Respiratory symptoms and lung function in older people with asthma or chronic obstructive pulmonary disease

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Among Australians aged 65 years and over, chronic obstructive pulmonary disease (COPD) is an important contributor to the burden of disease.[1] On the other hand, the burden of asthma falls predominantly on younger people. But asthma occurs in people of all ages, and, in older people, it can be difficult to distinguish asthma from COPD. In clinical practice, the distinction between asthma and COPD relies on history (including smoking) and lung function testing; in particular, the reversibility of airflow limitation in response to a bronchodilator.

In contrast, epidemiological studies have typically relied on routinely collected data and self-reported diagnosis. For example, an estimated 10 million American adults reported that they had been diagnosed with COPD by a doctor in 2000. However, data from the National Health And Nutrition Examination Survey (NHANES III) for 1988–1994 suggest that about 24 million US adults have evidence of impaired lung function, indicating that COPD is underdiagnosed in the United States.[2] The Global initiative on Obstructive Lung Disease (GOLD) guidelines require spirometry for the diagnosis of COPD,[3] but, in Australia, there has as yet been no comprehensive national health examination survey including spirometry.

How common are respiratory symptoms in middle-aged and older people?

We conducted a two-stage, cross-sectional epidemiological study in 2000–01, using similar methods to the European Community Respiratory Health Survey (ECRHS), but focusing on an older age group.[4,5] The subjects were 7005 adults aged between 45 and 69 years. The sample was randomly selected by computer from the electoral rolls for three inner south-eastern Melbourne electorates. A postal survey was conducted using the validated ECRHS respiratory screening questionnaire, including additional items on cough, sputum and shortness of breath, emphysema and heart disease.

Completed surveys were mailed back by 4276 (61.0%) participants. The survey was completed by telephone with 565 (8.1%) participants. A final response rate of 70.0% was achieved after adjusting for those no longer resident in the study area, outside the target age range, overseas, interstate or deceased. Among the 4906 respondents, there was a slight female preponderance (53.5% women). The median (range) age was 57 (45–69) years. Almost half (2338 or 47.7%) reported ever smoking for as long as a year, and 644 (13.1%) were current smokers.

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ABSTRACT

What we need to know

- What is an agreed definition of chronic obstructive pulmonary disease (COPD) for epidemiological research?
- What are the predicted values of gas transfer (TLCO) for Australian populations?
- What is the prevalence of asthma and COPD in people over the age of 70?
- How does the prevalence of asthma and COPD in Australia compare with that in other countries?

What we need to do

- Conduct community-based studies examining the burden of illness due to obstructive lung disease, using a common protocol that allows international comparisons of data.

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The prevalences of respiratory symptoms and chest problems are given in Box 1. The commonest symptoms were shortness of breath and wheezing, reported by over a quarter and a fifth of respondents, respectively. Of those reporting shortness of breath, 37.9% developed the symptom walking with people their own age, 18.4% walking at their own pace, and 16.2% at rest. Of those reporting wheezing, 53.8% also became breathless and 71.5% wheezed without an upper respiratory tract infection.

How good is lung function in middle-aged and older people?

A random sample of the participants was then invited to attend the lung function laboratory for spirometry, methacholine challenge and transfer factor measurements. This component of the study was approved by the Ethics Committee at the Alfred Hospital. Lung function was measured with a rolling seal spirometer. Abbreviations of the pulmonary function terms used are defined in Box 2.

Initial FEV_1 was recorded as the best of five blows that met the American Thoracic Society (ATS) criteria.[6] Methacholine was delivered by dosimeter up to a cumulative dose of 2 mg (10 μmol). TLCO was measured by the single-breath carbon monoxide method. ATS guidelines[7] were followed for calibration, quality control and correction for haemoglobin concentration.

Subjects were asked to withhold inhaled bronchodilators and not to smoke for 6 hours before testing. Predicted values were calculated from age, height and sex using published equations.[8,9] Spirometry, methacholine challenge and transfer factor measurements were satisfactorily completed by 1224, 1115 and 1221 subjects, respectively.

Definitions

- ***Airflow limitation*** was defined as FEV_1/FVC less than 70%;

1 Prevalence (proportions and 95% CIs) of respiratory symptoms and chest conditions ($n = 4906$)*

Symptom/history	*n* (%)	95% CI
Wheeze	1005 (20.5%)	19.4–21.6
Wheeze with breathlessness	541 (11.0%)	10.2–11.9
Wheeze without URTI	719 (14.7%)	13.7–15.7
Nocturnal chest tightness	698 (14.2%)	13.3–15.2
Nocturnal shortness of breath	441 (9.0%)	8.2–9.8
Asthma attack in past 12 months	328 (6.7%)	6.0–7.4
Shortness of breath hurrying or walking uphill	1336 (27.2%)	25.9–28.5
Shortness of breath walking with others of own age	505 (10.3%)	9.5–11.2
Shortness of breath walking at own pace	246 (5.0%)	4.4–5.7
Shortness of breath at rest	216 (4.4%)	3.9–5.0
Cough and sputum	612 (12.5%)	11.6–13.4
Asthma ever	736 (15.0%)	14.0–16.0
Asthma confirmed by a doctor	689 (14.0%)	13.1–15.1
Asthma medication	402 (8.2%)	7.4–9.0
Chronic bronchitis	590 (12.0%)	11.1–12.9
Chronic bronchitis confirmed by a doctor	569 (11.6%)	10.7–12.5
Emphysema	60 (1.2%)	0.9–1.6
Emphysema confirmed by a doctor	54 (1.1%)	0.8–1.4
Chronic bronchitis or emphysema medication	124 (2.5%)	2.1–3.0
Any respiratory medication	440 (9.0%)	8.2–9.8
Heart disease	566 (11.5%)	10.7–12.5
Treatment for heart disease	420 (8.6%)	7.8–9.4

* Reproduced with permission from Abramson et al. Prevalence of respiratory symptoms related to chronic obstructive pulmonary disease and asthma among middle aged and older adults. *Respirology* 2002; 7: 325-331 (Blackwell Publishing).[5] URTI = upper respiratory tract infection.

- ***Chronic obstructive bronchitis*** was defined as airflow limitation together with a positive response to the question: "*Have you brought up phlegm on most days for as many as 3 months of a year for at least 2 successive years?*";
- ***Emphysema*** was defined as airflow limitation and TLCO < 80% predicted.
- ***COPD*** for this study was defined as either chronic obstructive bronchitis or emphysema. The GOLD guidelines define mild (Stage I) COPD as $FEV_1/FVC < 70\%$ and $FEV_1 \geqslant 80\%$ predicted; and moderate or severe (Stage II or III) COPD as $FEV_1/FVC < 70\%$ and $FEV_1 < 80\%$ predicted.[3]
- ***Current asthma*** was defined for epidemiological purposes as wheeze in the last 12 months, combined with a provocative dose of methacholine causing a 20% fall in FEV_1 (PD_{20} FEV_1) < 2 mg.[10]

Of the 2900 subjects invited to the laboratory, 1232 (42.5%) completed a detailed questionnaire, seven by telephone. For this group, there was a slight male preponderance and their median (range) age was 57 (45–72) years when they attended the laboratory. Descriptive statistics for lung function are presented in Box 2.

2 Mean (95% CIs) for lung function test results in middle-aged and older subjects

	n	Mean	95% CI
FVC L	1224	4.19	4.13–4.25
FVC % predicted	1224	108.7	107.9–109.6
FEV_1 L	1224	3.16	3.11–3.21
FEV_1 % predicted	1224	103.6	102.6–104.6
FEV_1/FVC (%)	1224	75.3	74.9–75.8
TLCO ($mL \cdot min^{-1} \cdot mmHg^{-1}$)	1201	23.3	23.0–23.7
TLCO % predicted	1201	96.7	95.8–97.6
KCO ($min^{-1} \cdot mmHg^{-1}$)	1201	4.04	4.00–4.07
VA L	1222	5.81	5.74–5.88

FVC L = Forced vital capacity.

FVC % predicted = Forced vital capacity as a percentage of the predicted value.

FEV_1 L = Forced expiratory volume in 1 second.

FEV_1 % predicted = Forced expiratory volume in 1 second as a percentage of the predicted value.

FEV_1/FVC (%) = Forced expiratory ratio.

TLCO = Transfer capacity of the lung for carbon monoxide.

TLCO % predicted = Transfer capacity of the lung for carbon monoxide as a percentage of the predicted value.

KCO = Transfer coefficient for carbon monoxide (= TLCO/ VA).

VA L = Alveolar volume.

A chronic productive cough was reported by 51 participants (4.1%; 95% CI, 3.0%–5.3%). Airflow limitation was demonstrated by almost a fifth of participants (226 or 18.5%; 95% CI, 16.3%–20.6%). Twenty-two participants (1.8%; 95% CI, 1.1%–2.5%) had chronic productive cough and airflow limitation and thus met our definition of chronic obstructive bronchitis. Diffusing capacity was impaired below 80% predicted in 153 participants (12.7%; 95% CI, 10.9%–14.6%). Fifty-six participants (4.7%; 95% CI, 3.5%–5.9%) met our definition of emphysema.

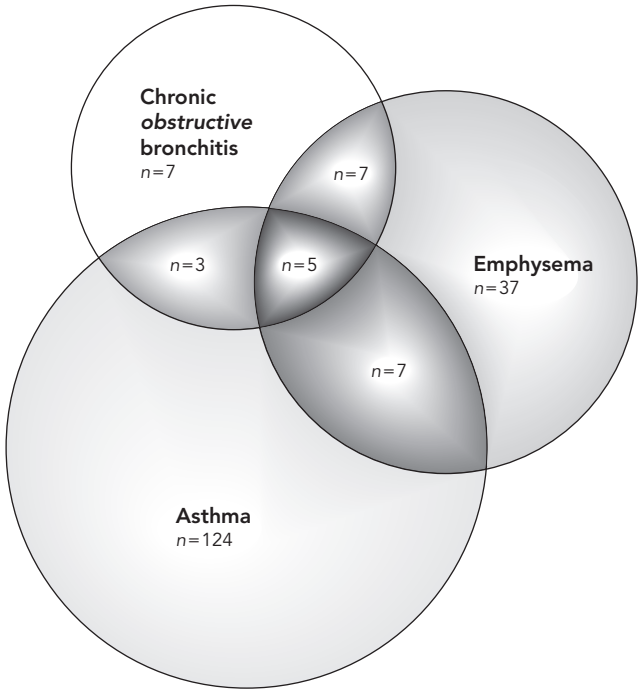
What is the prevalence of asthma and COPD?

Altogether 65 participants (5.4%; 95% CI, 4.1%–6.7%) had either chronic obstructive bronchitis or emphysema and thus met our stringent definition of COPD. On the other hand, 143 participants (11.7%; 95% CI, 9.9%–13.5%) had mild COPD (GOLD Stage I), and 83 participants (6.8%; 95% CI, 5.4%–8.1%) had moderate or severe COPD (GOLD Stage II or III). Current asthma was present in 139 participants (12.5%; 95% CI, 10.5%–14.5%). The overlap between chronic obstructive bronchitis, emphysema and asthma is shown in Box 3. The most common respiratory condition in this age group remained asthma without any features of COPD. However, 15 participants (1.4%; 95% CI, 0.7%–2.1%) met both the definitions of current asthma and COPD.

Conclusions

Asthma is less prevalent among older people than among young adults, but one in eight middle-aged and older adults self-report chronic bronchitis or emphysema (COPD). There is considerable overlap between self-reported diagnoses of asthma, chronic bronchitis and emphysema. Overall lung function was good in this

3 The overlap between asthma, chronic *obstructive* bronchitis and emphysema among a random sample of 1201 middle-aged and older people



sample, although the prediction equations chosen may not be appropriate for an Australian population. Further work is required to define reference values, particularly for TLCO in older Australians. Our results suggest that respiratory symptoms are still more likely to be due to asthma than COPD in this age group. Only around 1 in 19 middle-aged and older adults met objective criteria for COPD.

The existing international data on the prevalence of COPD and the incidence of asthma in elderly subjects were recently reviewed.[11] Our prevalence estimates are comparable with the rates of the clinically relevant COPD (4%–6%) previously detected in European adult populations. However, direct comparisons are somewhat difficult because of the many different definitions used in different studies. The Burden of Obstructive Lung Disease (BOLD) study is already collecting prevalence data using a standardised protocol in the United States, South America and China.[12] A BOLD study now needs to be performed in Australia to permit valid international comparisons of COPD prevalence.

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Competing interests

The author has undertaken an unrelated consultancy for GlaxoSmithKline.

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