

Supplementary File

Table S1. STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Pg #
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5-6
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	
		<i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls	6
		<i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed	
		<i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7-8
Data sources/measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7-8, <i>Supplementary table 1.</i>

Bias	9	Describe any efforts to address potential sources of bias	8-9
Study size	10	Explain how the study size was arrived at	7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8, Supplementary Table 1.
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	8-9
		(b) Describe any methods used to examine subgroups and interactions	8-9
		(c) Explain how missing data were addressed	
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed	
		<i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed	
		<i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	5
		(e) Describe any sensitivity analyses	8, Supplementary tables 2-3
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9
		(b) Give reasons for non-participation at each stage	9
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1.
		(b) Indicate number of participants with missing data for each variable of interest	
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	Table 1.
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence	Supplementary file.

		interval). Make clear which confounders were adjusted for and why they were included	
		(b) Report category boundaries when continuous variables were categorized	Supplementary table 1.
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	11-12, Supplementary file
Discussion			
Key results	18	Summarise key results with reference to study objectives	12
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	15-16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	17
Generalisability	21	Discuss the generalisability (external validity) of the study results	17
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Declarations

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

Table S2. Details and construction for each variable used in the analysis.

Variable	Question on survey	Description	Survey component	Variable name in HILDA dataset	Variable operationalisation for analysis	Categories	Reference
Identifier Variable							
Person ID	NQ-Recorded by interviewer	Person ID	HF	_xwaveid			
Outcome Variables							
Loneliness	• People don't come to visit me as often as I would like • I often need help from other people but can't get it • I often feel very lonely	Loneliness experienced by participants	SCQ	_lssupv _lssupnh _lssupvl	Individual responses for each question were recorded on Likert scales of 1-7 with 1 representing strongly disagree and 7 representing strongly agree. We classified people who were lonely to have a median score of ≥ 4 .	1=lonely 2=not lonely	Scale used by Lim, Manera et al. (2023)
Social Isolation	• There is someone who can always cheer me up when I'm down • I enjoy the time I spend with the people who are important to me • When somethings on	Social isolation experienced by participants	SCQ	_lssupcd _lssupi _lssuptp _lssupsh	Individual responses for each question were recorded on Likert scales of 1-7 with 1 representing strongly disagree and 7 representing strongly agree. We classified people who were socially isolated to have a median score of ≤ 4 .	1=isolated 2=not isolated	Scale used by Lim, Manera et al. (2023)

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	my mind, just talking with the people I know can make me feel better • When I need someone to help me out, I can usually find someone						
Independent Variable							
Hidden workforce	• Current labour force status (derived variable) • Even though you are not looking for work now, would you like a job? (Assume that suitable child care arrangements could be found.) • You have said that (currently) you usually work fewer than 35 hours per week. What is the main reason for your working part-	Hidden workforce status	PQ	_esdtl _nlwantj _jbptrea	In work if Employed FT, Employed PT, Employed, but usual hours worked unknown. Underemployed hidden worker if Employed PT & Caring for children; Caring for disabled or elderly relatives [not children]; Other personal or family responsibilities; Could not find full-time work; or Welfare payments or pension may be affected by working full time. Unemployed hidden worker if Unemployed, looking for FT work or Unemployed, looking for PT work	0=In work 1=Underemployed hidden worker 2=Unemployed hidden worker 3=Discouraged worker 4=Does not want work 5=Other	

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	time hours rather than full-time hours?				Does not want work if Not in the labour force, marginally attached or Not in the labour force, not marginally attached & Doesn't want to work Discouraged worker if Not in the labour force, marginally attached or Not in the labour force, not marginally attached & Wants to work or Maybe wants to work Other if Not in the labour force, marginally attached or Not in the labour force, not marginally attached & missing data for nlwantj		
Covariates							
Age	Year of Birth	Age of participant in years at last birthday	PQ	_hgage			
Gender	NQ- Recorded by interviewer	Gender of participant (limited to male or female)	HF	_hgsex	Categories provided by the HILDA data custodians, which were male and female. There was no 'other' option provided in the HILDA survey.	1=Male 2=Female	

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Marital Status	- Current marital status - Currently living with someone in a relationship	Marital status of participant	PQ	_mrcurr	Categories provided by the HILDA data custodians.	1=legally married 2=de facto 3=separated 4=divorced 5=widowed 6= never married and not de facto	
Self-Assessed Health	In general, would you say your health is: excellent, very good, good, fair, poor	Participant's self-rated health	SCQ	_gh1	Categories provided by the HILDA data custodians.	1=Excellent 2=Very Good 3=Good 4=Fair 5=Poor	
Level of Educational Obtainment	- Age left school - Highest education level achieved. - Highest year of school completed (excludes equivalents obtained post-school)/currently attending - Number of qualifications obtained since leaving school	Highest level of educational obtainment at the time of the survey	PQ	_edagels _edhigh1	Highest education level achieved (_edhigh1) was collapsed into 4 categories denoting tertiary level education (including postgrad, grad diploma and bachelors or honours), trade certificate (including those completing an adv diploma and a cert III or IV), high school certificate (those who completed year 12), and did not finish high school (those who achieved year 11 or below). A fifth category was included for those still in school, given our young sample, which	1=Tertiary level educated 2=Trade certificate 3=High school certificate 4=Did not finish high school 5=Still in school	

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					was determined using '_edage'.		
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Note: NQ- No question, SCQ- Self-Complete Questionnaire, PQ- Person Questionnaire, HQ- Household Questionnaire, HF-Household Form, FT-Full Time, PT-Part Time.

Lim, M. H., K. E. Manera, K. B. Owen, P. Phongsavan and B. J. Smith (2023). "The prevalence of chronic and episodic loneliness and social isolation from a longitudinal survey." Scientific Reports **13**(1): 12453.

Table S3. Full matrix of pairwise differences in adjusted predicted probabilities of loneliness and social isolation between labour force attachment categories.

Contrast	Difference (pp)	SE (pp)	95% CI (pp)	CI excludes 0
<i>Loneliness</i>				
Underemployed hidden worker vs In work	10.7	5.70	-0.5 to 21.9	No
Unemployed hidden worker vs In work	12.6	7.50	-2.2 to 27.3	No
Discouraged worker vs In work	11.7	4.12	3.6 to 19.8	Yes
Does not want work vs In work	3.4	2.76	-2.0 to 8.8	No
Other vs In work	-0.6	10.63	-21.5 to 20.2	No
Unemployed hidden worker vs Underemployed hidden worker	1.9	9.18	-16.2 to 19.9	No
Discouraged worker vs Underemployed hidden worker	1.0	6.68	-12.1 to 14.2	No
Does not want work vs Underemployed hidden worker	-7.3	6.05	-19.2 to 4.6	No
Other vs Underemployed hidden worker	-11.3	11.83	-34.6 to 11.9	No
Discouraged worker vs Unemployed hidden worker	-0.8	8.44	-17.4 to 15.7	No
Does not want work vs Unemployed hidden worker	-9.2	7.87	-24.6 to 6.3	No
Other vs Unemployed hidden worker	-13.2	12.65	-38.0 to 11.7	No
Does not want work vs Discouraged worker	-8.3	4.33	-16.8 to 0.2	No
Other vs Discouraged worker	-12.3	11.66	-35.3 to 10.6	No
Other vs Does not want work	-4.0	10.81	-25.3 to 17.2	No
<i>Social isolation</i>				
Underemployed hidden worker vs In work	-3.3	3.54	-10.2 to 3.7	No
Unemployed hidden worker vs In work	3.0	4.37	-5.6 to 11.6	No
Discouraged worker vs In work	3.1	2.52	-1.8 to 8.1	No
Does not want work vs In work	6.6	2.43	1.8 to 11.3	Yes
Other vs In work	-1.1	6.41	-13.7 to 11.5	No
Unemployed hidden worker vs Underemployed hidden worker	6.2	5.56	-4.7 to 17.2	No
Discouraged worker vs Underemployed hidden worker	6.4	4.12	-1.7 to 14.4	No
Does not want work vs Underemployed hidden worker	9.8	3.97	2.0 to 17.6	Yes
Other vs Underemployed hidden worker	2.2	7.35	-12.3 to 16.6	No
Discouraged worker vs Unemployed hidden worker	0.1	4.98	-9.6 to 9.9	No
Does not want work vs Unemployed hidden worker	3.6	4.97	-6.2 to 13.4	No
Other vs Unemployed hidden worker	-4.0	7.70	-19.2 to 11.1	No
Does not want work vs Discouraged worker	3.5	3.15	-2.7 to 9.6	No
Other vs Discouraged worker	-4.2	6.55	-17.1 to 8.7	No

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Other vs Does not want work	-7.6	6.86	-21.1 to 5.8	No
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Note: Pairwise differences in adjusted predicted probabilities (expressed in percentage points) derived from survey-weighted logistic regression models adjusted for age, gender, marital status, self-rated health, and educational attainment, among Australians aged 50–64 years (HILDA Wave 22, 2022). Confidence intervals are unadjusted, Wald-based 95% intervals computed using the pwcompare command in Stata. The right-most column indicates contrasts for which the 95% confidence interval excludes zero. Inference is based on the magnitude and precision of estimated differences rather than on hypothesis testing of individual contrasts. CI = confidence interval; pp = percentage points; SE = standard error.

Table S4. Fully adjusted logistic regression model of loneliness and social isolation among Australians aged 50-64 years.

Variable	Loneliness AOR	Loneliness 95% CI	Loneliness p-value	SI AOR	SI 95% CI	SI p-value
Hidden worker status (Ref: In work)						
Underemployed hidden worker	1.68	1.00 - 2.81	0.050	0.69	0.27 - 1.72	0.420
Unemployed hidden worker	1.82	0.94 - 3.54	0.076	1.31	0.63 - 2.73	0.464
Discouraged worker	1.75	1.21 - 2.54	0.003	1.33	0.87 - 2.04	0.190
Don't want work	1.19	0.91 - 1.56	0.212	1.74	1.22 - 2.48	0.003
Other	0.97	0.32 - 2.90	0.952	0.89	0.22 - 3.56	0.871
Age (years)	0.98	0.95 - 1.00	0.057	1.00	0.96 - 1.03	0.897
Gender (Ref: Male)						
Female	0.87	0.72 - 1.06	0.180	0.48	0.37 - 0.61	<0.001
Marital status (Ref: Partnered)						
Separated/divorced	2.12	1.64 - 2.76	<0.001	1.75	1.25 - 2.47	0.001
Widowed	2.93	1.66 - 5.16	<0.001	0.97	0.43 - 2.18	0.945
Never married and not de facto married	1.80	1.33 - 2.44	<0.001	1.75	1.19 - 2.59	0.005
Self-rated health (Ref: Excellent)						
Very good	0.96	0.59 - 1.56	0.863	1.37	0.64 - 2.91	0.416
Good	1.67	0.99 - 2.81	0.056	2.33	1.09 - 5.00	0.030
Fair	2.89	1.69 - 4.92	<0.001	4.10	1.89 - 8.92	<0.001
Poor	4.78	2.45 - 9.34	<0.001	4.69	1.84 - 11.91	0.001
Education (Ref: Tertiary)						
Trade certificate	1.26	0.98 - 1.61	0.068	1.16	0.78 - 1.72	0.461
High school	1.15	0.80 - 1.66	0.454	1.34	0.82 - 2.20	0.247
Did not finish high school	1.54	1.16 - 2.03	0.002	1.38	0.91 - 2.07	0.126

Note: SI- Social Isolation; AOR- Adjusted odds ratio; CI- Confidence Interval.

Table S5. Fully adjusted linear regression model of loneliness and social isolation among Australians aged 50-64 years

Variable	Loneliness β	Loneliness SE	Loneliness p-value	SI β	SI SE	SI p-value
Hidden worker status (Ref: In work)						
Underemployed hidden worker	0.56	0.20	0.007	-0.141	0.127	0.270
Unemployed hidden worker	0.76	0.29	0.010	-0.427	0.223	0.056
Discouraged worker	0.51	0.17	0.002	-0.125	0.103	0.226
Don't want work	0.13	0.10	0.194	-0.190	0.084	0.024
Other	-0.09	0.35	0.803	0.015	0.217	0.947
Age (years)	-0.02	0.01	0.015	0.002	0.007	0.807
Gender (Ref: Male)						
Female	-0.18	0.08	0.033	0.463	0.051	<0.001
Marital status (Ref: Partnered)						
Separated or divorced	0.77	0.16	<0.001	-0.194	0.091	0.033
Widowed	1.01	0.27	<0.001	0.080	0.149	0.591
Never married and not de facto	0.48	0.13	<0.001	-0.257	0.093	0.006
Self-rated health (Ref: Excellent)						
Very good	0.16	0.13	0.243	-0.162	0.089	0.071
Good	0.59	0.15	<0.001	-0.434	0.094	<0.001
Fair	1.18	0.17	<0.001	-0.872	0.110	<0.001
Poor	1.94	0.28	<0.001	-0.986	0.223	<0.001
Education (Ref: Tertiary)						
Trade certificate	0.16	0.10	0.102	-0.000	0.068	1.000
High school certificate	-0.06	0.14	0.645	-0.050	0.102	0.626
Did not finish high school	0.27	0.11	0.014	0.004	0.078	0.959
Constant	3.30	0.64	<0.001	5.870	0.404	<0.001

Note: Estimates derived from survey-weighted linear regression models adjusted for age, gender, marital status, self-rated health, and educational attainment.