

Economic Case Statement

Chronic Obstructive Pulmonary Disease (COPD)



THE
AUSTRALIAN
LUNG
FOUNDATION

**Alan J Crockett
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The Australian Lung Foundation (ALF) is an independent, not-for profit organisation, whose mission is to reduce the burden of lung disease in Australia and promote lung health.

This economic statement was commissioned by the ALF as part of its National COPD Program, and funded by an unrestricted grant to the authors.

The aims of the ALF's COPD program are:

- To raise the profile of COPD so it gets the attention it deserves
- To improve COPD diagnosis and treatment
- To educate the public and at-risk groups
- To improve the quality of life for COPD patients and carers and ultimately
- To reduce the human and economic cost of COPD.

The achievements of the ALF's program since its inception in 2001 include:

- Raised funds from non-government sources to develop COPD program
- Published a case statement on COPD in Australia and New Zealand
- Developed new national guidelines for the diagnosis and treatment of COPD
- Committed to a best practice education program
- Established a national patient support network and information service called LungNet
- Initiated baseline research into prevalence and GP practice
- Conducted research into patient needs and problems
- Developed national standards for pulmonary rehabilitation.
- Developed a theme for consumer communication encouraging a positive and optimistic outlook on COPD.



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Executive Summary

- COPD is costing the nation an estimated \$818 to \$898 million annually. This is a conservative estimate because it is based on 1993–94 figures extrapolated to the Year 2001. The addition of hidden costs could increase the estimate to more than \$1 billion per year.
- Prevalence estimates for COPD may be well in excess of the most recent AIHW figure of 300,000 (1996). Two recent studies indicate that COPD prevalence is in the range of 620,000 to 2.6 million cases.
- More accurate prevalence figures can only be obtained by a series of integrated prevalence and costing studies.
- The current misdiagnosis, misclassification and masking of the diagnosis of COPD by other co-morbid illnesses leads to a major underestimate of the economic burden of COPD.
- The enormous burden on carers represents a hidden/additional cost not accounted for in the current cost estimates.
- Another hidden indirect cost is that due to the management of complications and co-morbidities associated with COPD.
- There are on average, 1,740 people visiting a GP every day for COPD, and 1,000 people occupying a hospital bed. The average length of stay in hospital is 7.2 days, at a basic average cost of approximately \$3,700 per admission.
- Hospital costs for COPD have increased by almost 50% (CPI adjusted) since 1993-94, and the ageing population will ensure this increase continues.
- Economic modelling, purely based on GP and specialist consultations, and using conservative prevalence estimates, shows that there is a considerable 'unmet' medical need due to the large number of undiagnosed patients currently not receiving treatment. There is potential for these costs (and others) to increase rapidly as the prevalence increases and the population ages.
- A concerted effort is required to improve the application of existing COPD interventions (for which there is evidence of effectiveness) and to develop innovative strategies for reducing the burden of COPD. There is also a pressing need to educate GP's, allied health professionals and consumers on measures which can be taken to improve the health and economic outcomes for COPD.



Abbreviations and Acronyms

ACAM	Australian Centre for Asthma Monitoring
AIHW	Australian Institute of Health and Welfare
ALF	The Australian Lung Foundation
AR-DRG	Australian Refined Diagnosis Related Groups
CAL	Chronic Airflow Limitation
CAO	Chronic Airflow Obstruction
COAD	Chronic Obstructive Airways Disease
COLD	Chronic Obstructive Lung Disease
COPD	Chronic Obstructive Pulmonary Disease
COPD-X	Evidence based guideline for the management of COPD (The Australian Lung Foundation and The Thoracic Society of Australia and New Zealand)
DALY	Disability Adjusted Life Year
E65A	AR-DRG code for Chronic Obstructive Airways Disease with catastrophic or severe complications
E65B	AR-DRG code for Chronic Obstructive Airways Disease without catastrophic or severe complications
E69A	Bronchitis and Asthma Age>49 W CC
E69B	Bronchitis and Asthma (Age<50 W CC) or (Age>49 W/O CC)
E69C	Bronchitis and Asthma Age <50 W/O CC
GOLD	Global Initiative for Chronic Obstructive Lung Disease
GP	General Practitioner
ICD	The International Statistical Classification of Diseases and Related Health Problems



Terminology

Chronic obstructive pulmonary disease

Chronic obstructive pulmonary disease (COPD) is also known as chronic obstructive airways disease (COAD), chronic airflow limitation (CAL), chronic obstructive lung disease (COLD) or chronic airflow obstruction (CAO) and includes the diseases chronic bronchitis and emphysema. COPD is defined as a disease state characterised by progressive development of airflow limitation that is not fully reversible.¹ The distinction of COPD from asthma is difficult in people over 40 years of age, both on clinical and physiological grounds.

Cost

A cost is a use of resources, which therefore are not available to generate alternative benefits.

There is considerable variation in the terminology of costs. Drummond states that:²

- Direct costs are the value of all goods and services consumed in order to prevent, diagnose or treat an illness.
- Direct costs to health services are those incurred through such agencies as hospitals, medical practices and pharmacies, etc.
- Direct costs to patients/family are those paid "out of pocket".
- Indirect costs refer to lost (paid or unpaid) productive activity due to illness or premature mortality.
- Because pain and suffering do not represent tangible resources with alternative beneficial uses, they are counted as burdens of disease rather than as costs.
- Income transfers, such as through a pension or social security benefit, are not regarded as costs.

The perspective taken in this statement is that of Australian society as a whole.



1 Prevalence of COPD in Australia

1.1 What is COPD?

Chronic obstructive pulmonary disease (COPD) refers to a common group of largely preventable long-term serious disorders, including chronic bronchitis and emphysema, characterised by reduction in airflow that is not fully reversible. The airflow limitation is progressive and associated with an abnormal inflammatory response of the lungs to noxious particles or gases.¹ COPD is a major cause of mortality, illness and a high level of disability, particularly in the elderly, with patients suffering from cough, excessive sputum and increasing shortness of breath. The disease develops gradually and symptoms vary among individuals from mild shortness of breath to severe disabling breathlessness on minimal exertion.

COPD is a major public health problem. As well as causing significant morbidity and mortality, COPD is a risk factor for serious illness and death from a variety of other diseases including pneumonia and influenza. COPD is also commonly associated with diseases such as cancer and heart disease leading to a substantial economic burden on individuals and society.³ Tobacco smoking including cigarette, pipe and cigar is the most important risk factor for COPD. Smoking contributes about 85% of the risk of developing COPD. The susceptibility of individuals to developing COPD from tobacco smoking is variable.⁴ While smoking is the major risk factor, the reason why fewer than 20% of smokers develop significant airways disease is unknown. Other documented risk factors for COPD include exposure to occupational dusts and chemicals, indoor and outdoor air pollution, passive smoking, chest and viral infections and predisposing factors such as genetic variations.⁵ With currently available therapies, the underlying cellular pathology of COPD is irreversible, but its progression may be slowed if risk factor exposure is reduced.

The burden of disease through mortality, disability, impairment, illness and injury can be quantified in terms of a Disability Adjusted Life Year (DALY).⁶ The measurement of DALYs combines both the years of life lost due to premature mortality and the years lost to disability. In 1996, the Australian Institute of Health and Welfare (AIHW) estimated the burden of disease and injury in Australia based on the DALY and confirmed the morbidity of chronic lung disease. COPD was rated the third leading cause of disease burden behind ischaemic heart disease and stroke and responsible for 3.7% of the total disease burden in Australia.⁶ The National Health Priority Areas diabetes mellitus and asthma were rated seventh and ninth causes of disease burden respectively.

Clearly, COPD represents an enormous problem for Australia and the Australian General Practitioner (GP), who is primarily responsible for treating this chronic condition, and warrants priority as an area for primary health care research, evaluation and development. The disease impacts not only on patients but also on carers and the community as a whole. However, there is a low awareness and a poor profile of the disease in the community. Its causal links with smoking have tended to create stigma with the perception that COPD is a self-inflicted irreversible disease.⁷ Prioritising COPD as a National Health Priority Area should lead to an increase in collaboration, monitoring and research. A concerted effort is required to improve the application of existing COPD interventions (for which there is evidence of effectiveness) and to develop innovative strategies for reducing the future burden of COPD. There is also a pressing need to educate GPs, allied health professionals and consumers on measures which can be taken to improve the health and economic outcomes for COPD.



1.2 Demographic prevalence

The current disease burden of COPD represents a fundamental problem for Australia and most other nations and demands immediate attention. Chronic lower respiratory tract disease is the fourth highest cause of death in Australia behind cancer, ischaemic heart disease and stroke and accounted for 5,962 deaths in 2000 or 5% of all deaths.⁸ While other diseases have shown a decline in mortality over recent years, COPD has been reported to be the only leading cause of death increasing in prevalence.⁹ It is projected to be the third leading cause of death by the year 2020.¹⁰ In Australia, age-specific mortality from COPD, although decreasing in males since the 1970s, has been steadily increasing in females with Australian female COPD mortality predicted to overtake male mortality within the next five years.^{11,12} Mortality from COPD relative to that of the normal population appears to be worse for Australian patients than for some European COPD patients.¹³ COPD affects mainly older people with death rates increasing significantly for people from 60 years of age.¹² On average, people with COPD die 7 to 8 years earlier than the age-adjusted average rate of death.¹⁴

The actual number of people suffering from COPD in Australia is not known because substantial differences are apparent in estimates based either on self-report of symptoms or self-report of a medical diagnosis or on the measurement of lung function by spirometry where different cut off values are used. The measured prevalence of COPD depends on several factors as well as diagnostic criteria, such as concurrent medical conditions, the need to make age adjustments to survey data, and adjustments for changing revisions to the International Classifications of Diseases (ICD) codes.⁹ Hence, there are currently several widely different prevalence estimates for COPD in Australia.

- The AIHW estimated there were almost 300,000 persons with COPD in 1996 with more than 20,000 new cases annually.⁶ Extrapolating this data to the year 2000 gives an estimate of 380,000 person with COPD.
- Recently, 12.4% of a random sample of adults aged between 45-70 responding to a postal survey conducted by the Monash Medical School and the Alfred Hospital self-reported chronic bronchitis or emphysema.¹⁵ Extrapolating this point prevalence to the total Australian population aged between 45-70 years gives an estimated 620,414 people with COPD in Australia in this age group based on the population at 30 June 2000.
- A prevalence estimation model has been applied to estimate the prevalence of COPD in seven Asia-Pacific Countries including Australia. The model produced an estimated prevalence of COPD of 6.3% for the twelve countries. The report goes on to estimate the number of moderate to severe cases of COPD in Australia at 4.7% of the total population aged greater than 30 years (558,000 cases) in the year 2000.¹⁶
- The Busselton study (1990) estimated that chronic airflow limitation, measured by spirometry during seven population health surveys conducted between 1966 and 1984, occurred in 24% of men and 18% of women who were regular smokers and 5% of male and 8% of female non-smokers.¹⁷
- A recent study used spirometry to estimate the prevalence of COPD in a random population of 2,500 South Australian adults aged over 18 years.¹⁸ The prevalence of mild, moderate and severe COPD was estimated to be 24.1%. The prevalence varied by area with the highest rates reaching 27%. Extrapolating the prevalence from this study to the Australian population aged between 45 - 70 years at 30 June 2000 would give an estimated prevalence of 1.2 million persons with COPD. Extrapolation to the Australian population aged over 30 years would give an estimated prevalence of 2.6 million persons.



COPD is usually found in association with comorbidities due to several reasons:

1. Tobacco smoking causes lung cancer, ischaemic heart disease, stroke and a range of other conditions as well as COPD.¹⁹
2. COPD has effects on nutritional status, muscle wasting and depression.⁵
3. COPD increases the susceptibility of the lungs to infection, such as pneumonia or influenza.¹⁹
4. The pathological changes due to COPD may lead, in turn, to failure of the right side of the heart and thence further pathology.²⁰
5. Smoking tends to cluster with other unhealthy behaviours such as excessive alcohol consumption, a diet high in saturated fats and low levels of exercise.²¹ Thus COPD is found in association with diabetes.
6. A higher than expected proportion of people with COPD also have obstructive sleep apnoea.²²
7. Treatment of COPD with corticosteroids has side-effects such as osteoporosis.²³
8. Since COPD usually requires many years of exposure to tobacco smoke, it tends to be associated with other diseases that are more prevalent in old age.

Prevalence in indigenous Australians

Chronic lung disease is a major cause of mortality and morbidity in indigenous Australians. They die from COPD at a rate 10 times greater than non-indigenous Australians.²⁴ High smoking rates (56.1% males and 48.3% females)²⁵ and high rates of infectious disease amongst indigenous Australians are likely to continue to contribute to this high mortality rate for many years in the future. A recent study of 244 indigenous Australians in the Northern Territory reported that COPD was generally unrecognised by health providers only being documented in the health record of 8% of those with COPD.²⁴ Chronic respiratory symptoms of chronic bronchitis and recent wheeze were poor predictors of airflow obstruction giving support for community-wide spirometry screening in communities with a high prevalence of respiratory disease and tobacco use.²⁴

1.3 Treatment and management

COPD has no cure and treatment options are still relatively limited. Smoking cessation is the single most effective, cost-effective means to reduce the risk of developing COPD and to slow the progression of airflow limitation.¹ No other therapy has been found to modify the natural history of COPD. Current management of COPD is aimed at relieving symptoms, controlling exacerbations and improving exercise tolerance. Management includes both pharmacologic and non-pharmacologic therapies including pulmonary rehabilitation. A major initiative of the Australian Lung Foundation (ALF) has been to develop standards to facilitate establishment of pulmonary rehabilitation programs, which are currently under-supported in Australia. Management of COPD is guided by the severity of the disease as recommended by the draft ALF COPD-X guidelines based on the GOLD guidelines (Table 1).¹



Table 1. Therapy at each stage of COPD

Therapy at each stage of COPD		
Stage	Characteristics	Recommended treatment
ALL		<input type="checkbox"/> Avoidance of risk factor(s) <input type="checkbox"/> Influenza vaccination
Stage 1 Mild COPD	<input type="checkbox"/> FEV ₁ /FVC <70% <input type="checkbox"/> FEV ₁ >80% predicted <input type="checkbox"/> With or without chronic symptoms	<input type="checkbox"/> Intermittent bronchodilator
Stage 2 Moderate COPD	<input type="checkbox"/> FEV ₁ /FVC <70% <input type="checkbox"/> 30% < FEV ₁ <80% predicted (2A:50% <FEV ₁ <80%, 2B:30% <FEV ₁ <50% predicted) <input type="checkbox"/> With or without chronic symptoms	<input type="checkbox"/> Intermittent or regular bronchodilators <input type="checkbox"/> Combination bronchodilator may be considered <input type="checkbox"/> Rehabilitation <input type="checkbox"/> Inhaled glucocorticoids if significant symptoms and lung function response
Stage 3 Severe COPD	<input type="checkbox"/> FEV ₁ /FVC <70% <input type="checkbox"/> FEV ₁ <30% predicted or FEV ₁ <50% predicted plus respiratory failure or clinical signs of right heart failure	<input type="checkbox"/> Regular combination bronchodilator <input type="checkbox"/> Inhaled glucocorticoids if significant symptoms and lung function response or if repeated exacerbations <input type="checkbox"/> Treatment of complications <input type="checkbox"/> Rehabilitation <input type="checkbox"/> Long-term oxygen therapy <input type="checkbox"/> Consider surgical treatments

Pharmacologic agents:

- Bronchodilators; help to open up narrowed airways.
- Glucocorticoids; reduce inflammation in patients with severe COPD and repeated exacerbations.
- Vaccines; Vaccines for influenza and pneumonia can reduce serious illness and death in COPD patients.
- Antibiotics; For treatment of acute infections.
- Mucolytic agents; Overall benefits in COPD patients tend to be very small.
- Antitussives; Regular use is contraindicated in COPD.
- Respiratory stimulants; Not recommended for regular use.

Non-pharmacologic agents:

- Rehabilitation; Programs include exercise training and education including nutritional advice, and aim to reduce symptoms, improve quality of life, increase capacity to self-monitor with confidence, increase exercise capacity and decrease depression.
- Oxygen therapy; Long-term oxygen therapy has been shown to improve survival in hypoxaemic COPD patients if used for more than 15 hours per day.^{20,26}
- Surgery; bullectomy and lung transplantation considered in carefully selected patients.
- Mechanical ventilation; There is little evidence that mechanical ventilation has a role in the routine management of COPD.



1.4 Impact of treatment

The prediction that COPD will rise to be the third leading cause of death worldwide by the year 2020 has enormous implications for economic management of healthcare. Current prevalence estimates are likely to be under-estimates, as the disease is often not diagnosed until late in its course when lifestyle is significantly impaired. In Australia, with an aging population and the improvement in treating other chronic disease, the burden of COPD is likely to continue to increase for some years even if the prevalence of cigarette smoking continues to decrease and most of this increase will be in women.

In 2000-01 COPD (AR-DRG codes E65A and E65B) accounted for:²⁷

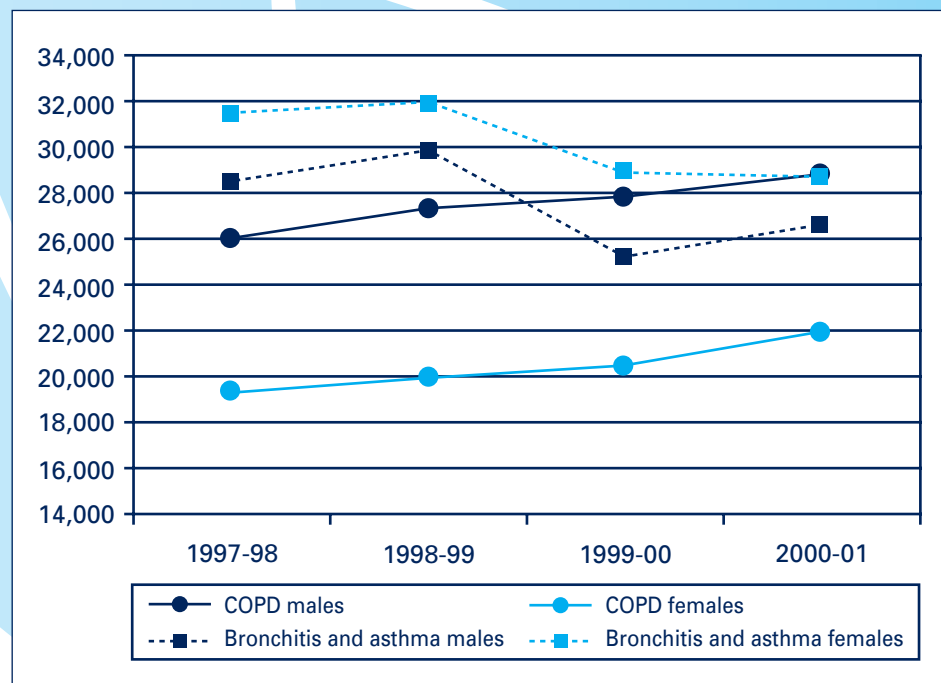
- 50,779 separations (0.85% all separations for public and private hospitals).
- 16.9% of all separations for the respiratory system.
- 366,516 bed days with an average length of stay of 7.2 days.

In addition in 2000-01 it is estimated that there were:^{28,29}

- 635,782 (0.7%) visits to a GP for COPD.

The number of hospital separations for COPD (AR-DRG E65A, E65B) is increasing annually (Figure 1).²⁷ Males have more hospital admissions for COPD than females. The rate of hospitalisation has increased by 11.1% for males and 13.2% for females from 1997-8 to 2000-01. In contrast the rate of hospitalisation for bronchitis and asthma (E69A, E69B, E69C) has decreased by 7.9% over the same period.

Figure 1. Hospital separations for COPD and bronchitis/asthma 1997-98 to 2000-01 in Australia

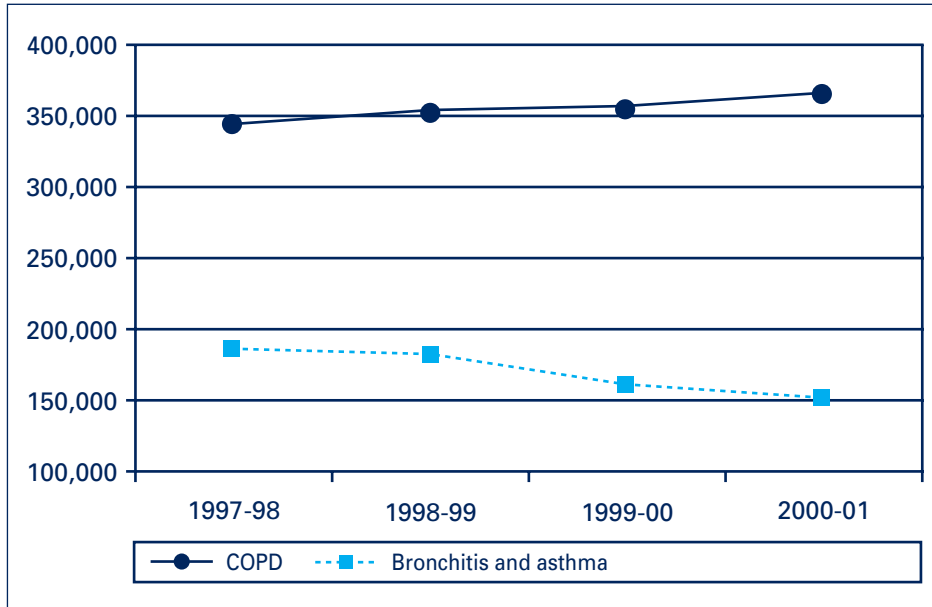


(Source: National Hospital Morbidity Database)

The number of hospital bed days for COPD (AR-DRG E65A, E65B) has increased with the number of hospitalisations (Figure 2). The number of bed days increased by 6.6% for COPD or 2% annually and decreased by 18.9% (over 6% annually) for bronchitis and asthma (AR-DRG E69A, E69B, E69C) during the 1997-98 to 2000-01 period.



Figure 2. Hospital bed days for COPD and bronchitis/asthma 1997-98 to 2000-01 in Australia



Source: National Hospital Morbidity Database



2 Costs of COPD in Australia

The cost burden associated with COPD is substantial and rising with increasing prevalence of the disease (ALF estimated cost of COPD in 1998; \$800 million per annum).³⁰ COPD affects patients, caregivers and society as a whole. For persons suffering from the disease it affects not only medical resource use but also health status, daily life and activities. Lung diseases, and COPD in particular, also affect work productivity, being among the three main causes of lost workdays.³¹ However, estimating the economic burden of COPD is difficult, as there is little data on the burden of illness imposed on society.³¹ In addition, misdiagnosis, misclassification and masking of the diagnosis by other co-morbid illnesses leads to a major underestimate of the economic burden.

The costs attributable to COPD are not uniform across patients but vary according to health status, gender, and the amount of comorbid illness. In a recent study of costs incurred by persons with COPD in the US approximately 20% of persons with COPD accounted for about 74% of total expenditure.³¹

2.1 Direct costs

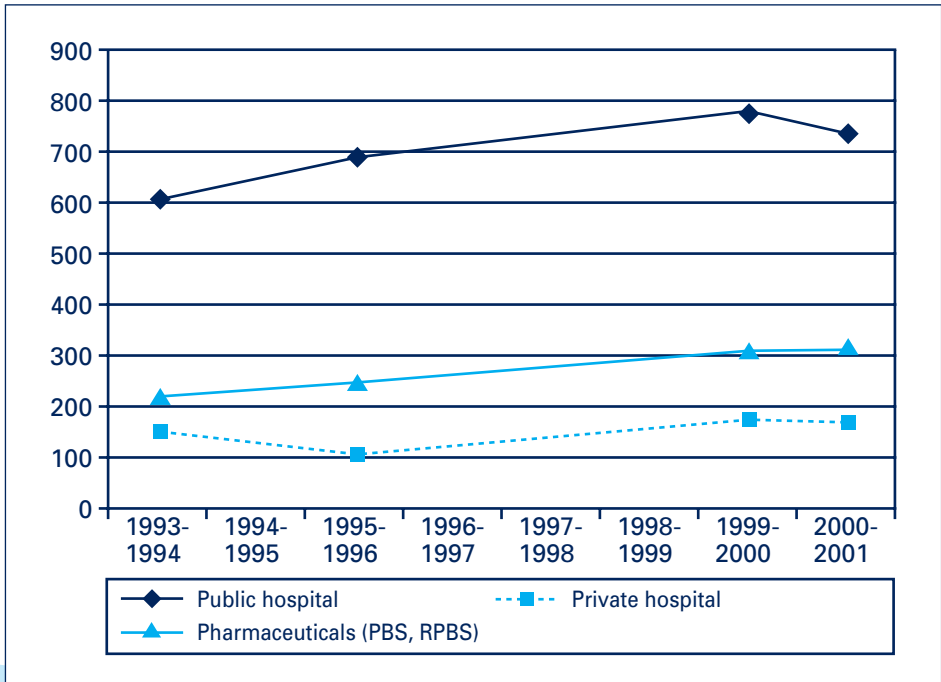
Direct costs are the value of all goods and services consumed in order to prevent, diagnose and treat illness. The AIHW employed a prevalence-based approach for estimating the direct cost of health services in a major study of health system costs of diseases and injury in Australia for the 1993-94 financial year.³² The methodology used is described in detail according to the major chapter groupings of the Ninth Revision (now superseded) of the International Classification of Diseases (ICD-9).³³ The estimations were based on the estimated resident Australian population by age and sex at 30 June 1994. The AIHW focused on direct costs because of the controversy and debate surrounding the calculation of indirect costs. The information on costs was estimated by detailed health sector for a given disease group defined in terms of a chapter of ICD-9.

In 1993-94 the AIHW estimated the health cost for all lung diseases to be \$2.5 billion or 8% of the total health system costs. Lung diseases were the sixth most costly disease group.³² Hospital cost was the largest contributor to health care costs for all lung diseases at \$833 million dollars. This estimate included a cost to public hospitals (\$527 million), private hospitals (\$128 million) and for non-inpatients (\$177 million). Total pharmaceutical costs including both prescription and over the counter medications were estimated to be \$733 million dollars.

The estimated Consumer Price Index (CPI), adjusted to 2001, costs for all lung diseases for a selected group of healthcare sectors (public hospitals, private hospitals and a combined cost for prescribed pharmaceuticals (Pharmaceutical Benefits Schemes (PBS) and Repatriation Pharmaceutical Benefits Schemes (RPBS)) from 1993-94 to 2000-01 are shown in Figure 3. CPI adjusted costs attributed to all lung diseases have increased during this time interval by 20% for public hospitals, 16% for private hospitals and 39% for prescribed pharmaceuticals.^{28,32,34,35}



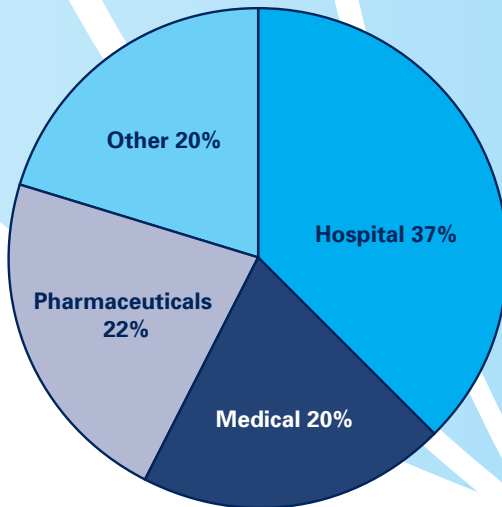
Figure 3. Estimated (CPI adjusted to 2001) annual cost (\$ million) for selected health care sectors for lung disease



Source: Australian Hospital Statistics 1995-96 and 2000-01
HIC Annual Reports Pharmaceutical and Repatriation Pharmaceutical Benefits Schemes Statistical Tables

The AIHW estimated that the cost for COPD alone in 1993-94 was \$300 million, almost three times as much as that for lung cancer.¹² Hospitalisation accounted for the major proportion of costs for COPD (\$112 million) followed by pharmaceutical costs (\$66 million) as shown in Figure 4. The hospitalisation costs for COPD represented 13.4% costs of hospitalisation for all respiratory disease. Most COPD hospitalisations occur in the public sector.

Figure 4. Estimated cost of COPD by health sector 1993-94

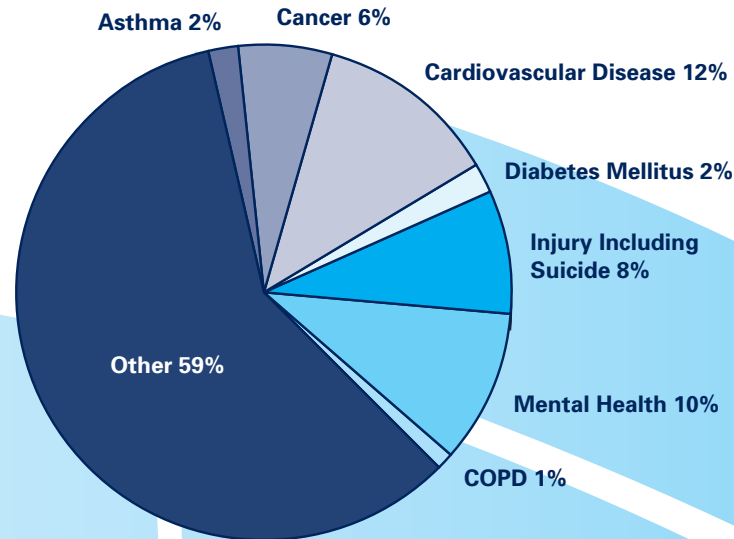


Source: Chronic diseases and associated risk factors in Australia, 2001



Comparison of the 1993-94 estimated cost of COPD with the cost of each of the six National Health Priority Areas is shown in Figure 5.³⁶ The cost of COPD was estimated at approximately one half the cost of asthma.

Figure 5. Health system costs for the National Health Priority Areas and COPD, 1993-94



Source: Australia's Health 2002

In 2000-01 the AIHW estimated the public and private hospital cost for COPD (AR-DRG E65A and E65B) to be \$188 million.³⁵ This represents an increase of 46% from the 1993-94 CPI adjusted estimate of hospital costs for COPD. The 1993-94 hospital cost also included a non-inpatient cost, which is not included in the \$188 million hospital cost estimate for 2000-01. Therefore, the 2000-01 estimated hospital cost for COPD is an underestimate in comparison with the CPI adjusted 1993-94 hospital cost. The hospital cost for COPD was the highest hospital cost of any respiratory disease and almost double the estimated hospital cost for asthma of \$95 million in 2000-01. The rate of increase in costs for COPD has exceeded the rate for total lung disease probably due to the ageing population and the increasing mortality and morbidity associated with this disease.

A lack of reliable current prevalence information plus the contribution of comorbid illness to the overall burden of disease makes the task of estimating the current cost of COPD in Australia extremely difficult. The AIHW estimated direct costs by taking known aggregate expenditures on health care and apportioning these to disease categories using known hospital morbidity data, casemix data, the 1990-91 GP survey and the 1989-90 Australian Bureau of Statistics (ABS) and National Health Survey.³² The direct costs calculated did not include costs for ambulance services, health promotion and disease prevention. To gain an insight into the current cost of COPD requires a repeat of the surveys undertaken previously with similar methodology employed but is dependent on reliable prevalence estimates. As a result, this brief economic statement can only arrive at a cost estimate for COPD in 2000-01 by extrapolation of the 1993-94 AIHW cost estimates of the health sectors of COPD taking into account currently available data.

Direct cost estimates for COPD for 2000-01 and 1993-94 are given in Table 2. The hospital cost for COPD (E65A and E65B) for 2000-01 was obtained from the AIHW National hospital morbidity database and assumed to represent 37.3% direct costs for COPD as estimated in 1993-94 by AIHW. The costs for the other health sectors were then calculated assuming pharmaceuticals represented 22%, medical costs 20.3% and other costs 20.3% of total direct costs as estimated in 1993-94.

Table 2. Estimated direct costs to the health system of COPD

Costs	COPD 1993-94 AIHW data (\$ million)	COPD 1993-94 CPI adjusted (to 2001) AIHW data (\$ million)	COPD 2000-01 (\$ million) (AIHW data)
Hospital	112	129	188
Medical	61	70	102
Pharmaceutical (prescribed and over the counter)	66	76	111
Other	61	70	102
TOTAL	300	345	503*

*The estimated total direct cost of COPD of \$503 million does not include the direct hospital costs of non-inpatients, nor the direct costs of related diseases and conditions associated with COPD and so represents an underestimate of the true health system impact of the disease.

Source: AIHW. Chronic diseases and associated risk factors in Australia, 2001
AIHW Australian hospital statistics 2000-01

2.3 Indirect costs

Indirect costs refer to lost productive activity due to the illness or premature death of the patient but can also include carer burden and opportunity cost to the carer and a cost to the community. Their inclusion in estimating the cost of illness remains controversial.

It is very difficult to estimate indirect costs for COPD. However, based on overseas experience, indirect costs may be substantial due to the significant degree of disability of COPD patients.³⁷ COPD patients experience progressive disability associated with the decline in lung function. The majority of people are incapable of productive work within a few years of diagnosis of COPD.

The indirect cost to carers has not been measured in Australia. With the increasing prevalence of COPD in females and the fact that many of these women are widowed, the burden of care is falling increasingly on the extended family or community services.

2.4 Total cost

A US estimate attributed 56% of the total cost burden of COPD to direct costs and 44% to indirect costs.³⁷ Indirect costs included estimated costs for lost wages, lost fringe benefits and lost production. Another US estimate attributed 61.5% cost of COPD to direct costs and 38.5% cost to indirect costs (indirect morbidity costs and costs related to premature mortality).³ Applying these estimates to COPD would give an estimated indirect cost for COPD in Australia of from \$315-\$395 million in the year 2000-01.

Combining the estimates for direct and indirect costs provides a total cost estimate for COPD in Australia in 2000-01 ranging from \$818 to \$898 million dollars (Table 3).



Table 3. Total cost estimate for COPD 2000-01

COPD Direct cost (\$ million)	COPD Estimated direct cost as % total cost	COPD Estimated indirect cost (\$ million)	COPD Estimated total cost (\$ million)
503	56	395	898
503	61.5	315	818

In 1998, the ALF, employing the method of Hensley and Saunders³⁸ estimated the total direct and indirect cost of COPD in Australia of approximately \$800 million.³⁰ The indirect costs were estimated as productivity or earnings losses that would be expected assuming that a patient experienced no significant disability at the time of onset or diagnosis and complete withdrawal from all forms of productive activity seven and a half years later. This estimate is similar to the estimates in Table 3 above. The costs of the comorbidities associated with COPD are hidden costs and are not included in these cost estimates

The current health system costs are for late-stage disease. Earlier disease diagnosis should lead to better secondary prevention (smoking cessation, physical exercise) which is likely to delay or reduce the future cost burden of COPD.

2.5 Home oxygen therapy

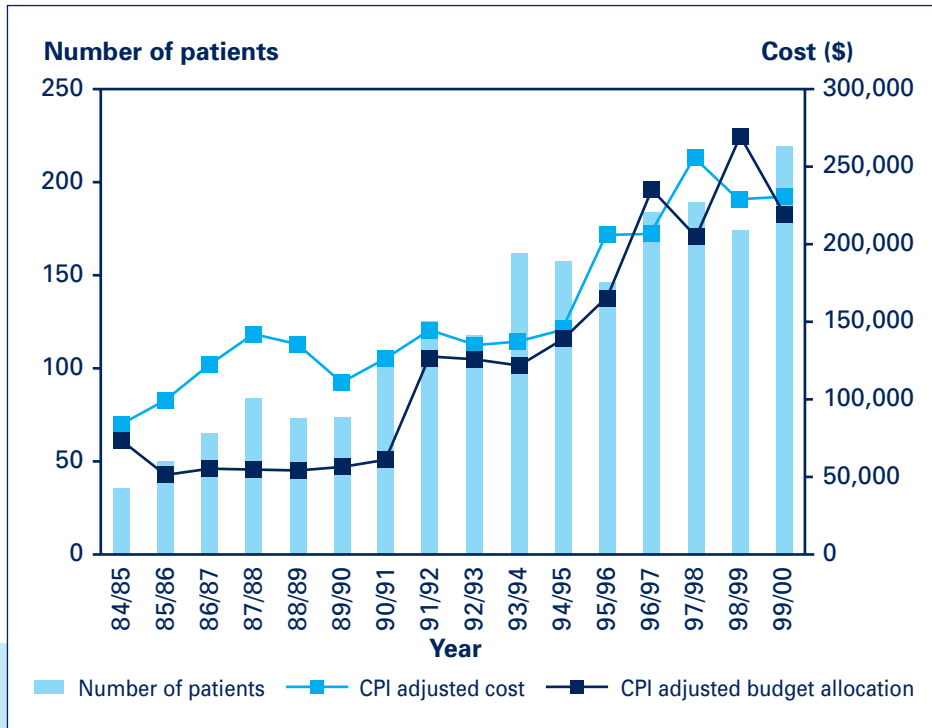
An example of how costs of individual items can impact on the cost of illness is the supply of home oxygen therapy to patients with COPD in Australia. Long-term home oxygen therapy is one of the more costly interventions for COPD but is probably cost-effective because of its positive impact on mortality rates.³⁹

In South Australia (SA), the cost of home oxygen therapy is covered primarily by site-specific grants provided to public hospitals by the state government Department of Human Services. Veterans receive their home oxygen therapy through the Department of Veterans Affairs while country hospitals provide home oxygen therapy for rural patients.

Most tertiary referral public hospitals in Southern Adelaide provide home oxygen therapy to patients assessed by the Respiratory Units as requiring this therapy. The cost of the provision of oxygen therapy at one such hospital has continued to increase, in spite of the introduction of cost saving strategies such as oxygen concentrators, in line with the ever-increasing number of patients requiring this therapy. Figure 6 shows the cost increases associated with the supply and maintenance of home oxygen therapy by this hospital from 1984-85 to 1999-2000.



Figure 6. CPI adjusted annual cost, budget allocation and number of prescriptions for home oxygen therapy provided by an Australian tertiary referral hospital



We have estimated there were approximately 111 patients on home oxygen therapy per 100,000 population in SA in the year 2001. Extrapolating this to the 2001 Australian population gives an estimated 21,700 patients on home oxygen therapy. The cost of providing home oxygen therapy in SA in the year 2001 was approximately \$1,400 per patient. On the basis of this, an estimated annual Australian cost of \$30.4 million can be calculated for the provision of home oxygen therapy. Most of this therapy is for the treatment of patients with COPD.



3 The Burden of Disease

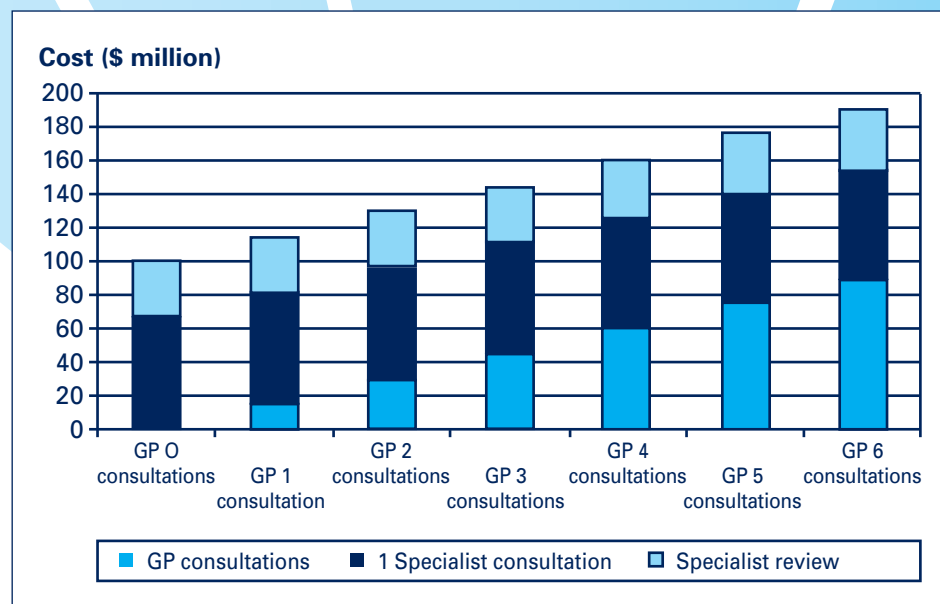
The burden associated with COPD includes both significant disability and premature death and increases with increasing age. In 1996, COPD was the largest contributor to the burden of lung diseases, more than 4 times the burden of other chronic respiratory diseases and conditions.⁴⁰

3.1 'Unmet' need

COPD has long received less than due recognition by health professionals in contrast to the enormous effort that has been made both Nationally and Internationally to improve asthma management.⁷ The recent study by Abramson reported that less than 20% of participants who were found, on laboratory tests, to have COPD had been diagnosed by a doctor.¹⁵ These undiagnosed patients will impact on healthcare provision in future years.

The Tan study estimated the prevalence of moderate to severe COPD as 558,000 cases.¹⁶ Modeling has been performed to obtain a cost estimate for the provision of medical (GP and Respiratory specialist consultations) to COPD patients based on these prevalence figures as shown in Figure 7. The unit cost of a GP encounter was set at \$27.00, the fee for Item 23 of the Medicare Benefits Schedule for the year 2000. The unit cost of respiratory physicians consultations were similarly obtained from the Medicare Benefits Schedule for the year 2000 - Item number 110; \$119.35 consultant physician referred consultation, and Item 116; \$59.75 for subsequent consultant physician review consultations.

Figure 7. Estimated annual cost (\$ million) of GP and specialist respiratory physician consultations for 558,000 moderate to severe COPD patients in Australia



From Figure 7 it can be seen that the provision of medical services alone to an estimated 558,000 patients with moderate or severe COPD could cost from \$82 million for 1 GP visit and 1 Specialist visit annually for each patient to \$190 million if each patient were to have 6 GP visits, 1 specialist consultation and 1 specialist review per year. This number of medical consultations for moderate or severe COPD patients is not unrealistic. The control group patients included in a recent GPEP study of home based care of patients with COPD, had a mean of 4.58 GP consultations during the 9 months of the study, equivalent to 6 GP consultations annually.⁴¹

The estimated \$102 million cost for medical services for COPD (Table 2) would allow only 2 GP consultations and 1 specialist consultation for each COPD patient with moderate or severe disease in the year 2000. The modeling demonstrates the large 'unmet' medical need of patients with COPD in Australia and the potential for future costs to escalate rapidly as the prevalence of the disease increases and the population ages.

With limited treatment options and a high mortality rate there is also a great 'unmet' need to develop new improved therapies for COPD. Research needs to be focused on gaining a better understanding of the disease at a cellular and molecular level, more accurate methods for detection and screening and new therapies that not only improve symptoms but which can stop disease progression and hopefully provide a cure for COPD.⁴²

3.2 Reduced quality of life

COPD patients often experience a marked reduction in quality of life.⁴³ Severe decrements in health-related quality of life (HRQoL) as measured by validated instruments have been found for COPD patients in comparison with age-matched normal populations.⁴⁴ The decrements occur in most dimensions of HRQoL including physical and social function, mobility, energy, sleep and emotional functioning. HRQoL scores have been found to be similar to those of patients suffering congestive heart failure or myocardial infarction.⁴³ COPD patients and their carers may also experience considerable depression and anxiety in relation to the illness and its associated disabilities, that are difficult to quantify.¹⁷

In 1998, the Respiratory Unit of a South Australian public hospital conducted a series of interviews with COPD inpatients their carers and their GPs. A trained, experienced, respiratory clinical nurse was recruited by the Respiratory Unit to interview COPD in-patients, carers and their GPs for their views on the patient's reasons for admission/readmission to hospital, the patient's knowledge of their illness, medications, social supports and quality of life. A total of 87 (29 males; 58 females) in-patients (plus 10 re-interviews), 12 GPs and 23 carers were interviewed. The mean age of the patients interviewed was 71.6 years (range 50-89).

A selection of individual patient responses representative of the common themes for many of the patients follows. The responses highlight patient perceptions and problems associated with their chronic illness and its comorbidities and the feelings of frustration, isolation and inability to cope.



Patients' responses

"...I mean I am on 30 pills a day now, I can't keep up 30 pills a day, that is ridiculous."

"The locum came down and when he looked at the listing of medication I have got he said I don't think there is anything left. The best thing is to take her to hospital."

"...I was unwell for probably a few days before I went to the doctors ... I knew that there was probably not a lot that they could do for me... so I just kept going until I just couldn't go on any further."

"I never want to go home after I have been in here (hospital) because I feel so safe."

"Well I was here (in hospital) fourteen times and I had a different complaint every time."

"The thing is when you are on your own you have a tendency to panic... and that only makes the problem worse."

"...it is very difficult because no sooner do we apply for help than they take it off our pension. Do you know what I mean? We can't afford it ... We can't afford help you know but yes, we do need help."

Carers' responses

"I have not been well myself, I only came out of hospital about four weeks ago."

"...he is a very frightened man as well, he needs constant reassurance."

GP' responses

"...I have experience in many different fields, but I am always a little unsure of treating individuals with chronic respiratory insufficiency."



4 Strategies to Reduce the Burden of COPD

The burden of disease and the costs to society of COPD are not inevitable and fixed. However, a concerted effort is required to improve the application of existing COPD interventions (for which there is evidence of effectiveness) and to develop innovative strategies for reducing the burden of COPD. There is also a pressing need to educate GPs, allied health professionals and consumers on measures which can be taken to improve the health and economic outcomes for COPD.

Several strategies have been introduced in an attempt to reduce the disease burden associated with COPD. Increased basic and applied research effort is required to investigate the cost-effectiveness and long-term effects on morbidity and mortality of many of these interventions and to develop new strategies and new therapies for improved management.

Examples of strategies to reduce the burden of COPD include:

Prevention of smoking

It is estimated that 90% of the health care costs of COPD in men and 80% in women are attributable to smoking.⁴⁵ Smoking prevention/cessation is the single most important intervention to reduce the escalating cost of COPD. The rate of decline of lung function is accelerated by smoking and smoking cessation slows this rate of decline in lung function in patients with COPD.⁴⁶ Primary prevention has led to a progressive reduction in the number of Australian adults currently smoking, but little attention has been given to secondary prevention i.e., helping smokers with proven disease to quit. A recent Australian review of the pharmacotherapy of smoking cessation found that all forms of nicotine replacement therapy and bupropion were effective as part of a strategy to promote smoking cessation. More intense levels of patient support are beneficial in facilitating the likelihood of quitting.⁴⁶

Vaccination

Along with smoking cessation the only other proven cost-effective therapy for COPD is vaccination to prevent influenza infection. Influenza vaccination can reduce serious illness and death in COPD patients.¹ A recent study in the Netherlands found that immunisation of elderly patients with chronic lung disease against influenza was effective and cost-saving.⁴⁷

Pulmonary rehabilitation

Pulmonary rehabilitation is a multidisciplinary intervention which aims to reduce symptoms, improve quality of life and increase mobility and physical endurance. The programs generally include exercise training, education, and nutrition counselling. COPD patients have been shown to benefit from pulmonary rehabilitation with improvement in exercise tolerance and fatigue.⁴⁸ The long-term cost-effectiveness of pulmonary rehabilitation and the effects on mortality are still unknown in Australia although cost-effectiveness has been shown in the UK.⁴⁹

Home based care

The high hospitalisation costs incurred by patients with COPD have encouraged the development of home-based care treatment programs for COPD patients in Australia in recent years. A recent trial of home based care versus hospital care for acute COPD reported that an acute care at home scheme could substitute for usual hospital care for some patients potentially freeing up resources. However significant comorbidities were a limiting factor.⁵⁰



5 Conclusions

- COPD has become an epidemic. Disease due to COPD is one of the largest public health problems facing our society. In the past COPD has long received less than due recognition by health professionals in comparison with other lung diseases such as asthma. Treatment options for patients are still relatively limited and people with COPD are still experiencing poor quality of life.
- There is currently no coordinated data collection for COPD in Australia. The Australian Centre for Asthma Monitoring (ACAM) has been established to develop a systematic approach to the surveillance of asthma across Australia, to monitor disease levels, burden and trends and to identify the potential for improved prevention and management of the disease. Such a coordinated systematic approach is required for COPD and would enable the refinement of uniform definitions and indicators of disease for monitoring.
- There is an urgent requirement for reliable prevalence data for COPD for the prediction of current and future health care needs and to monitor trends. Only two Australian prevalence studies based on population samples have been performed in recent years. One study found that 12.4% of the population aged between 45 and 70 years of age self-reported COPD, equivalent to 620,000 cases. The other study estimated the prevalence of mild, moderate and severe COPD to be 24.1% which if extrapolated to the Australian population aged 45-70 years would be equivalent to 1.2 million cases or to the Australian population over 30 years 2.6 million cases.
- COPD presents a major burden to the health care system. The cost associated with COPD is large with hospitalisation the greatest contributor to overall health care cost. Extrapolation from the costs estimated by the AIHW in 1993-94 gives an estimated cost of \$818-898 million for COPD in the year 2000-01. A study similar to that performed by the AIHW in 1993-94 is required to obtain accurate estimates of costs. Such a study is dependent on reliable prevalence estimates.
- There is a large 'unmet' clinical need for more effective therapies and better outcomes for people with COPD. Recent studies such as the international GOLD study and the work of the ALF have resulted in the formulation of guidelines for the management of COPD. The cost-effectiveness of these guidelines needs to be studied from the point of introduction to guide future resource allocation decision-making.
- An economic study needs to be applied to current interventions to provide some indication of the optimal mix that will provide the greatest improvement in health outcomes for Australian COPD patients. This proposed study would provide a rich source of information which could be applied for the rational allocation of resources.



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