



Supporting Information

Supplementary methods and results

**This appendix was part of the submitted manuscript and has been peer reviewed.
It is posted as supplied by the authors.**

Appendix to: Sunjaya AP, Poulos LM, Di Tanna GL, et al. The health and economic burden of breathlessness, Australia, 2019: a national survey. *Med J Aust* 2024; doi: 10.5694/mja2.52425.

Supplementary methods

1. Survey conduct

This summary of the conduct of the survey includes excerpts from the primary publication on the study. Further details are provided in the supplementary material of the primary publication.¹

- How was the survey distributed and how were people identified to participate?

The survey was distributed to a random selection of about 11,500 members of a web-based survey panel of around 900,000 members maintained by Dynata, an online panel provider and member of the Australian Market and Social Research Society. Data were collected during 13–30 October 2019.

- Was the survey advertised?

The survey was not publicly advertised. Members of the Dynata survey panel were randomly invited to complete the survey.

- How were participants selected?

“Dynata used customised algorithms to randomly invite 11,500 potential respondents from their current available pool that were representative of the national population, in terms of age, gender, location, household composition, household income, employment status, and education level. Recruitment quotas were used to ensure the final sample for this survey was representative of the Australian population in terms of age, gender, and state of residence. Dynata recruits members continuously through advertisements, invitations and messaging via relationships with other websites, online communities and social media groups and undertakes active strategies with communities of interest of all types to incorporate rare populations into the online sample blend.”¹

“To prevent duplication, Dynata use third-party digital fingerprint technology. Dynata check for duplicate participants by evaluating variables such as email address, matches across several demographic data, and device-related data through the use of digital fingerprint technology. Traps are also in place to capture geo-IP violations. These measures ensure only unique respondents complete the survey.”¹

- How representative were survey respondents with respect to population estimates for age group, gender, state of residence and relative disadvantage based on the Socioeconomic Index for Areas (SEIFA) Index of Relative Socioeconomic Disadvantage?

[See table on next page.]

Variable	NBS Survey	Population Estimate
Age		ABS 2019 (2)
<65 years old	7063 (70.1%)	78.9%
≥65 years old	3009 (29.9%)	21.1%
Gender		ABS 2019 (2)
Male	4874 (48.4%)	49.1%
Female	5151 (51.1%)	50.9%
Indeterminate/ No answer	47 (0.5%)	No data
State of Residence		ABS 2019 (2)
New South Wales	3233 (32.1%)	32.0%
Victoria	2578 (25.6%)	26.2%
Queensland	1994 (19.8%)	19.8%
South Australia	735 (7.3%)	7.0%
Western Australia	1058 (10.5%)	10.2%
Tasmania	212 (2.1%)	2.1%
Northern Territory	91 (0.9%)	0.9%
Australian Capital Territory	171 (1.7%)	1.7%
Socioeconomic Index for Areas (SEIFA) Quintile		Census 2016 (3)
Quintile 1 (most disadvantaged)	1692 (16.8%)	20.0%
Quintile 2	1833 (18.2%)	19.8%
Quintile 3	2176 (21.6%)	20.0%
Quintile 4	2095 (20.8%)	20.0%
Quintile 5 (least disadvantaged)	2276 (22.6%)	20.1%

- How long was the survey?

The survey length, depending on responses, was equivalent to 38 to 80 printed pages.

- How long did it take to complete?

The survey consists of three tiers depending on the participant's responses. The median time (IQR) for all 10,072 participants was 8.7 (interquartile range [IQR], 5.7–13.8) minutes. For those who completed all three tiers of the survey, the median time taken for the survey was 14.6 (IQR, 10.6–20.0) minutes.

- What types of questions were used: multi-choice, free text etc?

A variety of question styles were used – mainly multiple choice and sliding scale. Few questions requiring free text responses were included in the survey.

- Was the survey developed *de novo* or based on an existing survey instrument?

“The survey instrument was designed using a combination of pre-existing questionnaires from published studies and healthcare professional review. The questionnaire items were mainly multiple choice. Up to seven (depending on previous responses) required numeric answers and one item had an ‘other’ option which could be expanded with the use of open text. A draft survey instrument was cognitively tested with some people with asthma and some people with a non-scientific/non-medical background and some minor changes were made to improve interpretation.”¹

- How was the survey piloted or validated?

The survey was pilot tested by about 1000 respondents.

- Were changes made to the survey after it was piloted?

“After receiving the pilot data, a few small changes were made to the way some questions were asked before the survey was made available.”¹

- Was the survey only in English or did you have versions for people from non-English speaking backgrounds?

The survey was only in English.

- How was the survey conducted/administered?

“The potential respondents ... were sent a survey invitation via email. The survey invitation provided only a basic link and non-leading information. No information about the type of survey was provided in the invitation.”¹

“All participants were current members of a web-based survey panel and, as such, had already provided informed consent to participate in online surveys. In addition, informed consent for the present survey was obtained by showing participants a participant information statement which informed potential participants that the survey about “your health” would take 10-25 minutes to complete, was voluntary, that the survey responses were anonymous and would be stored by the (named) researchers for 5 years before being securely disposed of. Participants were informed that by submitting their completed survey, this indicated their consent to participate in the study.”¹

“Adaptive questioning was used. Some questions were only displayed based on previous responses (e.g. only those who said they smoked were asked about pack years). Also this survey had a tiered structure. People who indicated that they had breathlessness were asked further questions about symptoms and health care utilisation.”¹

“For each page of the survey, respondents were prompted to complete any outstanding items before moving forward. Most items included a ‘don’t know’, ‘not sure’, ‘prefer not to answer’ or ‘none of the above’ option.”¹

“Dynata identifies any survey responses where the completion time is less than 30% of the median length of the survey. These responses are then checked to determine the route that the participants followed to ensure that they have not bypassed a significant section of the survey, and whether any verbatim responses make sense. Fast responders are based on these checks and removed from the final sample. 106 responders were identified as “speeders” and removed from the final sample.

People who overuse the non-response items (such as ‘don’t know/not sure’) are referred to as flat-liners and are also removed from the final data during quality checks.”¹

- How many people were sent the survey? What was the response rate?

From the 11,488 individuals randomly invited and eligible to undertake the survey, 10,072 (87.7%) completed the survey.

2. Survey questions on quality of life, health care use and productivity loss

Under each heading, please tick the ONE box that best describes your health TODAY [EQ-5D-5L]

MOBILITY

1	I have no problems in walking about
2	I have slight problems in walking about
3	I have moderate problems in walking about
4	I have severe problems in walking about
5	I am unable to walk about

PERSONAL CARE

1	I have no problems washing or dressing myself
2	I have slight problems washing or dressing myself
3	I have moderate problems washing or dressing myself
4	I have severe problems washing or dressing myself
5	I am unable to wash or dress myself

USUAL ACTIVITIES *(e.g. work, study, housework, family or leisure activities)*

1	I have no problems doing my usual activities
2	I have slight problems doing my usual activities
3	I have moderate problems doing my usual activities
4	I have severe problems doing my usual activities
5	I am unable to do my usual activities

PAIN/DISCOMFORT

1	I have no pain or discomfort
2	I have slight pain or discomfort
3	I have moderate pain or discomfort
4	I have severe pain or discomfort
5	I have extreme pain or discomfort

ANXIETY/DEPRESSION

1	I am not anxious or depressed
2	I am slightly anxious or depressed
3	I am moderately anxious or depressed
4	I am severely anxious or depressed
5	I am extremely anxious or depressed

EQ-VAS

- We would like to know how good or bad your health is TODAY.
- The scale is numbered from 0-100.
- 100 means the best health you can imagine.
0 means the worst health you can imagine.
- Please click on the scale to indicate how your health is TODAY.

Add the following statement after the scale:

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Sliding scale presented with scores 0 to 100

For respondents with mild or clinically important breathlessness (mMRC 1-4), information about healthcare use and productivity loss related to breathlessness in the past 12 months was collected. An excerpt of questions used can be found below.

In the past 12 months, how many times have you visited your GP or local doctor for a non-urgent review of your breathing problem?

1	None
2	Once
3	2 to 3 times
4	4 to 6 times
5	More than 6 times
6	Don't know / not sure

In the past 12 months, how many times have you visited a specialist doctor about your breathing problem?

1	None
2	Once
3	2 to 3 times
4	4 to 6 times
5	More than 6 times
6	Don't know / not sure

In the past 12 months, how many times has your breathing worsened beyond what you usually experience in a typical day? (e.g. increased shortness of breath, wheezing, coughing or chest tightness)

1	None
2	Once
3	2 to 3 times
4	4 to 6 times
5	More than 6 times
6	Don't know / not sure

In the past 12 months, how many times have you had an urgent visit to your GP or local doctor because of your breathing problem?

1	None
2	Once
3	2 to 3 times
4	4 to 6 times
5	More than 6 times
6	Don't know / not sure

In the past 12 months, how many times have you gone to a hospital or emergency department as a result of your breathing problem?

1	None
2	Once
3	2 to 3 times
4	4 to 6 times
5	More than 6 times
6	Don't know / not sure

In the past 12 months, did you spend one or more nights in hospital as a result of your breathing problem?

1	Yes
2	No
3	Don't know / not sure

What best describes your employment status?

1	Full time employment
2	Part time employment
3	Casual employment
4	Unpaid or volunteer
5	Engaged in home duties
6	Currently unemployed and seeking work
7	Currently unemployed and not seeking work
8	Not in the labour force – retired from work
9	Not in the labour force – other reason

In the past 12 months, how many times did you miss work, school, or other activities due to your breathing problem?

1	None
2	Once
3	2 to 3 times
4	4 to 6 times
5	More than 6 times
6	Don't know / not sure

3. Cost estimates process and sources

Cost estimates for 2019 were obtained from the Medicare Benefits Schedule (MBS)⁴, Pharmaceutical Benefits Scheme (PBS)⁵, Australian Institute of Health and Welfare (AIHW), and Australian National Diagnosis Related Group (DRG)⁶ cost weights for emergency department visits and hospitalisations. As available dosing data for inhaled medications were incomplete, the unit cost is a weighted cost for the medication based on the volume prescribed for the different dosages reported in Pharmaceutical Benefits Schedule item statistics reports by Services Australia.⁷ Number of dispensings per year for these medications was based on Hew et al⁸ analysis of PBS dispensing data for inhaled corticosteroids. Over-the-counter medication costs were obtained from the website of a pharmaceutical chain (Chemist Warehouse). Productivity loss (missing days at work) was costed pro rata based on median employee earnings and rates reported by the Australian Bureau of Statistics according to the respondent's reported employment type (full time, part time or casual).⁹

Health care use type	MBS Item	Unit	Fee	Reference
General practitioner non-urgent	General practitioner visit during normal hours level B <20 mins		38.20	4
General practitioner urgent	General practitioner visit after hours level B <20 mins		49.80	4
Specialist	Specialist attendance		88.25	4
	Consultant attendance (any except psychiatry)		155.60	4
	Weighted specialist cost based on Service Australia report		110.02	
Emergency department/hospital	Emergency department cost	Mean cost per presentation	775.00	6
Hospitalisation	Hospitalisation	Mean cost per episode of acute admission	5335.00	6
Productivity loss				
Missing days at work	Missing days at work - full time	Median per week	1,463	9
Missing days at work	Missing days at work - part time/casual will be 25% extra	Median per hour	39.10	9

Medication Name	PBS Code	Puffs/doses per unit	Standard puff	Dosing reference	DPMQ 2019	2019 Dispensed	Total cost 2019	Reference
Ventolin (also sold as Zempreon or Asmol)	3495Y	200	1	10	15.67	37,810	592,482.70	5
Ventolin OTC (Mar 2022)					9.9			Chemist Warehouse
Bricanyl	2817G	120	1	10	19.55			5
Bricanyl OTC (Mar 2022)					11.39			Chemist Warehouse
Atrovent	8671J	200	2	10	35.33			5
Airomir	8354Q	200	1	10	39.47			5
Serevent	8141L	60	1	10	33.32			5
Oxis or Foradile	8136F	60	1	10	33.32	2,814	93,762.48	5
	8240Q	60	1	10	32.68	16,942	553,664.56	
	8239P	60	1	10	25.59	4,840	123,855.60	
		60	1	10			31.36	
Flixotide Accuhaler	8149X	60	1	10	42.45	10,429	442,711.05	5
	8148W	60	1	10	28.31	23,479	664,690.49	
		60	1	10			32.66	
Flixotide puffer	8346G	120	1	10	42.45	142,635	6,054,855.75	5
	8345F	120	1	10	28.31	80,774	2,286,711.94	
		120	1	10			37.34	
Pulmicort	2071B	200	2	11	28.89	27,450	793,030.50	5
	2070Y	200	2	11	23.44	3,580	83,915.20	
	2072C	200	2	11	39.85	28,140	1,121,379.00	
		200	2	11			33.77	
Arnuity Ellipta	11719T	30	1	11	28.31	360	10,191.60	5
	11729H	30	1	11	42.45	223	9,466.35	
		30	1	11			33.72	
Qvar puffer	8406K	200	2	11	20.58	3,429	70,568.82	5
	8407L	200	2	11	30.59	18,182	556,187.38	
		200	2	11			29.00	
Qvar Autohaler	8409N	200	2	11	34.59	6,164	213,212.76	5
	8408M	200	2	11	26.63	861	22,928.43	
		200	2	11			33.61	
Alvesco	8854B	120	1	11	38.26	90,019	3,444,126.94	5
	8853Y	120	1	11	26.15	17,501	457,651.15	
		120	1	11			36.29	
Intal	8334P	112	2	12	39.21	13,355	523,649.55	5
	8767K	200	2	12	35.03	1,558	54,576.74	
		112	2				38.77	
Tilade	8365G	112	2	13	35.1			
Xolair injection	10109C	1			410	8739	3,582,990.00	5
	10118M	1			205	3948	809,340.00	
	10973M	1			410	142	58,220.00	
	10967F	1			205	99	20,295.00	
	11175E	1			860.19	1515	1,303,187.85	
	11163M	1			860.19	6152	5,291,888.88	
	10122R	1			433.79	3490	1,513,927.10	
	10110D	1			220.59	1122	247,501.98	
	10968G	1			433.79	72	31,232.88	
	10956P	1			220.59	153	33,750.27	
	11176F	1			820	1759	1,442,380.00	
	11168T	1			820	6982	5,725,240.00	
		1					587.01	
Nucala injection	11003D	1			1685.39	1431	2,411,793.09	5
	10980X	1			1638	6712	10,994,256.00	
	10996R	1			1638	2909	4,764,942.00	
	11014Q	1			1685.39	2479	4,178,081.81	

Medication Name	PBS Code	Puffs/doses per unit	Standard puff	Dosing reference	DPMQ 2019	2019 Dispensed	Total cost 2019	Reference
		1					1,651.69	
Fasenra injection or pen	11523L	1			3358.39	907	3,046,059.73	5
	11504L	1			3358.39	1122	3,768,113.58	
	11549W	1			3311	1307	4,327,477.00	
	11529T	1			3311	1583	5,241,313.00	
		1					3,330.55	
Seretide puffer (also sold as Sereflo or Salplus)	8517G	120	2	10	41.95	40,277	1,689,620.15	5
	8518H	120	2	10	48.64	255,801	12,442,160.64	
		120	2	10			47.73	
Seretide Accuhaler	8430Q	60	1	10	41.95	33,992	1,425,964.40	5
	8431R	60	1	10	48.64	453,465	22,056,537.60	
		60	1	10			48.17	
Flutiform	2827T	120	2	10	37.3	943	35,173.90	5
	10008R	120	2	10	60.07	110,827	6,657,377.89	
	10007Q	120	2	10	45.16	31,104	1,404,656.64	
		120	2	10			56.67	
Symbicort Turbuhaler	8796Y	120	1	11	48.06			5
Symbicort Rapihaler	10015D	120	2	11	49.47	85,944	4,251,649.68	5
	10024N	120	2	11	46.25	5,717	264,411.25	
		120	2	11			49.27	
DuoResp Spiromax	11273H	120	2	10	44.79			5
Breo-ellipta	11129R	30	1	10	72.01			5
Spiriva	11043F	60	1	10	52.8			5
Onbrez	5137J	30	1	14	59.81	22,818	1,364,744.58	5
	5134F	30	1	14	59.81	49,493	2,960,176.33	
		30	1				59.81	
Brimica	10565C	60	1	10	87.77			5
Trelegy	11379X	30	1	10	97.5			5
Ultibro	10156M	30	1	10	88.88			5
Spiolto	10557P	60	1	10	83.39			5
Anoro Ellipta	10188F	30	1	10	92.95			5
Bretaris	10124W	60	1	15	62.36			5
Seebri	10059K	30	1	10	59.81			5
Incruse Ellipta	10187E	30	1	16	62.36			5
Singulair or montelukast (various brand names)	8627C	28			18.63	18,964	353,299.32	5
	8628D	28			18.21	45,409	826,897.89	
		28					18.33	
Nuelin tablet	8231F	100			17.34	4,926	85,416.84	5
	8230E	100			15.53	12,246	190,180.38	
	2634P	100			16.35	7,024	114,842.40	
		100					16.14	

Medication Name	PBS Code	Puffs/doses per unit	Standard puff	Dosing reference	DPMQ 2019	2019 Dispensed	Total cost 2019	Reference
Prednisone (steroid tablets) (brand names include Panafcort, Panafcortelone, Predsone, Predsolone, Redipred, Sone, Solone)	1934T	100			13.99	82,178	1,149,670.22	5
	1936X	30			15.82	157,007	2,483,850.74	
	1935W	60			14.39	198,020	2,849,507.80	
		60					14.83	
Dexamethasone	1292B	30			13.58	24,958	338,929.64	5
	2507Y	30			16.68	76,537	1,276,637.16	
		30					15.92	

DPMQ = Dispensed Price for Maximum Quantity

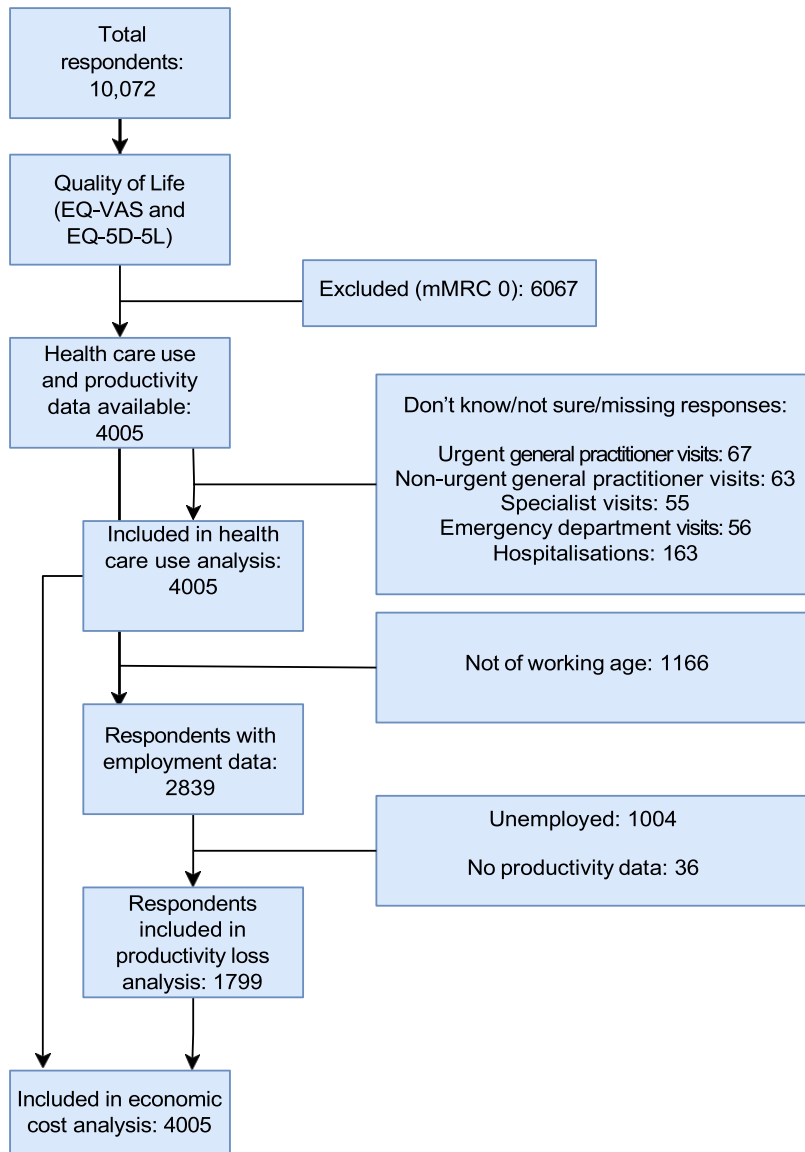
PBS Statistics for weighted cost of the medication were obtained from reference 7.

If a respondent has a condition beyond asthma and COPD, the mean Pharmaceutical Benefits Scheme (PBS) and Repatriation Pharmaceutical Benefits Scheme (RPBS) Medication Expense per person per year is taken as \$485.¹⁷

4. Supplementary statistical analysis details and sensitivity analysis

Statistical analysis

Figure 1. Flow diagram of responses including in our analyses



Sensitivity analyses

Scenario	Lower range	Upper range
Non-urgent general practitioner	Those with >6 classified as 6 visits	Those with >6 classified as 12 visits
Urgent general practitioner	Those with >6 classified as 6 visits	MBS Urgent Outside 11PM-7AM fees
Specialist	Fully specialist MBS scheduled fees	Fully consultant MBS scheduled fees
Emergency department/hospital	10% lower cost than IHPA average	IHPA weighted cardiac rates
Hospitalisation	10% lower cost than IHPA average	Assuming a 25% rehospitalisation rate in a year post first hospitalisation

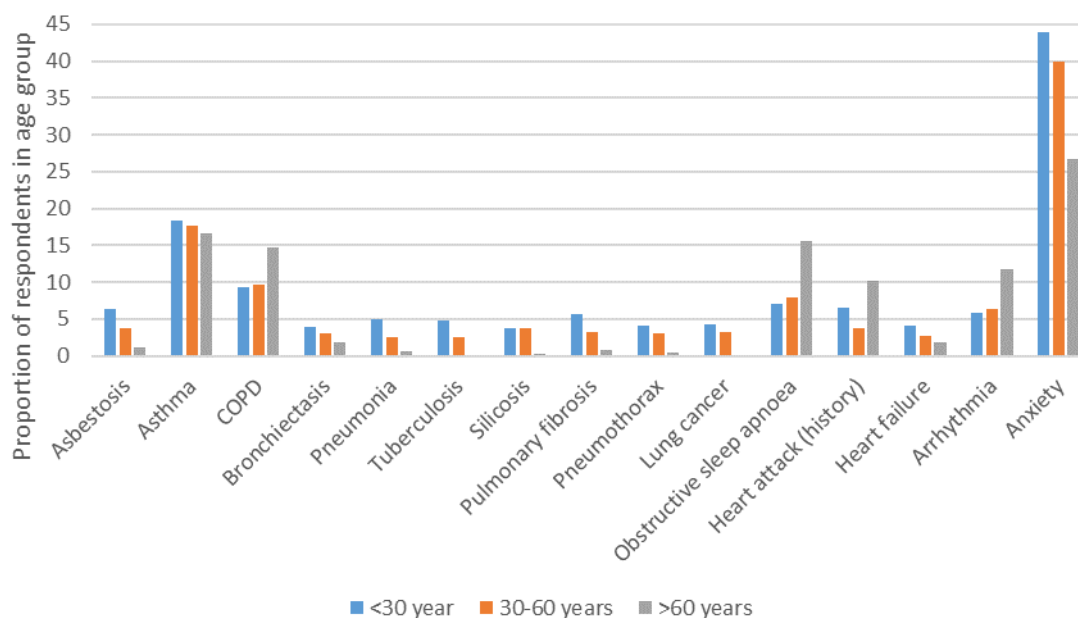
IHPA - Independent Health and Aged Care Pricing Authority; MBS – Medical Benefits Scheme.

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Supplementary results

Figure 2. Most frequent medical conditions among the 4005 survey participants with mild (3044 respondents) or clinically important breathlessness (961 respondents) (mMRC grades 1–4), by age group



Medical condition	Age group			Total
	<30 year	30-60 years	>60 years	
Respondents	955	1453	1597	4005
Asbestosis	60 (6.3%)	54 (3.7%)	17 (1.1%)	131 (3.3%)
Asthma	175 (18.3%)	255 (17.6%)	265 (16.6%)	695 (17.4%)
Chronic obstructive lung disease*	90 (9.4%)	140 (9.6%)	235 (14.7%)	465 (11.6%)
Bronchiectasis	38 (4.0%)	44 (3.0%)	31 (1.9%)	113 (2.8%)
Pneumonia	48 (5.0%)	38 (2.6%)	10 (0.6%)	96 (2.4%)
Tuberculosis	47 (4.9%)	37 (2.6%)	3 (0.2%)	87 (2.2%)
Silicosis	36 (3.8%)	54 (3.7%)	4 (0.3%)	94 (2.4%)
Pulmonary fibrosis	53 (5.6%)	46 (3.2%)	14 (0.9%)	113 (2.8%)
Pneumothorax	40 (4.2%)	44 (3.0%)	8 (0.5%)	92 (2.3%)
Lung cancer	41 (4.3%)	46 (3.2%)	1 (0.1%)	88 (2.2%)
Obstructive sleep apnoea	67 (7.0%)	114 (7.9%)	249 (15.6%)	430 (10.7%)
Heart attack (history)	62 (6.5%)	54 (3.7%)	163 (10.2%)	279 (7.0%)
Heart failure	39 (4.1%)	40 (2.8%)	29 (1.8%)	108 (2.7%)
Arrhythmia	56 (5.9%)	92 (6.3%)	188 (11.8%)	336 (8.4%)
Anxiety	419 (43.9%)	581 (40.0%)	426 (26.7%)	1426 (35.6%)

* Includes emphysema and chronic bronchitis.

Table 1. Quality of life scores, health care use, and economic costs for 10 072 adults who participated in the 2019 National Breathlessness Survey, by breathlessness severity (modified Medical Research Council [mMRC] dyspnoea grade): unadjusted results

Outcome	mMRC 0	mMRC 1	mMRC 2	mMRC 3	mMRC 4
Respondents	6067	3044	620	216	125
Quality of Life	(Reference)	Estimated Mean Differences (95% CI)			
EQ-VAS (0-100)	77.2 (76.7, 77.7)	-9.9 (-10.7, -9.1)	-20.9 (-22.2, -19.6)	-21.5 (-23.6, -19.5)	-18 (-20.9, -15.0)
EQ-5D-5L Index (max 1)	0.878 (0.873, 0.883)	-0.091 (-0.099, -0.083)	-0.245 (-0.257, -0.233)	-0.227 (-0.248, -0.207)	-0.300 (-0.324, -0.276)
Healthcare use	Odds Ratio (95% CI)				
Non-urgent general practitioner visit	-	1	2.80 (2.34-3.37)	2.99 (2.22-4.03)	2.06 (1.4-3.04)
Specialist visit	-	1	3.03 (2.53-3.64)	3.20 (2.41-4.26)	2.00 (1.34-2.99)
Urgent general practitioner visit	-	1	2.91 (2.42-3.50)	2.63 (1.97-3.52)	2.40 (1.62-3.56)
Emergency department/hospital visit	-	1	3.44 (2.83-4.18)	2.62 (1.92-3.56)	2.23 (1.45-3.44)
Hospitalisation	-	1	1.57 (1.22-2.01)	1.56 (1.06-2.30)	2.13 (1.31-3.47)
High frequency of health care use (≥4 visit/year)					
Non-urgent general practitioner visit	-	1	3.85 (3.05-4.87)	4.88 (3.49-6.82)	3.84 (2.41-6.14)
Specialist visit	-	1	4.32 (3.20-5.83)	3.97 (2.54-6.21)	4.25 (2.38-7.56)
Urgent general practitioner visit	-	1	4.33 (3.18-5.89)	2.67 (1.58-4.50)	4.45 (2.49-7.93)
Emergency department/hospital visit	-	1	4.22 (3.00-5.94)	1.96 (1.03-3.75)	3.21 (1.57-6.58)
Productivity					
Employment (for those below retirement age) ^a	-	1	0.69 (0.56-0.84)	0.54 (0.39-0.75)	0.46 (0.31-0.70)
Missing days at work/school	-	1	2.89 (2.40-3.47)	2.67 (1.99-3.57)	1.65 (1.09-2.52)

Economic costs		Estimated mean cost (95% CI)			
Total health care cost	-	1374.00 (1276.84, 1471.17)	2633.00 (2203.86, 3062.13)	2383.18 (1735.35, 3031.00)	2639.88 (1627.6, 3652.16)
Societal cost	-	1521.41 (1418.65, 1624.16)	2945.88 (2487.03, 3404.73)	2624.28 (1942.05, 3306.52)	2804.07 (1778.36, 3829.78)

CI = confidence interval; EQ-5D-5L = EuroQol five dimensions, five levels; EQ-VAS = EuroQol Visual Analogue Scale.

#Adjusted for age, sex, Indigenous background, self-reported heart disease, self-reported lung disease, High-PHQ4 score, multimorbidity and smoking status. Adjusted results are reported in the main article, Boxes 3, 5, 7, 8.

*Testing whether there is a linear trend (can be increasing or decreasing) in the outcomes as mMRC severity increases.

^aEmployment refers to reporting having a full time, part time or casual employment.

Figure 3. Impairment reported by 10 072 adults who participated in the 2019 National Breathlessness Survey, by breathlessness severity (modified Medical Research Council [mMRC] dyspnoea grade) and EQ-5D-5L domain

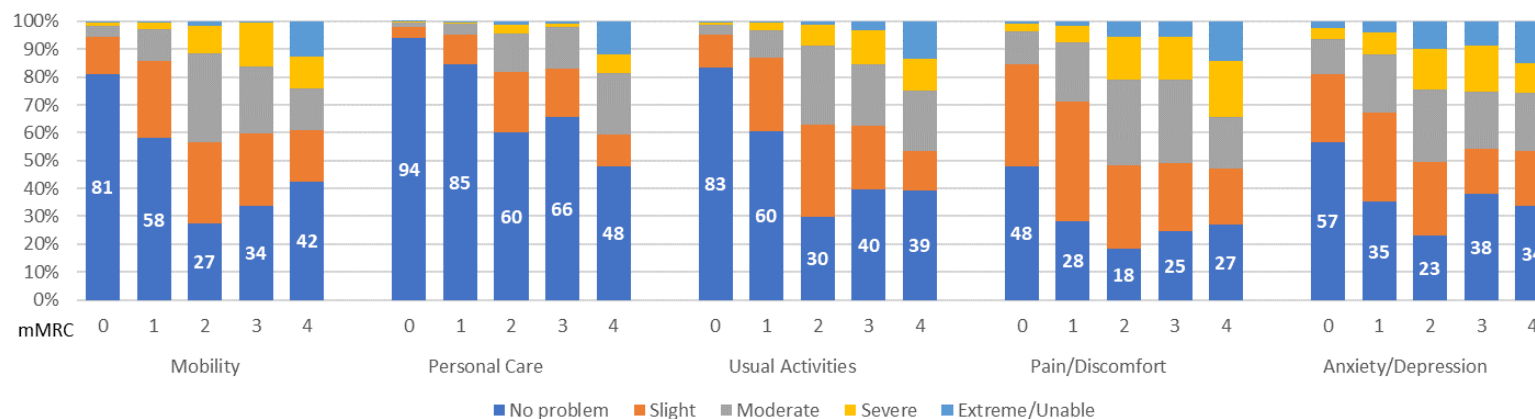


Table 2. Impairment reported by 10 072 adults who participated in the 2019 National Breathlessness Survey, by breathlessness severity (modified Medical Research Council [mMRC] dyspnoea grade) and EQ-5D-5L domain (data for figure 3)

	Mobility					Personal Care					Usual Activities					Pain/Discomfort					Anxiety/Depression				
	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
No problem	4919	1766	170	73	53	5716	2577	372	142	60	5059	1840	185	86	49	2904	857	113	53	34	3445	1070	143	82	42
Slight	813	839	182	56	23	237	322	136	37	14	714	810	205	49	18	2239	1312	187	53	25	1466	981	164	35	25
Moderate	239	354	196	52	19	84	114	85	33	28	208	295	176	48	27	713	641	191	65	23	759	628	160	44	26
Severe	66	75	61	34	14	17	23	20	2	8	63	82	46	26	14	171	189	95	33	25	261	246	92	36	13
Extreme/Unable	30	10	11	1	16	13	8	7	2	15	23	17	8	7	17	40	45	34	12	18	136	119	61	19	19

Table 3. Quality of life for 10 072 adults who participated in the 2019 National Breathlessness Survey: multivariable analysis (factors other than breathlessness)

Characteristic	Coefficient (95% confidence interval)			
	Quality of life		Economic costs	
	EQ-VAS	EQ-5D-5L index	Total health care cost	Societal cost
Age (per year)	0 (0 to 0)	0 (0 to 0)	-0.13 (-0.24 to -0.02)	-0.15 (-0.26 to -0.04)
Sex (women)	0 (-0.02 to 0.01)	0 (-0.01 to 0.01)	0.33 (0.06 to 0.59)	0.28 (0.03 to 0.54)
Self-reported heart disease	-0.02 (-0.04 to 0)	-0.06 (-0.08 to -0.05)	0.47 (0.32 to 0.62)	0.49 (0.34 to 0.63)
Self-reported lung disease	-0.02 (-0.03 to 0)	-0.02 (-0.04 to -0.01)	0.2 (0.07 to 0.33)	0.21 (0.09 to 0.34)
High PHQ-4 score	-0.18 (-0.19 to -0.16)	-0.20 (-0.21 to -0.19)	0.21 (0.08 to 0.35)	0.22 (0.09 to 0.35)
Multimorbidity*	-0.12 (-0.13 to -0.1)	-0.12 (-0.13 to -0.11)	0 (0 to 0)	0 (0 to 0)
Currently smokes	-0.05 (-0.06 to -0.03)	-0.03 (-0.04 to -0.02)	0.18 (0.04 to 0.32)	0.17 (0.04 to 0.31)
Formerly smoked	-0.02 (-0.03 to 0)	-0.02 (-0.03 to -0.01)	-0.13 (-0.24 to -0.02)	-0.15 (-0.26 to -0.04)

EQ-5D-5L = EuroQol (five dimensions, five levels); EQ-VAS = EuroQol Visual Analogue Scale; PHQ-4 = patient health questionnaire 4.

* Adjusted for modified Medical Research Council [mMRC] dyspnoea grade (severity of breathlessness), age, gender, Indigenous status, self-reported heart disease, self-reported lung disease, high (PHQ-4) score, multimorbidity, and smoking status. Coefficient: change per unit increase (for continuous variables) or change in category (No to Yes, for binary variables).

† Two or more medical conditions.

Table 4. Health care use by 4005 participants with modified Medical Research Council [mMRC] dyspnoea grades 1 to 4, by breathlessness severity: type and frequency

	Non-Urgent General Practitioner Visits				Specialists Visits				Urgent General Practitioner Visits				Emergency Department/Hospital Visits			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
None	1793	209	71	47	2360	328	113	73	2396	341	127	70	2580	379	149	81
Once	524	90	28	17	290	82	35	10	282	83	31	14	212	86	25	10
2-3 times	473	168	53	22	257	111	36	15	232	94	35	15	145	73	29	13
4-6 times	133	77	24	12	74	63	14	9	75	50	9	5	51	38	7	4
>6 times	86	66	33	16	37	23	13	7	28	31	9	11	32	26	4	5

Table 5. Health care use by 4005 participants with modified Medical Research Council [mMRC] dyspnoea grades 1 to 4, by breathlessness severity: overall

	Any Health care Use				Any General Practitioner Visit				Hospitalisation			
	1	2	3	4	1	2	3	4	1	2	3	4
No	56	30	31	39	58	32	33	41	2624	472	171	83
Yes	44	70	69	61	42	68	67	59	337	98	35	22

Table 6. Median economic costs, by breathlessness severity

Outcome	All respondents				People who had at least one non-urgent general practitioner or specialist visit			
	mMRC 1	mMRC 2	mMRC 3	mMRC 4	mMRC 1	mMRC 2	mMRC 3	mMRC 4
Respondents	n=3044	n=620	n=216	n=125	n=1286	n=419	n=145	n=71
Health care use type	Median cost per individual (IQR)				Median cost per individual (IQR)			
Non-urgent general practitioner visit	\$0 (0, 38)	\$115 (0, 115)	\$115 (0, 191)	\$38 (0, 115)	\$115 (38, 115)	\$115 (38, 191)	\$115 (115, 191)	\$115 (38, 191)
Specialist visit	\$0 (0, 0)	\$0 (0, 330)	\$0 (0, 330)	\$0 (0, 330)	\$110 (0, 330)	\$110 (0, 330)	\$110 (0, 330)	\$110 (0, 330)
Urgent general practitioner visit	\$0 (0,0)	\$0 (0, 149)	\$0 (0, 149.)	\$0 (0, 149)	\$0 (0, 149)	\$50 (0, 149)	\$50 (0, 149)	\$50 (0, 149)
Emergency department /hospital visit	\$0 (0,0)	\$0 (0, 775)	\$0 (0, 775)	\$0 (0, 775)	\$0 (0, 775)	\$775 (0, 2325)	\$0 (0, 2325)	\$0 (0, 2325)
Hospitalisation	\$0 (0,0)	\$0 (0, 0)	\$0 (0, 0)	\$0 (0, 0)	\$0 (0, 0)	\$0 (0, 0)	\$0 (0, 0)	\$0 (0, 5335)
Medication	\$485 (0, 485)	\$485 (13,6, 485)	\$485 (0, 485)	\$408 (0, 485)	\$485 (18, 485)	\$485 (38, 485)	\$485 (15, 485)	\$485 (0, 485)
Total healthcare use cost	\$485 (341, 749)	\$729 (485, 3566)	\$710 (485, 2835)	\$523 (115, 3162)	\$683 (523, 2743)	\$1424 (649, 5780)	\$1184 (633, 4661)	\$1492 (600, 8308)
Productivity loss								
Missing days at work (only for those at work)	\$0 (0, 367)	\$367 (0, 1101)	\$343 (0, 1101)	\$0 (0, 956)	\$367 (0, 1101)	\$956 (319, 1195)	\$367 (0, 1101)	\$319 (0, 1101)
Societal cost	\$485 (485, 1004)	\$984 (485, 4240)	\$756 (485, 2919)	\$594 (191, 3721)	\$922 (523, 3108)	\$1850 (707, 6011)	\$1588 (710, 5973)	\$1811 (600, 8594)

CI = confidence interval; EQ-5D-5L = EuroQol five dimensions, five levels; EQ-VAS = EuroQol Visual Analogue Scale;

*Adjusted for age, sex, Indigenous background, self-reported heart disease, self-reported lung disease, High-PHQ4 score, multimorbidity and smoking status. Adjusted results are reported in the main article, Boxes 3, 8.

Table 7. Estimated mean annual economic costs for 4005 respondents with modified Medical Research Council [mMRC] dyspnoea grades 1 to 4

Outcome	Adjusted [#]				P for linear trend [*]
	mMRC 1	mMRC 2	mMRC 3	mMRC 4	
Self-report lung or heart disease (1343 respondents)					
Total healthcare cost	2070.94 (1826.92, 2314.96)	2908.76 (2294.66, 3522.87)	2785.92 (1910.59, 3661.24)	3404.97 (1554.35, 5255.58)	0.09
Societal cost	3184.08 (2731.6, 3636.57)	4653.48 (3332.96, 5973.99)	4391.17 (2359.9, 6422.44)	3140.55 (833.11, 5447.99)	0.93
No self-reported heart or lung disease (2662 respondents)					
Total healthcare cost	1127.05 (1035.83, 1218.28)	1783.98 (1399.23, 2168.74)	1417.38 (783.81, 2050.95)	2317.44 (1099.58, 3535.3)	
Societal cost	1488.9 (1340.18, 1637.62)	2621.9 (1908.26, 3335.54)	2761.11 (958.18, 4564.04)	2895.17 (439.5, 5350.84)	0.13

[#]Adjusted for age, sex, Indigenous background, High-PHQ4 score, multimorbidity and smoking status.

^{*}The *contrast* Stata command was used to statistically determine the presence or absence of a linear trend of increasing/decreasing outcome effect size with increasing breathlessness severity (mMRC grade).

Table 8. Extrapolation of the adjusted mean annual health care use and societal cost per person to the Australian adult population (19 years or older in 2022)

	Proportion of adult population	Societal cost per person	Number of people	Total cost for the mMRC grade
mMRC 1	30.2%	\$1413	5,956,574	\$8,416,638,412
mMRC 2	6.2%	\$2065	1,214,179	\$2,507,279,883
mMRC 3	2.1%	\$1795	421,809	\$757,147,119.1
mMRC 4	1.2%	\$2075	244,413	\$507,156,975
Australian Adult Population¹⁸	19,710,700			Overall cost \$12,188,222,389
	Proportion of adult population	Health care use cost per person	Number of people	Total cost for the mMRC grade
mMRC 1	30.2%	\$1288	5,956,574	\$7,672,066,720
mMRC 2	6.2%	\$1854	1,214,179	\$2,251,088,088
mMRC 3	2.1%	\$1636	421,809	\$690,079,491.3
mMRC 4	1.2%	\$1992	244,413	\$486,870,696
Australian Adult Population¹⁸	19,710,700			Overall cost \$11,100,104,995

STROBE Statement—Checklist of items that should be included in reports of cross-sectional studies

The page numbers in this checklist refer to the submitted manuscript, not to the published article or its Supporting Information file

	Item No	Recommendation	Page No
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	3
Methods			
Study design	4	Present key elements of study design early in the paper	3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3, App. 1
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	3, App. 1
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	4, 5
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	3-5, App. 1-4
Bias	9	Describe any efforts to address potential sources of bias	5
Study size	10	Explain how the study size was arrived at	-
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	4, 5, App. 4
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	5, 6, App. 4
		(b) Describe any methods used to examine subgroups and interactions	5, 6, App. 4
		(c) Explain how missing data were addressed	5
		(d) If applicable, describe analytical methods taking account of sampling strategy	-
		(e) Describe any sensitivity analyses	5, App. 4

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	6, Fig. S1, S2
		(b) Give reasons for non-participation at each stage	Fig. S1
		(c) Consider use of a flow diagram	Fig. S1
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 2, Fig. S2
		(b) Indicate number of participants with missing data for each variable of interest	Fig. S1
Outcome data	15*	Report numbers of outcome events or summary measures	Fig. 1, 2
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Tables 3-7, S1-S6
		(b) Report category boundaries when continuous variables were categorized	Tables 3-7, S1-S6
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	6-8, Tables 6,7, S2, S3, S5, S6
Discussion			
Key results	18	Summarise key results with reference to study objectives	8, 9
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	9, 10
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10,11
Generalisability	21	Discuss the generalisability (external validity) of the study results	9, 10
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	11

*Give information separately for exposed and unexposed groups.

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.