low, although it was higher when collected using CAWI rather than CAWSI. This is in line with previous evidence that non-response tends to be higher in self-administered and self-directed modes compared to where an interviewer is present (Jäckle et al., 2017). All participants in the CAWSI group responded to the items of interest except for four individuals who did not report their number of days exercised (this was 0.67% of the CAWSI sample). Non-response rates among the CAWI group ranged from 0.10% on the overall happiness item to 3.67% on number of days exercised.

Table 3: Item non-response by mode of interview for the six wellbeing measures at Wave 7 and Wave 8

	Wave 7[1]		Wave 8			
	Missing responses CASI (*N* = 2,941)		Missing responses CAWSI (*N* = 596)		Missing responses CAWI (*N* = 1,908)	
Measure	***n***	**%**	***n***	**%**	***n***	**%**
Global health	6	0.20	0	0	44	2.31
Overall happiness	5	0.17	0	0	2	0.10
Child health utility scale	7 missing on 1 or more items	0.24 missing on 1 or more items	0	0	34 missing on 1 or more items	1.78 missing on 1 or more items
	13 missing on scale	0.44 missing on scale	1 missing on scale	0.17 missing on scale	5 missing on scale	0.26 missing on scale
Days of exercise	6	0.20	4	0.67	70	3.67
Sleep quality	7	0.24	0	0	46	2.41
Sleep quantity	7	0.24	0	0	43	2.25

Note: All asked via CASI at Wave 7 except sleep items via CAI.

Source: LSAC, K cohort, Waves 7 and 8

Aim 2: Examining selection effects

In this section we examine whether the sample who responded using CAWSI at Wave 8 had different characteristics or attributes from the sample that responded via CAWI. That is, who was more or less likely to respond using either method, or were there no discernible differences between the samples. Any differences in sample composition may, at least in part, explain heterogeneity in responses as explored when investigating measurement error (aim 3). Attributes studied included gender, Indigenous status, language spoken at home, parental education, parental and young person employment, and household structure. Young person caring activities were also included, as caring responsibilities might increase the pressure on a young person's time and could lead to the young person preferring a mode that allowed them more flexibility around when they could complete the survey.

Descriptive and bivariate analysis

In the first stage of analysis, the composition of the CAWSI and CAWI samples was compared using descriptive measures and bivariate Pearson chi-square and t-tests. Results are given in Appendix A. Briefly, tests conducted at the 5% level of significance showed that there were some demographic differences between the two samples. Those who responded via CAWSI had a higher level of disadvantage on average than the CAWI group in terms of their neighbourhood characteristics, with differences also seen with respect to parental education level and household composition.

Multivariate regression analysis

In the second stage a multivariate regression was estimated to model the likelihood of response according to mode (binary dependent variable with CAWI = 1 and CAWSI = 0) with Wave 8 socio-demographic factors as predictors. The model was fitted on a complete-cases basis in that only those with valid responses for all covariates were retained in the sample. The parental employment variables, in particular, had relatively large amounts of missing data, at around 13% on P1 employment status, 42% on P2 employment status, 28% on mother's and 47% on father's employment status. This results in an overall 40% missing on parental employment variable in two-parent households. Removing this variable from the model did not qualitatively change results. Due to collinearity with household structure and parent employment, the indicator of whether the young person lived away from the parental home was not included in the final model. Preliminary results (not shown) indicated it was not a significant predictor of mode.

Results in Table 4 show that males and those living in regional or remote areas had a lower likelihood of responding via CAWI, whereas those with a language other than English spoken at home or living in less disadvantaged neighbourhoods had a higher likelihood of responding via CAWI. Respondents with at least one parent with a university degree were also more likely to respond via CAWI. However, factors such as Indigenous status, parental employment, household structure and carer status were not significant in this model.

Table 4: Results from logistic regression model for likelihood of responding using CAWI compared to CAWSI

Variables	β (SE)
Male (ref = female)	0.472*** (0.065)
Aboriginal and Torres Strait Islander (ref.= not Indigenous origin)	0.661 (0.313)
Language other than English spoken at home	2.049** (0.590)
Living in regional or remote area (ref = living in major city)	0.691** (0.110)
Neighbourhood disadvantage based on SEIFA score (ref = lowest 25%)	
Middle 50%	1.223 (0.217)
Highest 25%	1.505* (0.337)
Lone-parent household	0.875 (0.615)
At least one parent has university degree	1.280* (0.181)
Parental employment (ref = Two parents – both employed)	
Single parent – employed	0.792 (0.574)
Two parents – one employed	0.481 (0.309)
No employed parent	0.914 (0.191)
Study child employed	0.826 (0.129)
Carer status and frequency of care (ref = Not a carer)	
Carer – provides care every day	1.686 (0.786)
Carer – provides care at least once a week	0.749 -0.196
Carer – provides care fortnightly or less	1.312 (0.417)
Observations	1,470
Pseudo R^2	0.0605

Notes: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$ and standard errors in parentheses.
Source: LSAC, K cohort, Wave 8

Aim 3: Investigating measurement error

Here we determined whether Wave 8 responses given using CAWSI differed significantly from those obtained via CAWI. Table 5 reports the difference in means and sample distributions between the two groups (i.e. those that responded via CAWSI vs those that responded via CAWI) for the 6 measures of interest. Multivariate regression analysis was conducted for measures where differences were found. In summary, results showed that the distribution of results varied by mode for overall happiness, child health utility score and number of days of exercise. However, after accounting for selection effects in the multivariate analysis, measurement effects persisted in the health utility score but not overall happiness or number of days of exercise. The CAWSI mode yielded higher levels of health scores compared with the CAWI, suggesting the presence of an interviewer in CAWSI might have introduced potential social desirability bias, a form of measurement error.

Global health

There was no significant difference in the distribution of responses to the global health item between the CAWI and CAWSI samples ($\chi^2_4 = 3.205, p = 0.524$). Irrespective of mode, around one-eighth of respondents indicated their health was 'Excellent', one-third were 'Good' and less than 3% 'Poor'.

Overall happiness

For the overall happiness measure, results indicated significant variation in the distribution of responses between the CAWI and CAWSI groups at Wave 8 ($\chi^2_4 = 40.3166, p < 0.001$). A higher proportion of respondents who used CAWSI selected 'strongly agree', 'neither agree nor disagree', or 'strongly disagree' compared to those who responded via CAWI.

Table 5: Distribution of responses to Wave 8 wellbeing items by mode of data collection

	CAWSI (%)	CAWI (%)	Test result[a]
Global health			
Excellent	12.3	12.8	$\chi^2_4 = 3.2054$ $p = 0.524$
Very good	37.1	39.0	
Good	33.9	34.3	
Fair	13.9	11.7	
Poor	2.9	2.2	
N	**596**	**1,864**	
Overall happiness			
Strongly disagree	5.7	2.2	$\chi^2_4 = 40.3166$ $p = 0.000$
Disagree	5.4	6.4	
Neither agree nor disagree	17.1	15.2	
Agree	42.3	53.4	
Strongly agree	29.5	22.9	
N	**596**	**1,906**	
Child health utility score			
Mean score	0.76	0.68	$t_{2496} = 6.9733$ $p < 0.000$ Bartlett's equal-variances test: $\chi^2_1 = 0.2265$ $p = 0.634$
N	**595**	**1,903**	
Number of days of exercise – 30 mins minimum			
0	9.8	11.3	$\chi^2_7 = 21.271$ $p = 0.003$
1	10.1	11.6	
2	12.7	16.9	
3	19.1	19.8	
4	13.5	14.2	
5	18.1	13.2	
6	6.9	6.5	
7	9.8	6.5	
N	**592**	**1,838**	

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	CAWSI (%)	CAWI (%)	Test result[a]
Sleep quality			
Very well	20	16.9	$\chi^2_3 = 3.4759$
Fairly well	56.9	58.3	$p = 0.324$
Fairly badly	19.1	21.1	
Very badly	4	3.7	
N	**596**	**1,862**	
Sleep quantity			
Very well	25.34	24.45	$\chi^2_3 = 5.6255$
Fairly well	40.94	37.59	$p = 0.131$
Fairly badly	24.5	29.44	
Very badly	9.23	8.53	
N	**596**	**1,865**	

Note: [a] Chi-square test for difference in response distribution across modes, with the exception of child utility, which tested for difference in means and equal variances.

Source: LSAC, K cohort, Wave 8

Child health utility scale

Results showed a statistically significant difference in means between the CAWI and CAWSI groups for the child health utility indictor. The CAWSI group reported higher health scores than the CAWI group on average ($t_{2496} = 6.973, p < 0.000$) but with similar variance ($Bartlett's\ test\ \chi^2_1 = 0.2265, p = 0.634$).

Number of days of exercise per week

There were significant differences in the distribution of responses between the CAWI and CAWSI groups for the number of days with at least 30 minutes of exercise ($\chi^2_7 = 21.271, p = 0.003$), with those who responded by CAWI typically reporting less days.

Sleep quality and quantity

No significant differences were found between the distribution of responses to the sleep quality ($\chi^2_3 = 3.4759, p = 0.324$) or sleep quantity ($\chi^2_3 = 5.6255, p = 0.131$) items for the different modal groups

Separating selection effects

For happiness, health utility scores and exercise items, evidence pointed to possible measurement effects with responses given using CAWI distributed differently to those obtained via CAWSI. However, differences could also be at least partly explained by selection effects, as the composition of the CAWI and CAWSI samples varied, as described earlier. To disentangle measurement from selection effects, we estimated a multivariate regression model for each of the three outcome measures (happiness, health utility score and days of exercise) using a predictor of mode indicator (1 = CAWI, 0 = CAWSI) and controlling for socio-demographic differences in the two samples. Wave 7 responses to outcome measures were also controlled for. These were collected using a single mode (CAWSI) and prior to selection into CAWSI or CAWI at Wave 8. The specific model formulation used for each outcome was informed by the structure of the outcome measure and statistical tests for model assumptions.

Overall happiness

To construct a multivariate model for overall happiness, the measure was restructured to 3 categories (rather than 5 as in earlier analysis): 1) Strongly disagree/disagree; 2) Neither agree nor disagree; 3) Agree/strongly agree. Combining categories in this way was necessary for convergence, due to the small number of respondents who replied, 'Strongly disagree' or 'Disagree'.

An ordered logit model was estimated, following confirmation that the parallel regression assumption was met using the Brant test. Model 1 in Table 6 was unadjusted whereas Model 2 controlled for Wave 7 differences in happiness scores and differences in the Wave 8 socio-demographic characteristics of the sample. Model 1

showed that mode impacted on the level of happiness reported, with those who responded via CAWI more likely to indicate higher overall happiness compared with those who used CAWSI. However, this effect was not found after adjustments were made in Model 2, suggesting that variation in happiness responses was not attributable to mode. Rather, differences were explained by the young person's employment status and previous happiness level measured at Wave 7, which was collected using CAWSI and was therefore not impacted by modal effects at that time (full results provided in Appendix C).

Table 6: Parameter estimates for ordered logit regression for predicting overall happiness

	Model 1 (unadjusted) β (SE)	Model 2 (adjusted) β (SE)
CAWI (ref = CAWSI)	0.240**	0.135
	(0.105)	(0.163)
N	2,502	1,375

Notes: β = estimated regression coefficient and SE = Standard errors *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, ref = reference category. Adjusted model covariates include Wave 7 overall happiness measure, sex, Indigenous status, main language spoken at home, remoteness area, neighborhood disadvantage, household structure, parental education, parental employment, Young Person employment, carer status (all measured at Wave 8).

Source: LSAC, K cohort, Waves 7 and 8

Child health utility scale

The child health utility scale was treated as a continuous score and a robust regression model was estimated. The measure was not normally distributed with heteroskedasticity present; however, inspection of predicted model residuals post estimation showed an acceptable distribution (see Appendix B).

Results from both unadjusted and adjusted models (Table 7) showed that scores of the child health utility scale differed by mode of data collection; those who completed scale items using CAWI reported a lower score than those who replied via CAWSI. Specifically, the child health utility score was 7 percentage points lower for the CAWI group in Model 1 (unadjusted) and around 4 percentage points lower in Model 2, after adjustments for socio-demographic measures and Wave 7 utility scores.

For other preference-based utility instruments used for adults, a commonly used norm is that a difference of 0.03 on the 0 to 1 death to full health scale is considered to be the minimum clinically important difference (Drummond, 2001). Given that LSAC respondents were aged 18–19 years at Wave 8, we can use this norm to interpret our CHU9D scale results. Thus, CAWI respondents reporting CHU9D scores that were 4 percentage points (a difference of 0.04) lower than those reported by CAWSI can be considered a clinically meaningful drop in child utility.

Table 7: Parameter estimates from robust regression model for child utility scale

	Model 1 (unadjusted) β (SE)	Model 2 (adjusted) β (SE)
CAWI (ref = CAWSI)	-0.074***	-0.042***
	(0.010)	(0.013)
N	2,498	1,369

Notes: β = estimated regression coefficient and SE = Standard errors, *$p < 0.05$, **$p < 0.01$, ***p < 0.001, ref = reference category. Adjusted model covariates include Wave 7 child utility score as well as sex, aboriginal status, main language spoken at home, remoteness area, neighborhood disadvantage, household structure, parental education, parental employment, Young Person employment and carer status (all measured at Wave 8).

Source: LSAC, K cohort, Waves 7 and 8

Days of exercise per week

An ordered logit model was estimated for the outcome variable of number of days per week with exercise of at least 30 minutes. The Brant test showed that the parallel regression assumption for this model was met. Results in Table 8 show the response patterns for this item did not differ by mode (Model 2), after adjustments were made for prior levels of exercise measured at Wave 7, and socio-demographic characteristics. Rather, heterogeneity in responses was explained by gender, remoteness area, parental and young person's employment, and household structure, as well as exercise levels measured at Wave 7, which were collected using CAWSI and were therefore not impacted by modal effects at that time (see full results in Appendix C).

Table 8: Parameter estimates for ordered logistic regression model with outcome of days per week with exercise of at least 30 minutes

	Model 1 (unadjusted) β (SE)	Model 2 (adjusted) β (SE)
CAWI (ref = CAWSI)	-0.312***	-0.143
	(0.083)	(0.125)
N	2,430	1,332

Notes: β = estimated regression coefficient and SE = Standard errors, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, ref = reference category. Adjusted model covariates include Wave 7 day of exercise (30 mins) measure as well as sex, Indigenous status, main language spoken at home, remoteness area, neighborhood disadvantage, household structure, parental education, parental employment, Young Person employment, carer status (all measured at W8).

Source: LSAC, K cohort, Waves 7 and 8

4 Summary and discussion

This paper examined differences in response patterns to 6 wellbeing items asked in Wave 8 for the K cohort. Specifically, the items and measures related to overall happiness, global health, the child health utility score, number of days of exercise, sleep quality and sleep quantity. Participants were encouraged to respond using a computer-assisted web interview (CAWI), which allowed them to complete the survey online, in their own time and without an interviewer present. Those who did not respond using CAWI were asked to participate in a computer-assisted self-interview (CAWSI). This involved an in-home interview where children independently completed the survey on a device handed to them by the interviewer.

The first aim was to determine whether the level of item non-response varied between CAWSI and CAWI modes. Overall, item non-response rates were low, although marginally higher when collected using CAWI, ranging between 0.10% on the overall happiness item to 3.67% on number of days exercised. Higher item non-response in web-based surveys relative to interviewer administered surveys is common (DeLeeuw, 2018; Goodman et al., 2022; Heerwegh & Loosveldt, 2008; Jäckle, Lynn, & Burton, 2015).

One likely explanation for differences in item non-response rates between modes could be the influence of the presence of an interviewer (Bowling, 2005; Jäckle et al., 2017). For example, evidence suggests that interviewers may encourage respondents to complete cognitive response questions carefully and, thus, may diminish the possibility of non-response (Daikeler & Bosnjak, 2020; McPherson, Smith-Lovin, & Cook, 2001). Similarly, some suggest that an interviewers' presence may create a sense of accountability (Hope, Campanelli, Nicolaas, Lynn, & Jäckle, 2014). In LSAC, even though interviewers were instructed to do their own tasks (e.g. admin tasks) when the CAWSI was being done, evidence suggests that interviewers could affect respondents' answers through their presence, as well as their manners when overseeing the survey (Lavrakas, 2008). Therefore, in a CAWI-based setting, elimination of accountability may allow respondents to rush through questions with minimal thought or perceived consequence, which may, in turn, impact data quality, including non-response rates. Interviewer effects might be present especially in LSAC where the interviewer might change every time and as children become adolescents over the course of the study, their level of comfort with a new interviewer/stranger in the room, plus with the content of the survey itself, might also change overtime with changes in their social development.

The second and third aims were to examine possible selection effects and measurement effects; that is, whether the sample of those who responded using CAWI differed from those who responded using CAWSI, and if responses given also varied. Males and those living in regional or remote areas were less likely to respond using CAWI and therefore more likely to need follow-up via CAWSI. Individuals who lived in less disadvantaged neighbourhoods, had at least one parent with a university degree, and those who spoke a language other than English at home had higher probability of participating in CAWI rather than in the CAWSI follow-up. These findings suggest that cultural values of linguistic diverse children, parental education and geographic factors may influence whether a respondent completes the CAWI ahead of the in-home interview. Cernat and Sakshaug (2021b) found that respondents who were partnered, highly educated and tech savvy were more likely to complete the web-based mode of a sequential mixed-mode longitudinal survey, compared with the face-to-face mode.

There was evidence that child health utility scores tended to be higher on average when CAWSI rather than CAWI was used, suggesting the presence of an interviewer might influence participant responses on this or other preference-based utility instruments. Such an effect was limited, however, and not found on the other measures

studied. Users of the child health utility data in Wave 8 may wish to account for and adjust analyses accordingly; for example, by including an indicator of data collection mode.

For survey methodologists, the question is not if LSAC should continue to use mixed methods for data collection but rather how best to design the mixed-method approach moving forward. The CAWI provides a cost-effective way to collect survey data; however, as demonstrated by our results, it is less likely to be completed by some hard-to-reach groups. One of the barriers to completing a web-based survey is access to internet and a computer. At Wave 8, the CAWI was only programmed for a desktop computer or laptop. Restricting future data collections to web-based surveys, particularly those that can only be completed on a computer, might exclude groups that do not have access to the necessary technology and those who are not computer literate (McCluskey & Topping, 2011). If CAWI were the only option available to participants, the sample would likely become biased, and LSAC would risk losing key demographic groups, rendering the sample less representative.

Similarly, while CAWSI was an effective follow-up mode, offering it as a main method of collection could discourage particular demographic groups from participating. Only providing CAWSI would also be prohibitively costly (particularly surveying in regional and remote areas) and restrictive for those who prefer to complete a survey privately and in their own time. In the context of LSAC, by undertaking the CAWSI during the in-home interview, it increased the time spent with the interviewer, which has implications for cognitive load (increased survey content in one sitting) and an increased financial and time burden for those with family, work or other commitments. Using a mixed-mode approach, with CAWSI targeting non-responders to CAWI, is preferred for increasing response rates, improved data quality and better population coverage. Consequences in terms of measurement effects are likely to be minimal, at least on the measures studied here.

The results on mode effects presented in this paper should be interpreted with some caveats. It was assumed that the socio-demographic factors included in the regression models captured all possible selection effects but that may not be the case. It was also assumed, in the assessment of measurement effects, that mode of data collection was independent of that set of socio-demographic covariates. It is not possible to empirically test the viability of these assumptions but if they were not to hold, measurement and selection effects would confound and remain inseparable (Vannieuwenhuyze, Loosveldt, & Molenberghs, 2014). Surveying study participants on preferred mode, including the use of different types of internet-enabled devices, is one way forward to better understanding modal preferences and participation and would facilitate further research in this field.

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Appendix A: Bivariate analysis for aim 2

Examining selection effects

Possible selection effects (aim 2) were investigated at the preliminary stage by examining the descriptive differences in key socio-demographic characteristics of the two survey groups (i.e. those who responded via CASI versus via CAWI) in Wave 8. Covariates chosen are assumed to be free from measurement effects. Pearson chi-square and t-tests were used to test for differences at the 5% level of significance.

Demographic characteristics

At Wave 8, the indicator for socio-economic position was not available and the household income variable had a large number of missing responses (around 40%). Consequently, parental education, parental employment, and neighbourhood disadvantage were used as proxy measures for household socio-economic position. It is important to include these as 86% of 18–19 year olds were still living in their parental home at the time of the interview.

Results in Table 4 show that at Wave 8, respondents in the CASI group were more likely than those in the CAWI group to identify as male, as Aboriginal and Torres Strait Islander, live in regional or remote areas, live in more disadvantaged neighbourhoods, and have parents without a university degree. They were also more likely to live with one parent and have parents who are less likely to be employed compared with the CAWI group. No group differences were observed between the CASI and CAWI respondents for young person employment over the last 12 months or for time spent caring for someone.

These results suggest that digital access might still be an issue for certain types of respondents, such as those in lower socio-economic positions, hence presenting an argument for providing different response options to different types of survey participants.

Table A1: Socio-demographic characteristics of CASI and CAWI at Wave 8

	CASI	CAWI	Test of significance
Sex			
Male	61.74	45.44	$\chi^2_1 = 48.3011$
Female	38.26	54.56	$p = 0.000$
N	**596**	**1,908**	
Indigenous status: Aboriginal and Torres Strait Islander			
Yes	4.19	1.36	$\chi^2_1 = 18.2355$
No	95.81	98.64	$p = 0.000$
N	**596**	**1,907**	
Main language other than English spoken at home			
Yes	z	11.41	$\chi^2_1 = 9.8519$
No	93.09	88.59	$p = 0.002$
N	**593**	**1,902**	
Young Person lives away from parental home			
Yes	16.19	13.12	$\chi^2_1 = 2.5473$
No	83.81	86.88	$p = 0.060$
N	**593**	**1,882**	

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	CASI	CAWI	Test of significance
Remoteness area (ABS)			
Major city	60.29	70.72	$\chi^2_1 = 18.9058$ $p = 0.000$
Regional or remote	39.71	29.28	
N	**486**	**1,663**	
Parental education: University degree			
Yes	30.62	42.7	$\chi^2_1 = 24.3125$ $p = 0.000$
No	69.38	57.3	
N	**518**	**1,780**	
Household composition			
Two parents	76.34	84.34	$\chi^2_1 = 16.5355$ $p = 0.000$
One parent	23.66	15.66	
N	**486**	**1,609**	
Neighbourhood relative Socio-Economic Advantage-Disadvantage (SEIFA)			
Lowest 25%	29.53	19.46	$\chi^2_2 = 44.2383$ $p = 0.000$
Middle 50%	51.68	49.9	
Highest 25%	18.79	30.64	
N	**596**	**1,906**	
Parental employment			
Single parent – employed	23.38	15.49	$\chi^2_2 = 23.1035$ $p = 0.000$
Two parents – both employed	56.92	68.19	
Two parents – one employed	12.0	12.59	
No parent employed	7.69	3.73	
N	**325**	**1,207**	
Young Person current employment status			
Not employed	26.52	28.14	$\chi^2_1 = 0.5879$ $p = 0.443$
Employed	73.48	71.86	
N	**592**	**1,880**	
Carer status and frequency of care			
Not a carer	85.02	85.06	$\chi^2_3 = 2.7717$ $p = 0.428$
Carer – provides care every day	3.54	3.35	
Carer – provides care at least once a week	6.57	5.32	
Carer – provides care fortnightly or less	4.88	6.27	
N	**594**	**1,881**	

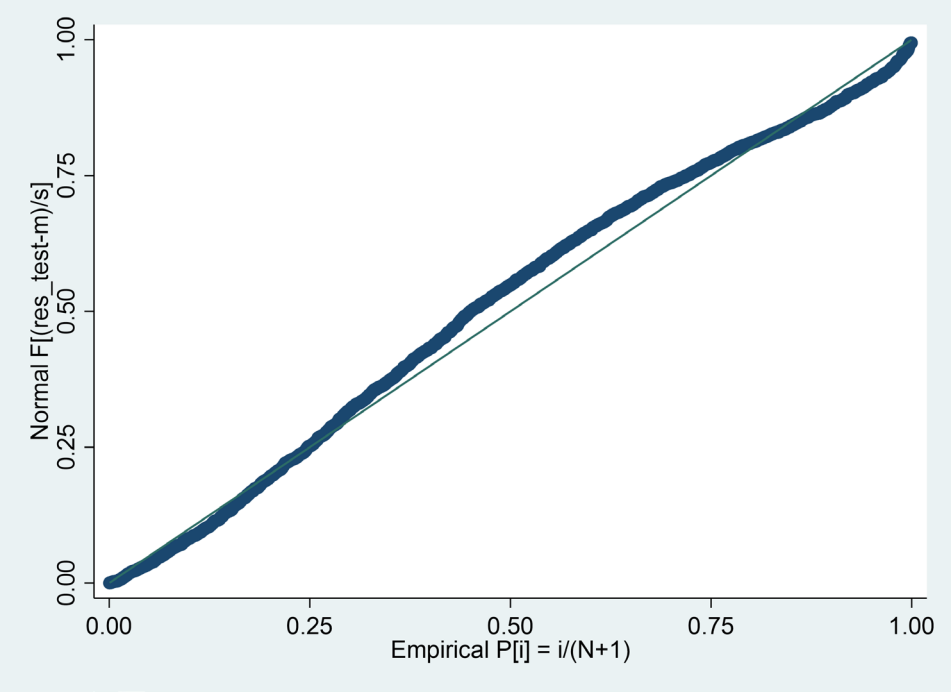
Notes: Two parents include non-biological parents. Caring for some was defined as 'Do you help someone who has a long-term health condition, has a disability or is elderly, with activities that they would have trouble doing on their own.'

Source: LSAC, K cohort, Wave 8

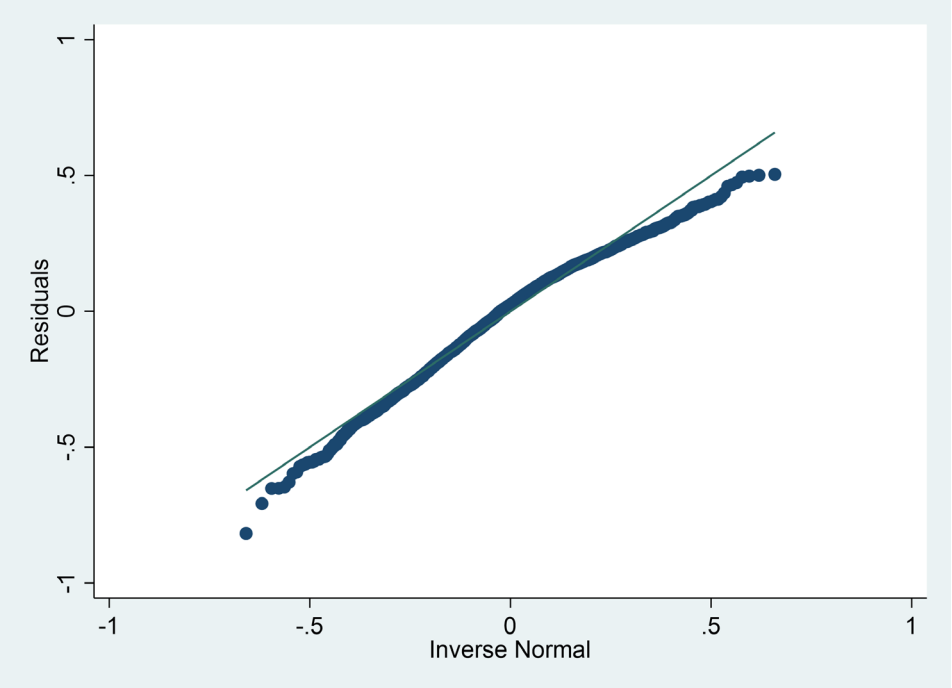
Appendix B

Figure B1: Distribution of residuals for regression of the child utility scale with control variables

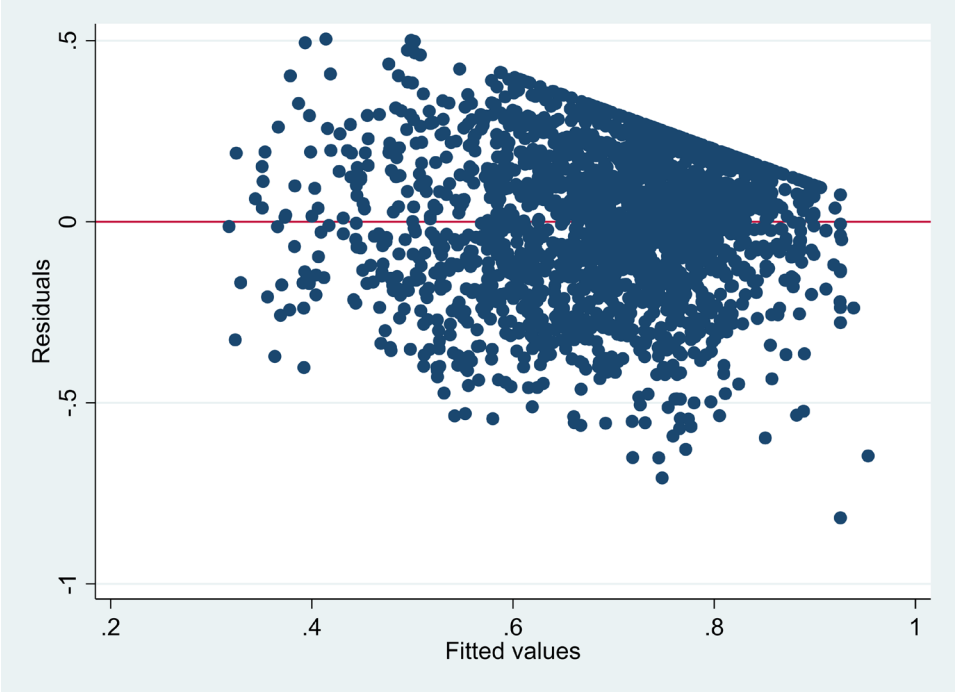
Standardised normal probability plot



Quantiles of residuals against quantiles of the normal distribution



Residuals against the fitted values of the dependent variable



Appendix C

Table C1: Full results parameter estimates for ordered logit regression for predicting overall happiness

Variables	Model 1 (unadjusted) β (SE)	Model 2 (adjusted) β (SE)
CAWI Online (ref = CASI at interview)	0.240**	0.135
	(0.105)	(0.163)
Happy with how things are in my life (Wave 7)		0.577***
		(0.083)
Socio-demographics		
Sex (ref = Female)		0.089
		(0.133)
Indigenous status (ref = Non-indigenous)		0.577
		(0.595)
Language other than English spoken at home		-0.048
		(0.220)
Living in regional or remote area (ref = Major city)		0.155
		(0.164)
Relative neighbourhood disadvantage: SEIFA score (ref = Bottom 25%)		
Middle 50%		0.158
		(0.182)
Highest 25%		0.318
		(0.219)
Lone-parent household		-14.118
		(563.841)
At least one parent has university degree		0.209
		(0.138)

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Variables	Model 1 (unadjusted) β (SE)	Model 2 (adjusted) β (SE)
Parental employment (ref = Two parents – both employed)		
Single parent – employed		13.761 (563.841)
No employed parent		13.909 (563.841)
Two parents – one employed		-0.058 (0.196)
Study child employed		0.605*** (0.140)
Carer status and frequency (ref = Not a carer)		
Carer – provides care every day		-0.183 (0.347)
Carer – provides care at least once a week		-0.266 (0.268)
Carer – provides care fortnightly or less		0.137 (0.296)
/cut1	-2.117*** (0.103)	-0.104 (0.331)
/cut2	-0.930*** (0.090)	1.075*** (0.330)
Observations	**2,502**	**1,375**

Notes: β = estimated regression coefficient and SE = standard errors, *p < 0.05, **p < 0.01, ***p < 0.001, ref = reference category; /cut1 – this is the estimated cut point on the latent variable used to differentiate respondents with 'Strongly disagree/disagree' response from 'Neither agree nor disagree' and 'Agree/strongly agree' response when values of the predictor variables are evaluated at zero; cut2 – this is the estimated cut point on the latent variable used to differentiate respondents with 'Strongly disagree/disagree' and 'Neither agree nor disagree' response from 'Agree/strongly agree' response when values of the predictor variables are evaluated at zero.

Source: LSAC, K cohort, Waves 7 and 8

Table C2: Full results parameter estimates for linear regression for predicting child utility score

Variables	Model 1 (unadjusted) β (SE)	Model 2 (adjusted) β (SE)
CAWI Online (ref = CASI at interview)	-0.074*** (0.010)	-0.042*** (0.013)
Child Health Utility 9D – Wave 7		0.503*** (0.028)
Socio-demographics		
Sex (ref = Female)		0.023** (0.011)
Indigenous status (ref = Non-indigenous)		0.043 (0.041)
Language other than English spoken at home		0.001 (0.017)
Living in regional or remote area (ref = Major city)		0.027** (0.013)

Table continued over page →

Variables	Model 1 (unadjusted) β (SE)	Model 2 (adjusted) β (SE)
Relative neighbourhood disadvantage: SEIFA score (ref = Bottom 25%)		
Middle 50%		-0.000 (0.015)
Highest 25%		-0.006 (0.017)
Lone-parent household		-0.086 (0.085)
At least one parent has university degree		-0.026** (0.011)
Parental employment (ref = Two parents – both employed)		
Single parent – employed		0.057 (0.087)
No employed parent		0.020 (0.080)
Two parents – one employed		-0.005 (0.015)
Study child employed		0.028** (0.012)
Carer status and frequency (ref = Not a carer)		
Carer – provides care every day		-0.034 (0.035)
Carer – provides care at least once a week		-0.034 (0.024)
Carer – provides care fortnightly or less		-0.007 (0.021)
Observations	**2,498**	**1,369**
R-squared	**0.019**	**0.282**

Notes: β = estimated regression coefficient and SE = standard errors, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, ref = reference category.

Source: LSAC, K cohort, Waves 7 and 8

Table C3: Full results parameter estimates for ordered logistic regression model with outcome of days per week with exercise of at least 30 minutes

Variables	Model 1 (unadjusted) β (SE)	Model 2 (adjusted) β (SE)
CAWI online (ref = CASI at interview)	-0.312*** (0.083)	-0.143 (0.125)
Days per week exercise 30 min Wave 7		0.391*** (0.025)
Socio-demographics		
Sex (ref = Female)		0.371*** (0.100)
Indigenous status (ref = Non-indigenous)		0.208 (0.427)
Language other than English spoken at home		-0.019 (0.162)

Table continued over page →

Variables	Model 1 (unadjusted) β (SE)	Model 2 (adjusted) β (SE)
Living in regional or remote area (ref = Major city)		0.240* (0.123)
Relative neighbourhood disadvantage: SEIFA score (ref = Bottom 25%)		
Middle 50%		0.104 (0.142)
Highest 25%		0.252 (0.166)
Lone-parent household		-1.582** (0.747)
At least one parent has university degree		-0.144 (0.103)
Parental employment (ref = Two parents – both employed)		
Single parent – employed		1.628** (0.760)
No employed parent		0.913 (0.693)
Two parents – one employed		-0.174 (0.151)
Study child employed		0.213* (0.112)
Carer status and frequency (ref = Not a carer)		
Carer – provides care every day		-0.112 (0.288)
Carer – provides care at least once a week		0.159 (0.207)
Carer – provides care fortnightly or less		-0.043 (0.216)
/cut1	-2.344*** (0.093)	-0.897*** (0.227)
/cut2	-1.498*** (0.082)	0.026 (0.221)
/cut3	-0.727*** (0.077)	1.035*** (0.221)
/cut4	0.073 (0.075)	2.032*** (0.226)
/cut5	0.695*** (0.077)	2.818*** (0.231)
/cut6	1.589*** (0.084)	3.801*** (0.241)
/cut7	2.309*** (0.099)	4.608*** (0.255)
Observations	**2,430**	**1,332**

Notes: β = estimated regression coefficient and SE= standard errors, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. ref = reference category; /cut1 – this is the estimated cut point on the latent variable used to differentiate respondents' 1 day of exercise response from more than 1 day of exercise response when values of the predictor variables are evaluated at zero; /cut2 – this is the estimated cut point on the latent variable used to differentiate respondents with '1 and 2 days of exercise response from more than 2 days of exercise when values of the predictor variables are evaluated at zero; and so on.

Source: LSAC, K cohort, Waves 7 and 8