SERIOUS AND CONTINUING ILLNESS POLICY AND PRACTICE STUDY

EPIDEMIOLOGY OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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EPIDEMIOLOGY OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE

COPD is characterized by airflow limitation that is not fully reversible. The airflow limitation causes progressively worse shortness of breath on exertion and is associated with an abnormal inflammatory response of the lungs to noxious particles and gases (ALF, 2001). COPD is often associated with chronic bronchitis; however, many cases also manifest emphysema.

Risk factors

Tobacco smoking is the principle risk factor for COPD (ALF, 2001). Globally, it is estimated that 82% of deaths due to COPD are attributable to smoking (Zaher et al, 2004). The other recognized risk factors for COPD include exposure to passive (environmental) tobacco smoke, indoor and outdoor air pollution, occupational dusts and chemicals, and possibly to a minor extent, viral respiratory infections (ALF, 2001; GOLD, 2006). These additional risk factors may function to worsen respiratory symptoms or they may contribute to the risk of developing COPD, either independently or in conjunction with tobacco smoking. A small percentage of people with COPD have an inherited deficiency of alpha-1-antitrypsin, a protein that normally inhibits the action of destructive enzymes in the lungs (ALF, 2001).

Quality of COPD Data

Reliable data on the prevalence and mortality associated with COPD are lacking in many parts of the world. This poses challenges for providing estimates of the true burden associated with this condition. Accurate estimates of prevalence depend on multiple factors: diagnostic criteria, potential confounding conditions, appropriate age and risk factor adjustments to population estimates, appropriate adjustments for revisions to the International Classification of Disease codes and a common recognition of the condition and its symptoms (ALF, 2001; Halbert et al, 2003; GOLD, 2006; Halbert et al, 2006; Lopez et al, 2006).

As a result, estimates of observed prevalence are generally based on factors other than the actual occurrence of the disease. Such factors include expert opinion, self-report of symptoms or medical diagnosis and spirometry results. These factors may lead to over or under-estimation of the true prevalence of COPD.

In addition, regional differences in smoking behaviours, type and processing of tobacco, pollution exposure, climate, frequency and management of respiratory infections and genetic factors all cause significant intra and inter-country variation in mortality rates (Hurd, 2000; Lopez et al, 2006). The interpretation of mortality data is also affected by a lack of standardization of death certification and coding practices, as well as variability in the recognition and diagnosis of COPD and the availability and quality of medical treatment in different countries (Hurd, 2000).

Thus currently available data only provide estimates of the prevalence, mortality and morbidity associated with COPD and should be interpreted cautiously.

GLOBAL PROFILE

Prevalence

COPD is a leading cause of death that is increasing in prevalence in the population (Hurd, 2000). The global prevalence of COPD is estimated as 7.6% (Halbert et al, 2003; GOLD, 2006). The onset of COPD increases with age; it is estimated to be 3.0% in individuals less than 40 years of age, 8.2% in individuals between the ages of 40 to 64 years and is highest for those over the age of 65 years (14.2%) (Halbert et al, 2006). It occurs more often in males (9.8%) than in females (5.6%), although this trend may be changing as more females are exposed to the risk factors associated with COPD (Lopez et al, 2006).

The prevalence in smokers is 15.4% (Halbert et al, 2003), compared to 4.3% in non-smokers (Halbert et al, 2006). The fact that only 15% of smokers develop COPD suggests that individual susceptibility does play a role in the development of this condition (GOLD, 2006). In addition, residential and occupational setting can increase the likelihood of exposure to environmental risk factors. The prevalence of COPD in urban settings is 10.2%, compared to 6.1% and 8.0% for mixed and rural settings respectively (Halbert et al, 2006).

Mortality

COPD was estimated to cause approximately 2.7 million deaths (males 1.4; females 1.3) worldwide in 2000, 98.6% among those 45 years of age and over (Mathers et al, 2001). It was the sixth leading cause of death among low and middle income countries, and fifth among higher income countries, resulting in 2.4 million deaths and 0.3 million deaths respectively in 2001 (Mathers et al, 2001).

COPD is projected to increase to the third leading cause of death worldwide by 2020, due to the expanding smoking epidemic in the developing world and an aging population globally (GOLD, 2006; Lopez et al, 2006).

Burden of disease

1.9% of all disability adjusted life years (DALYs) were attributable to COPD in 2000, an estimated 27.8 million DALYs (Lopez et al, 2006). By the year 2020, COPD is estimated to rank fifth among conditions contributing the highest burden of disease to society on a worldwide scale (Hurd, 2000). This increasing burden is primarily because COPD is a costly disease to manage. The cost of care is directly related to the severity of disease and the distribution of costs changes as the disease progresses and as a patient ages (Sullivan et al, 2000; Jansson et al, 2002; GOLD, 2006). The cost of illness varies in each country because of differences in health care financing between countries, and the extent to which the costs are borne by the individual and his or her carer varies from country to country. Generally, the poorer the country the more of the costs of treatment (if indeed it can be afforded at all) are borne by the individual. In the richer nations, the costs tend to be borne by public funding or by private health insurance. The largest contributor to the cost of COPD is hospitalization, often accounting for more than 70% of all COPD related medical care costs (Sullivan et al, 2000).

There are substantial indirect costs associated with COPD because of the degree of disability that is associated with this condition. The majority of people living COPD are incapable of productive work within a few years of diagnosis (Crockett et al, 2002). In addition to lost productivity due to illness and premature death of the patient, there are considerable costs associated with the carer burden and opportunity costs to the carer. Such indirect costs are variable and are not well defined, so remain difficult to quantify.

AUSTRALIAN PROFILE

Prevalence

Current estimates of the prevalence of COPD in Australia are based on self-reports provided by the 2004-05 National Health Survey, administered by the Australian Bureau of Statistics (ABS). The National Health Survey sample includes the majority of people living in private households, but excludes the most remote areas of Australia. These areas cover 86.4% of Australia's land mass but

comprise just 3% of the total population. However, approximately 28% of Australia's Indigenous population live in these areas and so are underrepresented in this data. In addition, estimates based on self-report generally underestimate the true prevalence of COPD in the population. This is especially true in Australia as inconsistencies in the clinical definition of COPD exist and affect the quality of the available data sources (ALF, 2001; AIHW, 2005). Furthermore, the Australian Lung Foundation (ALF) estimates that one in six Australians over the age of 45 years have COPD, three-quarters of whom are unaware that they have the condition (ALF, 2006). This occurs because COPD is generally diagnosed late, when it is moderately advanced and has begun to restrict a person's lifestyle (AIHW, 2005). Therefore, the significant proportion of undiagnosed COPD, which likely exists in Australia, is not reflected in the estimates discussed below.

The overall prevalence of COPD in Australia in 2004-05 was approximately 3.0% - 589,900 Australians. The prevalence was higher, 4.4%, for the 45-74 year old age group and increased to 8.8% in persons over the age of 75 years (ABS, 2006). The estimated prevalence among females was slightly higher than males in individuals under the age of 60 years, after which the prevalence in males was higher than in females (AIHW, 2005).

There is a lack of data estimating the prevalence of COPD among Indigenous Australians but it is considered by many health professionals to be a much larger problem in this population than in the non-Indigenous community because of greater prevalence of smoking and recurrent respiratory infections. It may also be under-recognised, resulting in delayed treatment (Maguire et al, 2002; Trewin et al, 2005).

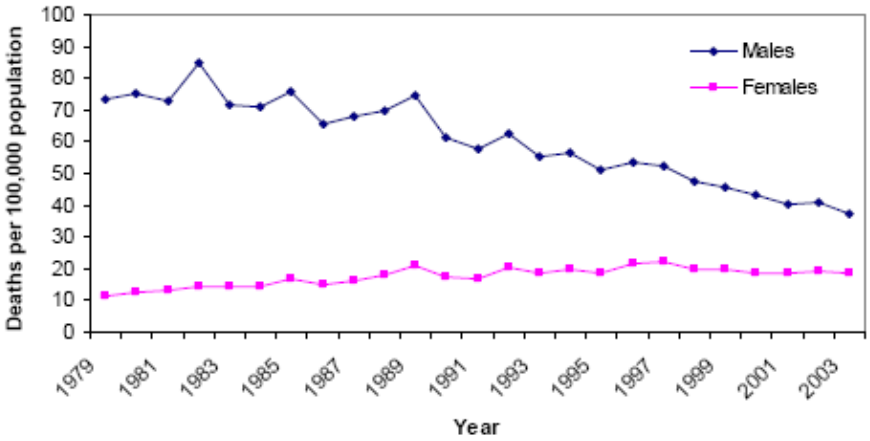
Mortality

COPD was the fifth leading cause of death in Australia in 2004. It was listed as the underlying cause of 5,199 deaths, representing 3.9% of all deaths in Australia for that year (AIHW, 2006). Over 90% of COPD deaths occurred in individuals 65 years of age and older (AIHW, 2005).

The male COPD mortality rate has been gradually decreasing since 1979 (Figure 1) (AIHW, 2006). Simultaneously, the female mortality rate has been increasing, but has plateaued in the past 5 years (AIHW, 2006). Despite the decline in the male mortality rate, it still remains about double the

female rate with 31.3 deaths per 100,000 males compared to 16.3 deaths per 100,000 females (AIHW, 2007).

Figure 1: Trends in COPD mortality rates, 1979-2003.



Notes: Age-standardised to the Australian population at June 30th, 2001; COPD classified according to IDC-9 codes 491, 492, 496 and ICD-10 codes J41 to J44; rates for 1979-1996 have been adjusted by a factor of 0.93 to accommodate classification changes and be comparable with 1997-2003 rates.

Source: (AIHW, 2005)

Respiratory diseases were responsible for 9% of the total Indigenous deaths for the period 1999 to 2003, and tended to affect the Indigenous population at younger ages compared to the non-Indigenous population (Trewin et al, 2005). The age standardised death rate for the 35–44 year old age group was almost 18 times higher for Indigenous males compared to non-Indigenous males and 14 times higher for Indigenous females compared to non-Indigenous females (Trewin et al, 2005). COPD was one of the leading causes of death in the majority of these cases and in 2003, 3.1% of all COPD deaths in Australia occurred among Indigenous Australians (AIHW, 2005)

In addition to the 5,199 instances where COPD was identified as the underlying cause of death, it was also listed as an associated or contributing cause of death on another 7,100 death certificates (AIHW, 2006). In more than half of these cases, a circulatory disease was listed as the underlying cause of death (AIHW, 2005).

Table 1 is a modified version of two fact sheets on COPD created by the Australian Institute of Health and Welfare (AIHW). It summarises key trends for several COPD mortality and morbidity indictors.

Table 1: COPD mortality and morbidity trends

	MALES	FEMALES	PERSONS
MORTALITY INFORMATION			
Number of deaths:			
2004	2,986	2,213	5,199
2003	3,163	2,215	5,378
1997	3,608	2,229	5,837
Age-standardised death rate (per 100,000):			
2003	37.6	18.5	26.1
1997	52.3	22.3	34.0
Position in top 10 causes of death:			
2003	5th	7th	5th
1997	4th	6th	5th
Average age at death (years):			
2003	77.7	78.3	77.9
1997	76.3	76.7	76.4
Percentage 65 years of age and over (%):			
2003	91.3	90.0	90.7
1997	90.8	89.5	90.3
Percentage Indigenous [(a)] (%):			
2003	2.2	4.5	3.1
1997[(b)]	2.5	3.8	3.0
Total potential years of life lost[(c)] (years):			
2003	7,605	5,405	13,010
1997	10,455	6,823	17,278
Potential years of life lost per death (years):			
2003	2.4	2.4	2.4
1997	2.9	3.1	3.0
Number of deaths in which COPD was an associated cause:			
2003	4,642	2,577	7,219
1997	4,750	2,346	7,096
Most common associated cause of COPD deaths:			
2003	Pneumonia	Respiratory failure	Respiratory failure
1997	Respiratory failure	Respiratory failure	Respiratory failure
HOSPITALISATION INFORMATION			
Number of hospital separations:			
2002-03	30,532	23,034	56,566
1998-99	27,703	19,232	46,935
Average length of stay (days):			
2002-03	7.3	7.7	7.5
1998-99	7.8	8.2	7.9
Average age at hospital separation (years):			
2002-03	72.6	71.1	71.9
1998-99	70.9	69.6	70.4
Percentage 65 years of age and over (%):			
2002-03	80.8	74.6	78.1
1998-99	78.1	72.4	75.8
Percentage of all hospital separations (%):			
2002-03	1.0	0.6	0.8
1998-99	1.0	0.6	0.8
Percentage Indigenous [(d)](%):			
2002-03	6.0	9.2	7.4
1998-99	4.6	7.5	5.8

Note: Rates are per 100,000 and are age-standardised to the 2001 Australian population

(a) Includes data from WA, SA and NT only. For reference against deaths from all causes in these three states, percentage Indigenous in 2003=3.7 and in 1997=4.0
(b) Indigenous data for 1997 should be interpreted with caution
(c) Potential years of life lost is an indicator of premature mortality based on an arbitrary upper age limit of 75 years
(d) Includes data from WA, SA and NT only. For reference against separations for all conditions in these three states, percentage Indigenous in 2002-3=7.4, and in 1998-99=7.0

Adapted from: (AIHW, 2005; 2006)

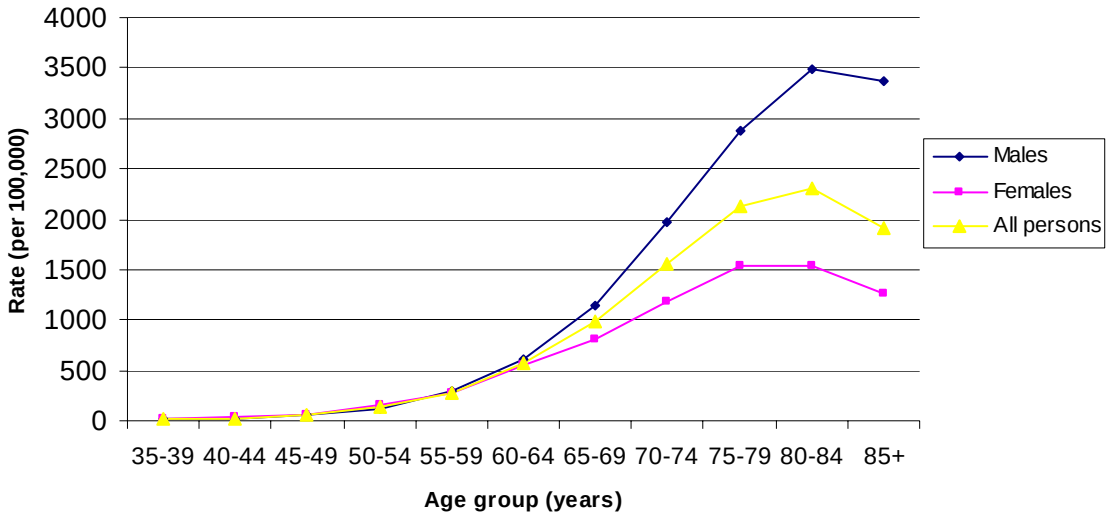
Burden of disease

In 2004, COPD was estimated to account for 3.6% of the total disease burden in Australia, 3.7% of the years of life lost due to premature mortality and 3.5% of the years of healthy life lost due to poor health and disability (AIHW, 2006). Australians living with COPD generally become incapable of maintaining employment within seven to eight years of diagnosis (AIHW, 2005), primarily because of the disability associated with this condition.

The 2003 Survey of Disability, Ageing and Carers found that 34.1% of individuals who reported living with either emphysema or bronchitis were experiencing some level of disability associated with their condition (ABS, 2004). 12.3% of respondents reported living with a profound disability, meaning they required some level of assistance with their self-care, mobility and communication needs (ABS, 2004). Disability was reported to be twice as common in males compared to females and was highest among older individuals, with 68% of respondents who reported disability over 65 years of age (ABS, 2004).

The management of COPD in Australia was estimated to be well below the recommended guidelines specified by the Global Initiative for Chronic Obstructive Lung Disease and the ALF and Thoracic Society of Australia and New Zealand's recently published COPD-X guidelines (Matheson et al, 2006). In 2002-03, COPD encounters represented less than 1% of all encounters managed by a general practitioner (Britt et al, 2003). In the same period, it resulted in approximately 53,566 hospital separations, most within the public sector and most involved individuals 65 years of age and older (Crockett et al, 2002; AIHW, 2005). The rate of hospitalisation among males is substantially higher than females for individuals 65 years of age and older (Figure 2) (AIHW, 2005).

Figure 2: Hospital separation rates by age and sex, 2002-03



Adapted from: (AIHW, 2005)

COPD associated hospitalisations occurred at a higher rate among Indigenous Australians. In 2000-01, the rate of Indigenous COPD hospitalisations was four to five times the non-Indigenous rate (Trewin et al, 2005). In the next year, 2002-03, Indigenous people made up 7.4% of all hospitalisations for COPD. A higher proportion of Indigenous females were hospitalised as a result of COPD than Indigenous males, 9.2% compared to 6.0% respectively (AIHW, 2005).

The average length of stay in hospital associated with all cases of COPD was 7.5 days, which has decreased for all males and females since 1997 (AIHW, 2005). The most common procedure associated with COPD hospitalisations was physiotherapy.

The health system expenditure, including direct cost of health goods and services incurred by governments, non-government organisations and health service providers, was estimated at $433 million in 2000-01 (AIHW, 2004). Hospitalisations accounted for 63.1% of this expenditure, an estimated $273 million. Pharmaceuticals (prescribed and over the counter) accounted for 19.6% of the total COPD expenditure, approximately $85 million. Males 65 to 84 years of age utilized the greatest proportion, $163 million, 37.7% of the total COPD expenditure in that year (AIHW, 2004).

Indirect costs associated with COPD, including absenteeism, early retirement and the burden on carers, were extrapolated from international data. The estimated indirect costs for COPD in Australia in 2000-01 ranged between $315 to $395 million (Crockett et al, 2002), bringing the total cost estimate for COPD in Australia to a figure between $748 to $828 million (ALF, 2001).

COPD IN THE AUSTRALIAN CAPITAL TERRITORY AND WESTERN SYDNEY

Prevalence and mortality

The self-reported prevalence of emphysema and/or bronchitis in the Australian Capital Territory (ACT) in 2001 was 4.4% (Dugdale et al, 2006). It was the fifth leading cause of death in males and the seventh leading cause of death in females in 2003 in this area (Dugdale et al, 2006). This represented 4.3% of all male deaths and 3.6% of all female deaths in that year.

Respiratory diseases in general continue to pose a burden on the lives of people living within the Western Sydney area. Current prevalence data for COPD in the Western Sydney area is unavailable. However, COPD was reported to be responsible for 6% of all deaths among individuals 65-74 years of age and 5% of all deaths among individuals over the age of 75 years from 1999-2000 (Close et al, 2002). These figures are consistent with ACT and New South Wales rates.

Burden of disease

Information on the burden of COPD within Western Sydney and the ACT is taken from the Division of General Practice (DGP), Population Health Profiles, produced by the Public Health Information Development Unit (PHIDU), the University of Adelaide. The data for chronic conditions and risk factors, including prevalence estimates, have been estimated from the 2001 National Health Survey, and so are based on self-report. Details of the model used are available from the PHIDU (PHIDU, 2007e; 2007d; 2007b; 2007c; 2007a). The numbers are estimates for a DGP area, not measured events as are death statistics. Therefore, they should only be used as indicators of likely levels of a condition or risk factor in the given areas.

The ACT DGP covers the entire ACT area. There are four DGPs that cover the majority of the Sydney West Area Health Service jurisdiction (the Lithgow Local Government Area (LGA) is the only exclusion, which is covered by the New South Wales (NSW) Central West DGP): Blue Mountains, Hawkesbury-Hills (formerly Hawkesbury), Nepean and WentWest (formerly Western Sydney).

COPD was classified as an ambulatory care sensitive (ACS) condition within each DGP. This classification identified conditions in which timely and effective care, delivered in primary care settings, could have reduced the risk of hospitalisation associated with the condition. Admissions to

hospital for chronic ACS conditions could be avoided by effective management to prevent or reduce the severity of acute illness episodes.

COPD was among the top four conditions with the highest rate of avoidable hospitalisations in the Hawkesbury-Hills, Nepean, WentWest and ACT DGPs in the period from 2001-02. Figure 3a illustrates the differences in rates of avoidable COPD hospitalisations for the Western Sydney DGPs and figure 3b compares an aggregated Western Sydney rate with avoidable hospitalisation rates from ACT, NSW and Australia.

Figure 3a: Avoidable COPD hospitalisation rates for the DGPs within Western Sydney, 2001-02

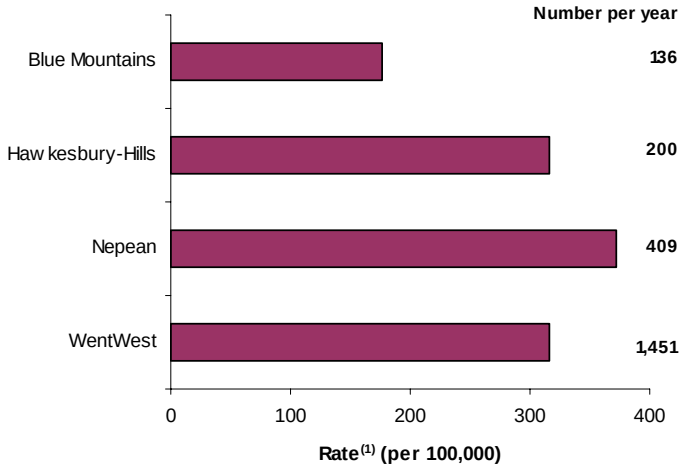
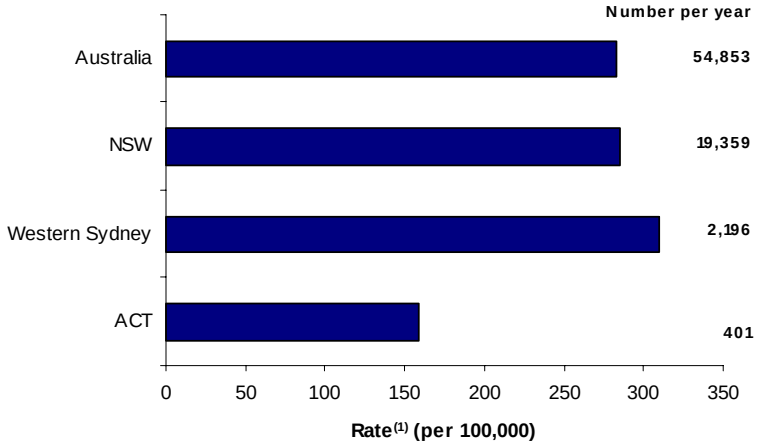


Figure 3b: Avoidable COPD hospitalisation rates for Western Sydney(2), ACT, NSW and Australia, 2001-02



(1) Rate is the indirect age-standardised rate per 100,000 population
(2) Author's calculation from data from the Public Health Information Development Unit (PHIDU). Calculation does not include data from the Lithgow LGA.

Adapted from: (PHIDU, 2007e; 2007d; 2007b; 2007c; 2007a)

Within the Western Sydney area, Indigenous Australians generally experienced a much higher rate of potentially avoidable hospitalisations for chronic illness, including COPD, compared to non-Indigenous Australians (SWAHS, 2006).

COPD ranked among the top ACS conditions associated with avoidable mortality in Western Sydney and the ACT from 1997-2001. Avoidable mortality served as a measure of the adequacy and effectiveness of care in the area during that period (Gordis, 2000). The ACT rate of avoidable COPD mortality, 10.0 per 100,000, was lower than the rates for Western Sydney, NSW and Australia, 12.9, 12.4 and 11.6 per 100,000 respectively (Figure 4).

Figure 4a: Avoidable COPD mortality rates for the DGPs within Western Sydney, 2001-02

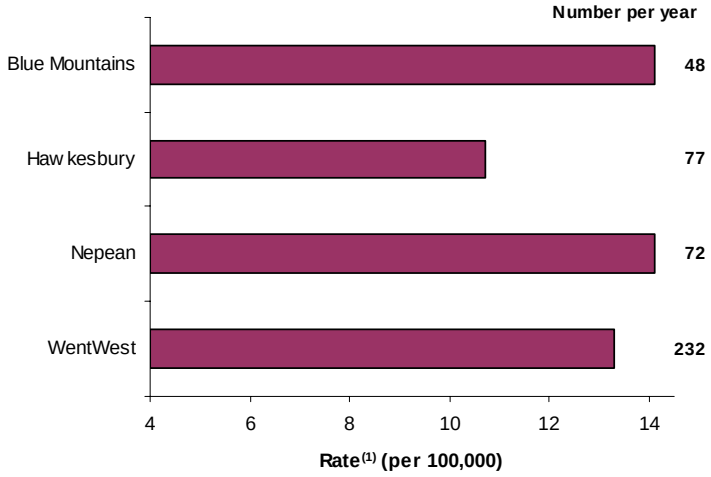
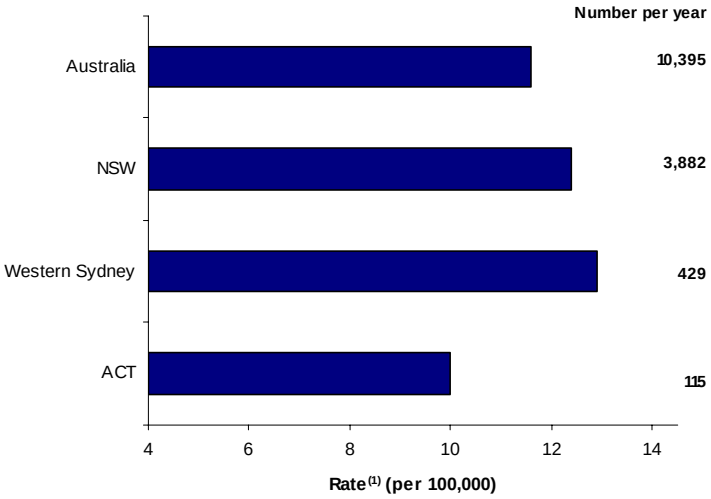


Figure 4b: Avoidable COPD mortality rates for Western Sydney(2), ACT, NSW and Australia rates, 2001-02



(1) Rate is the indirectly age-standardised rate per 100,000 population
(2) Author's calculation from data from the Public Health Information Development Unit (PHIDU). Calculation does not include data from the Lithgow LGA.

Adapted from: (PHIDU, 2007e; 2007d; 2007b; 2007c; 2007a)

Table 2: Selection of chronic illnesses and major co-morbidities in all ages, Western Sydney and NSW residents, 1997-2000.

UNDERLYING CAUSE OF DEATH	WESTERN SYDNEY		NSW	
	Total as underlying cause	**% co-existing condition**	**Total as underlying cause**	**% co-existing condition**
Ischaemic heart disease (ICD10 I20-I25)	3,361		39,538	
Co-existing contributory causes:				
Other forms of heart disease (I30-I49,I51,I52)		1,043 (31.0%)		12, 054 (30.5%)
Heart failure (I50)*		720 (21.0%)		9,146 (23.1%)
All forms of diabetes (E10-E14)		388 (12.0%)		3,858 (9.7%)
Organic mental disorders (F00-F09)		240 (7.1%)		2,064 (5.2%)
Diabetes (E10,E11)	125		1,322	
Co-existing contributory causes:				
Ischaemic heart disease (I20-I25)		79 (63.2%)		719 (54.4%)
Other forms of heart disease (I30-I49,I51,I52)		23 (18.4%)		282 (21.3%)
Heart failure (I50)		25 (20%)		211 (15.8%)
Heart Failure (I50)	282		4,108	
Co-existing contributory causes:				
Other forms of heart disease (I30-I49,I51,I52)		82 (29.1%)		852 (20.7%)
Pneumonia/influenza (J10-J18)		66 (23.4%)		1,132 (27.6%)
Renal failure (N17-N19)		68 (24.1%)		746 (18.2%)
Chronic lower respiratory disease (J40-J47)		45 (16.0%)		502 (12.2%)
Organic mental disorders (F00-F09)		27 (9.6%)		395 (9.6%)
Cerebrovascular disease (I60-I69)		27 (9.6%)		375 (9.1%)
Diabetes (E10-E14)*		38 (13.5%)		275 (6.7%)
Pneumonia n influenza (J10-J18)	188		2,704	
Co-existing contributory causes:				
Signs & symptoms (R50-R69)		32 (17.0%)		385 (14.2%)
Other forms of heart disease (I30-I49,I51,I52)		25 (13.3%)		260 (9.6%)
Heart failure (I50)		18 (9.6%)		218 (8.1%)
Ischaemic heart disease (I20-I25)		23 (12.2%)		295 (10.9%)
Other bacterial diseases (A30-A49)		33 (17.6%)		323 (11.9%)
Chronic obstructive pulmonary disease (J44)	521		6,614	
Co-existing contributory causes:				
Other forms of heart disease (I30-I49,I51,I52)		90 (17.3%)		867 (13.1%)
Heart failure (I50)*		104 (20.0%)		1,261 (19.1%)
Pneumonia/influenza (J10-J18)		135 (25.9%)		2,057 (31.1%)
Ischaemic heart disease (I20-I25)		112 (21.5%)		1,131 (17.1%)

* SCIPPS index conditions

Source: (EIRE, 2004)

Co-morbidities

Like most chronic illnesses, COPD is commonly associated with other co-morbidities. Within the Western Sydney population, pneumonia/influenza is the most common co-morbidity, affecting 26% of COPD cases. Cardiovascular diseases are the second most common co-morbidity associated with COPD, with 22% of cases with ischaemic heart disease, 20% of cases with heart failure and 17% of cases with other forms of heart disease (Table 2) (EIRE, 2004).

CONCLUSION

The information presented in this review highlights the burden of disease associated with COPD globally, within Australia and within the Western Sydney and ACT areas. Estimates of the prevalence of COPD in Australia indicate that this condition has become more prevalent in recent years. This may be due partly to a better recognition and diagnosis of the condition resulting from recent revisions to the International Classification of Diseases (ICD) codes and the development national guidelines for the diagnosis and management of COPD, COPD-X, developed by the Australian Lung Foundation. It may also be attributable to the delayed effect of an increase in the proportion of female smokers in Australia since the 1970s (AIHW, 2005). The decline in mortality reflects the fact that individuals are generally living longer with the condition, which may be a result of improved management of COPD in Australia. Taken together however, the increasing prevalence and decreasing mortality of COPD supports the need to continue to improve the management of this condition in order to curtail its social and economic burden, which remains substantial and will increase due to the aging population.

Effective strategies are required to reduce the occurrence of acute illness episodes. These episodes generally result in avoidable hospitalisations which are common and costly to the health system and highly disruptive to the individual and his or her family. In addition, improvements in the supportive mechanisms currently available to patients are required to address the significant disability caused by COPD. This will be important for improving patients' quality of life and in easing the burden that carers currently experience. Finally, the carer's role in supporting patients living with COPD is integral to a patient's day-to-day functioning. However, the true burden that is experienced by carers and the support that they require to function effectively in this role remains poorly understood. This information is an important input that is required for the development of cohesive and sustainable polices to improve the management of COPD in Western Sydney and the ACT.

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