ACCESS ECONOMICS Pty Limited

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The economic impact of allergic disease in Australia: not to be sneezed at

Report by Access Economics Pty Limited for the

Australasian Society of Clinical Immunology and Allergy (ASCIA)

ascia

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GLOSSARY OF COMMON ABBREVIATIONS

ABS	Australian Bureau of Statistics
AC	allergic conjunctivitis
AE	atopic eczema
AIHW	Australian Institute of Health and Welfare
AR	allergic rhinitis
ASCIA	Australasian Society for Clinical Immunology and Allergy
AWE	Average Weekly Earnings
BEACH	Bettering the Evaluation and Care of Health
BoD	Burden of Disease
DALY	Disability Adjusted Life Year
DCIS	Disease Costs and Impact Study
DWL	deadweight loss
FA	food allergy
FTE	full time equivalent
HIV	Human Immunodeficiency Virus
ICD-9	International Classification of Disease, Ninth Edition
ICD-10	International Classification of Disease, Tenth Edition
ICPC-2	International Classification of Primary Care, Second Edition
ISAAC	International Study of Asthma and Allergies in Childhood
MBS	Medicare Benefits Schedule
NHMD	National Hospital Morbidity Database (AIHW)
NHS	National Health Survey (ABS)
NPV	net present value
OAS	Oral Allergy Syndrome
PBS	Pharmaceutical Benefits Scheme
PID	Primary Immune Deficiency
PPP	purchasing power parity
QALY	Quality Adjusted Life Year
RR	relative risk
SLE	Systemic Lupus Erythematosus
SPT	Skin Prick Testing
TNF	Tumour Necrosis Factor
TRAPS	TNF-receptor associated periodic fever syndrome
WG	Wegener's Granulomatosis
VSL(Y)	Value of Statistical Life (Year)
YLD	Years of healthy life Lost due to Disability
YLL	Years of Life Lost due to premature mortality

EXECUTIVE SUMMARY

Allergies are chronic immunological disorders that occur when a person's immune system mounts an abnormal response to substances in the environment (allergens) that do not normally bother other people. In this report, to accord with data sources, allergies are grouped as:

- allergic rhinitis (hay fever) and conjunctivitis;
- allergic asthma;
- allergic chronic sinusitis; and
- other allergies, which include food, drug, latex, sting and bite allergies, urticaria (hives, nettle rash), contact dermatitis and anaphylaxis, among other disorders.

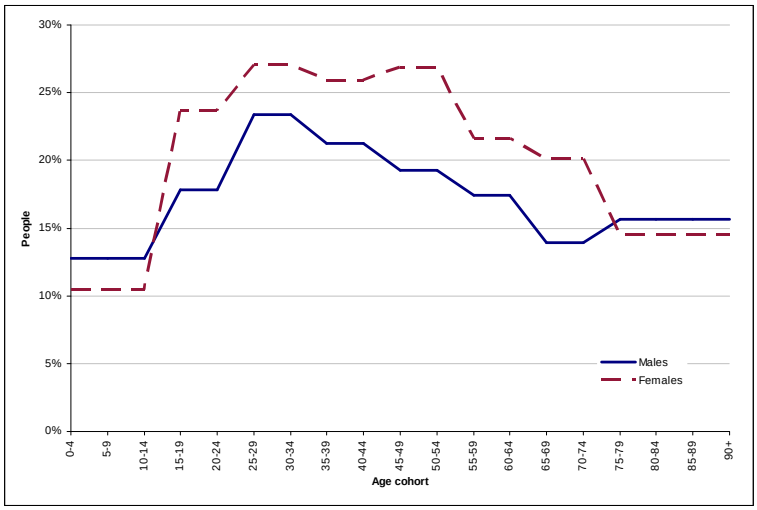
Allergy testing for diagnosis involves the detection of Immunoglobulin E (IgE) antibodies directed against environmental allergens, either by skin prick testing (SPT) or blood allergy testing. Patch testing can also be used to detect non-IgE mediated disorders such as contact allergic dermatitis. Allergies can cause significant discomfort, affect sleep, and impair learning, memory and behaviour in children. In children with severe food allergy, management in the community is complex and has the potential to cause anxiety within affected families regarding care in schools, risk of death and the need or otherwise for injectable adrenaline. For affected adults, allergic disorders can lead to impaired quality of life, absenteeism from work, other reduced productivity, aids (especially self-care aids such as dressings for atopic eczema) and home modifications (eg, to prevent or reduce allergen levels in the home). Most patients with allergic disorders have associated comorbidities. The relative risk of death in people with allergic disorders is slightly elevated, estimated in this report as 1.02 across all Australians with allergies.

Prevalence of allergies in Australia

Allergies have emerged as a major public health problem in developed countries during the twentieth century; Australia and New Zealand have among the highest prevalence of allergic disorders in the developed world. This report estimates that in 2007:

- 4.1 million Australians (19.6% of the population) have at least one allergy, of which 2.2 million (55%) are female and 1.9 million (45%) are male;
- the highest prevalence of allergies is in the working age population, with 78% of people with allergies aged 15 to 64 years (see chart below), and
- there are 7.2 million cases of allergy (ie, an average of 1.74 comorbid allergies per person).

ALLERGIES, PREVALENCE RATES BY AGE AND GENDER, AUSTRALIA, 2005



Literature evidence indicates increases in the prevalence of many types of allergies in recent decades. For example, hospital admissions for food anaphylaxis in Australia have doubled over the last decade, and increased five-fold in children aged 0-4 years. Peanut allergy has doubled in prevalence in young children over a five year period.

Linear estimation from historical data from the Australian Bureau of Statistics National Health Survey suggests that the age-gender prevalence of allergies has changed in Australia over the period 1995-2005, for males and females together, by:

- -0.08% per annum for allergic asthma;
- 0.22% per annum for allergic rhinitis;
- -0.04% per annum for allergic sinusitis;
- -0.06% per annum for other allergies; and
- 0.09% per annum for all allergies – this means that while prevalence is 19.6% this year, if current trends continue, it would be 19.7% next year and so on.

There is stronger overall growth in the number of older Australians (particularly males). **If current trends continue, there would be a 70% increase in the number of Australians with allergy, from 4.1 million currently to 7.7 million by 2050 (26.1% of the population or more than one in four Australians compared to one in five Australians today).** If the rise in age-gender prevalence rates could be immediately arrested, there would be 5.62 million Australians with allergies by 2050 (with growth in numbers due solely to population growth and ageing) and in fact a decline relative to population from 19.6% now to 19.1% by mid-century.

Costs

In 2007, the **financial cost of allergies was $7.8 billion**. Of this:

- $5.6 billion (72%) was productivity lost due to:
  - lower productivity while at work – 'presenteeism' ($4.2 billion)
  - lower employment rates ($1.1 billion);
  - absenteeism and lost household productivity ($196 million); and
  - premature death, including employers' search and hiring costs ($84 million).

- $1.2 billion (15%) was the direct health system expenditure of which:
  - allergic asthma was an estimated $808 million; and
  - non-asthma allergy (NAA) was an estimated $349 million; and
- $262 million (3%) was other indirect costs such as aids and home modifications and the bring-forward of funeral costs; and
- $783 million (10%) was the deadweight loss from transfers including welfare payments (mainly Disability Support Pension and Carer Payment) and taxation forgone.

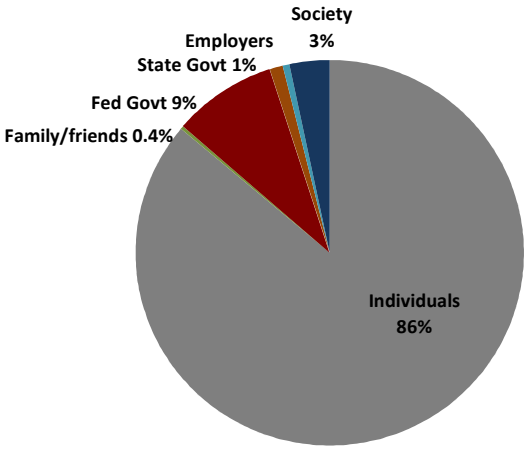
To put this financial cost in perspective, it is more than twice as large as schizophrenia ($1.8 billion) and bipolar affective disorder ($1.6 billion) combined. Additionally, **the net value of the lost wellbeing (disability and premature death) was a further $21.6 billion**. For 156,144 Disability Adjusted Life Years (DALYs). This represents almost double the same figures for either arthritis or hearing loss (both $11.7 billion).

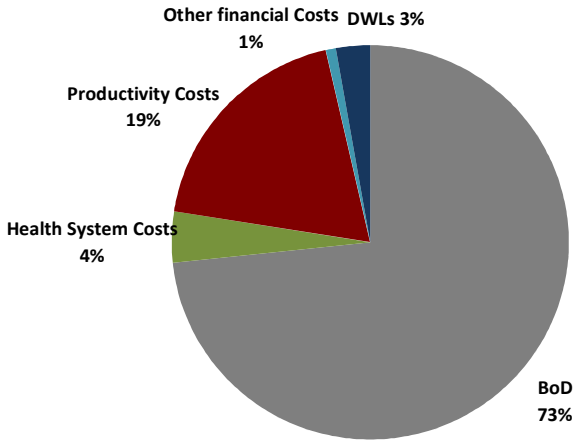
In per capita terms, this amounts to a **financial cost of around $1,912 per person with allergies** per annum. Including the value of lost wellbeing, the cost is $7,200 per person per annum.

Individuals with allergies bear 48% of the financial costs, and their families and friends bear a further 1%. Federal government bears 32% of the financial costs, mainly through taxation revenues forgone ($1.9 billion), funded health expenditures ($497 million) and welfare payments ($78 million), as well as other expenditures ($65 million). State and Territory governments bear around 5% of the costs, with the remaining 13% borne by others in society (including employers).

If the burden of disease (the economic cost of disability and premature death) is included, individuals bear 86% of the costs. Total cost shares are depicted in the following charts.

TOTAL COSTS OF ALLERGIES, BY TYPE OF COST AND BY BEARER (% TOTAL)





Workforce considerations

Australia would need 178 allergy/immunology specialists by 2017 to correct the current maldistribution and achieve the benchmark of NSW/ACT specialist to population ratios (SPRs) over the ten-year period till then. This contrasts with the likely 115 specialists who would be available if training places are kept at the six per year currently projected. The additional 63 specialists could be achieved by training 127 over the period rather than 64, given the simple assumptions of the basic modelling in this report. There would be little

impact by 2012, with the SPR only 0.52 compared to 0.51 in the likely case; however, the benefits would start to emerge from 2013 onwards.

Future directions

In Australia there is a lack of public and professional appreciation of the impact of allergic and immune disorders on quality of life, and even less of the economic impact to society and individuals who suffer allergic disease. Raising awareness of the economic and health impacts is an important factor in facilitating the early recognition and control of allergic disease.

Development of a framework of best practice for management of allergic disease in Australia will be enhanced by:

- timely access to specialist allergy/immunology services;
- access to early and accurate diagnosis;
- access to affordable and cost-effective therapy and novel therapies;
- support for community and medical education outside the current paradigm;
- support for local research to develop interventional strategies to reduce the burden of disease in the community; and
- development of a model of allergy as a chronic disease.

Access Economics
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1. INTRODUCTION

Access Economics was commissioned by the Australasian Society for Clinical Immunology and Allergy (ASCIA) to estimate the demographic prevalence, financial cost and disease burden of allergic disorders in Australia. Allergic disorders are chronic immunological disorders that can impact negatively on quality of life and productivity.

ASCIA is the peak professional body of Australian and New Zealand Allergy and Immunology specialists. The aims of ASCIA are to improve the care of patients by providing evidence-based information on allergic and immune disorders within the medical and lay community. Its aims are supported by the provision of educational material for health professionals and patients, support for research, and collaboration with other professional and government organisations such as the National Asthma Campaign and Commonwealth Department of Health and Ageing (DoHA).

This report is structured as follows.

- The rest of this chapter provides background information on the immune system, specific allergic diseases and their symptoms and treatment, as well as methods of diagnosis.
- Chapter 2 presents current and projected future prevalence of allergy in Australia.
- Chapters 3 and 4 discuss the health system costs and other financial costs associated with allergic disease. Other financial costs include productivity losses (due to lower employment rates, worker absenteeism and premature death), carer and other costs, as well as deadweight (efficiency) losses (DWLs) from transfer payments, such as government welfare and income support payments[1].
- Chapter 5 presents burden of disease (BoD) estimates, which refers to the years of healthy life lost due to disability and premature mortality caused by allergic disease, and is measured by Disability Adjusted Life Years (DALYs).
- Chapter 6 summarises the economic impacts of allergies.
- Chapter 7 reviews the adequacy of the allergy and immunology workforce in Australia, based on simple projections of demand and supply.
- Chapter 8 presents strategic, forward-looking conclusions from the analysis.

1.1 THE IMMUNE SYSTEM

The immune system is a complex network of cells and proteins that defends the body against infection and protects against the development of malignancy. In the simplest terms, diseases of the immune system result from either a deficiency of normal immune responses, or overactive or inappropriate immune responses (Shearer et al, 2006; Verbsky and Grossman, 2006). Inappropriate immune responses include allergies (where the immune system responds to innocuous environmental substances) and autoimmune diseases (where the immune system responds to components of the body as if they were foreign and harmful).

[1] A cost analysis of the economic impact of immune diseases (other than allergy) is beyond the scope of the current report.

Disorders managed by allergy and immunology specialists include the following conditions, some of which may also be occupational.

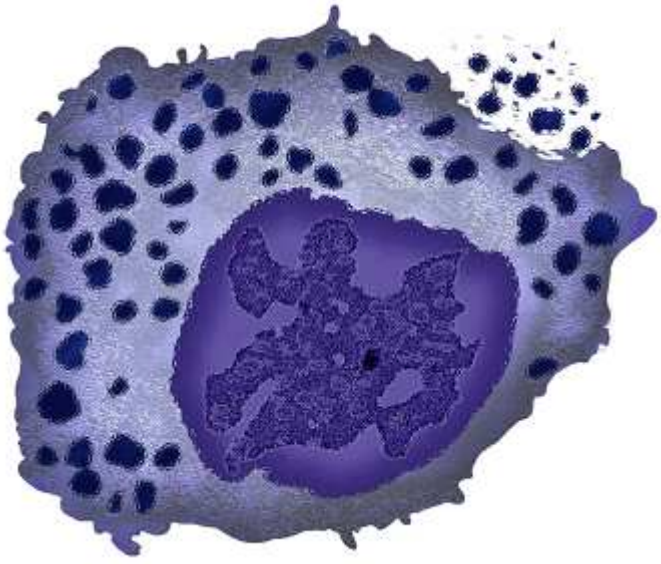
- Classical Allergic Disorders
  - Allergic rhinitis (hay fever)
  - Asthma
  - Food Allergy
  - Drug Reactions (eg, antibiotics, pain killers or anaesthetics)
  - Latex allergy
  - Stinging insect allergy
  - Urticaria/angioedema (hives, swellings)
  - Atopic eczema
  - Anaphylaxis (serious allergic reactions)
- Disorders usually managed by allergy specialists
  - Non-allergic (vasomotor) rhinitis
  - Non-allergic adverse food reactions (food intolerance)
- Overlapping disorders sometimes co-managed with other specialties
  - Chronic sinusitis
  - Nasal polyps
  - Aspirin triad (nasal polyps, late onset asthma, aspirin allergy)
  - Eosinophilic oesophagitis and gastroenteritis
  - Coeliac disease
  - Contact allergic dermatitis
  - Extrinsic allergic alveolitis (Farmer's lung)
  - Sarcoid
- Other immune disorders
  - Hypereosinophilia syndromes
- Non-allergic disorders often erroneously attributed to allergy
  - Migraines
  - Irritable bowel syndrome
  - Chronic fatigue syndrome
  - Some psychological disorders (attributed to environmental factors such as food or inhaled substances)
- Immune deficiency
  - Primary Immune Deficiency
  - Acquired Immune Deficiency (eg, HIV infection, cancer chemotherapy)
- Autoimmune disorders
  - Vasculitis
  - SLE/Systemic Lupus Erythematosus

1.2 WHAT IS ALLERGY?

Allergy occurs when a person's immune system mounts an abnormal response to substances in the environment that do not normally bother other people. These substances are known as allergens. They are usually small proteins and include house dust mites, animal skin and saliva, pollen, moulds and foods. When allergic people are exposed to allergens, they can form Immunoglobulin E (IgE) antibodies against that allergen.[2] A person allergic to pollen protein, for example, will have IgE antibodies capable of recognising the shape of pollen protein (the *allergen*), in much the same way that a lock 'recognises' the shape of a key.

IgE antibodies stick to the surface of mast cells within tissues and act as remote sensors within the environment. Mast cells are like 'land-mines', and contain 'bean bags' filled with irritant chemicals including histamine. When IgE antibodies attach, mast cells are triggered to dump their contents into the tissues. When these are released in small amounts, they cause local itch and irritation. In much larger amounts, the result can be much more serious. Symptoms may include the sneeze and itch of hay fever, the cough and wheeze of asthma, or the devastating top to toe rash, severe difficulty breathing and vascular collapse of anaphylaxis.

FIGURE 1-1: IGE PRIMED MAST CELL, ANTIGEN, DEGRANULATION

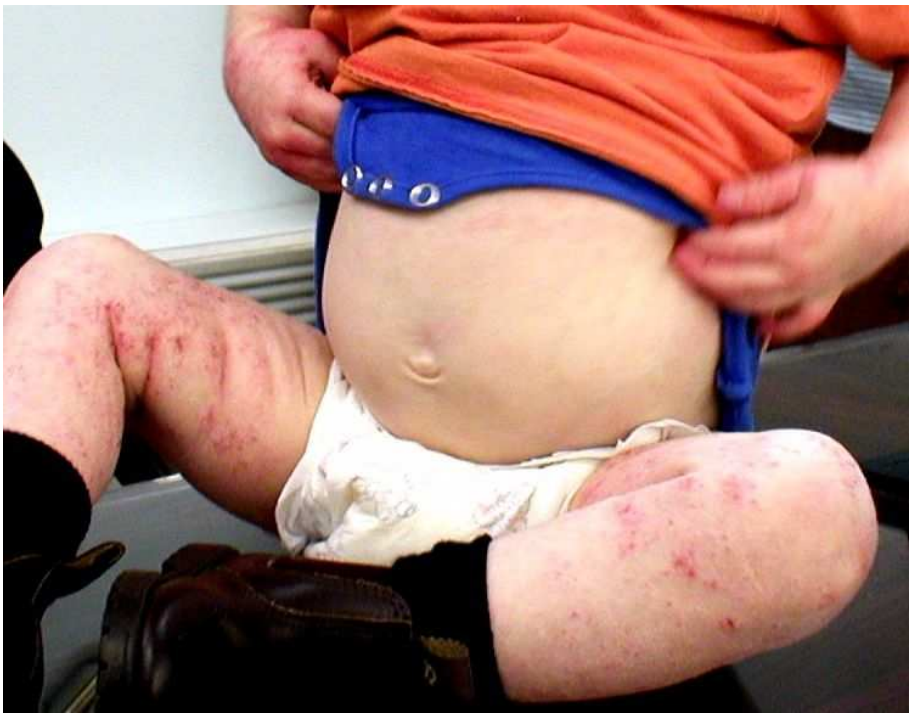


Source: Dr P Smith.

A delayed inflammatory response may often follow over the next several hours, resulting in the attraction of white cells into the tissues, and the ongoing inflammation characteristic of asthma, atopic eczema and allergic rhinitis.

[2] While the word 'allergy' is often used by the lay community to represent any perceived adverse reaction to an environmental insult, it is important to bear in mind that the diagnosis of allergy is critically dependent on identifying the immune process involved in the allergic response.

FIGURE 1-2: INFLAMMATION OF ECZEMA



Source: Dr R Mullins.

There are numerous forms of allergic disorders and comorbidity makes classification difficult. To accord with the estimates of prevalence in later sections, this section is structured to describe the symptoms and treatment of:

- allergic rhinitis (hay fever) and conjunctivitis;
- asthma;
- chronic sinusitis; and
- other allergies (including food, drug, sting allergies and anaphylaxis, among other things).

1.2.1 ALLERGIC RHINITIS (HAY FEVER) AND CONJUNCTIVITIS

Various sources from around the world (Wilson et al, 2006, Asher et al, 2006; Wist et al, 2005; Hopper et al, 1995) suggest that allergic rhinitis[3] and conjunctivitis are rare in infants but estimated to affect around one in six children aged 6-7 years, one in ten children aged 13-14 years, 18% of those aged 15-34 years and 10% of older adults aged 35-54 years.[4] Symptoms generally persist for at least ten years, often longer (Greisner et al, 1998). Typical complaints are those of a blocked and runny nose with clear mucus, itchy nose, sneezing

[3] *Non-allergic rhinitis* is a term used to describe symptoms triggered by changes in temperature or humidity, or exposure to irritants such as cigarette smoke or perfume and occasionally dietary factors. Pregnancy and some medications (particularly antihypertensive agents) can also cause nasal congestion. There are various theories describing how this condition may arise, including an imbalance in the function of nerves that make mucous glands secrete fluid and which cause blood vessels to swell or contract and 'subclinical allergy' (Kaliner, 2007; Ciprandi, 2004; Garay, 2004). In some, non-allergic rhinitis is an inflammatory condition associated with eosinophilic inflammation of the nasal mucosa, and is associated with the development over time of chronic sinusitis, nasal polyps and the 'aspirin triad' (see Section 1.2.3).

[4] Note these prevalence rates are somewhat different from the findings for Australia presented in Chapter 2.

and cough from post nasal drip, a symptom that can be mistaken for asthma cough. Allergic rhinitis may masquerade as continuous or recurrent respiratory infection, frequent sore throats and may be complicated by sinusitis or otitis media. Those with allergic rhinitis suffer more frequent and prolonged sinus infection, and treatment of the allergic component may reduce the risk (Cirillo et al, 2007). Allergic conjunctivitis is usually accompanied by rhinitis, with red and itchy eyes, sometimes complicated by infective conjunctivitis due to frequent rubbing. Seasonal symptoms are most commonly triggered by pollen exposure, with perennial rhinitis aggravated by exposure to house dust mite, mould spores or indoor pets (Plaut and Valentine, 2005; Van Hoecke and Van Cauwenberge, 2007).

Lethargy, poor concentration and behavioural changes may arise as a result of persistent symptoms and poor quality sleep, and impact on learning in young children (Simons, 1996; Marshall and Colon, 1993: Gauci et al, 1993). These factors may be aggravated by use of sedating (as opposed to the more expensive non-sedating) antihistamines as a cost saving measure (Nolen, 1997; Storms, 1997; Vuurman et al, 1993). Since avoidance of exposure to the allergen is often not possible, the cornerstones of management revolve around the use of medication (one or more of topical nasal corticosteroids, oral or topical antihistamine nasal sprays or eyedrops) or immunotherapy, a specialist supervised procedure also known as 'desensitisation' (Plaut and Valentine, 2005; Van Hoecke and Van Cauwenberge, 2007).

Allergic rhinitis may predispose people to obstructive sleep apnoea, which results from collapse of the upper airways during sleep. This results in reduced airflow, a drop in oxygen levels and disturbed sleep. Factors predisposing to this condition include being overweight and having a blocked nose. Nasal blockage is associated with more severe obstructive sleep apnoea, arousals during sleep and daytime sleepiness even when sleep apnoea is absent. These abnormalities had been found to be reversible with surgical correction of anatomical abnormalities, topical nasal steroid sprays in patients with allergic rhinitis and reduced allergen exposure in patients with seasonal allergic rhinitis (Craig et al, 1998; University of Wisconsin Sleep and Respiratory Research Group, 1997; McNicholas et al, 1982; Santos et al, 2006).

Observational studies have linked chronic mouth breathing to structural changes of the face. Nasal obstruction due to allergic rhinitis or adenoid hypertrophy (the so-called 'adenoid facies') have been associated with a long and narrow face, a long narrow tongue, high arched palate, small lower jaw, over bite and cross bite and dental crowding and malocclusion. Animal studies have demonstrated the development of similar abnormalities in experimental models. Furthermore, some have been shown to be reversible when the obstruction has been relieved. These observations have cosmetic and functional implications for patients with severe dental abnormalities (Spector, 1997; Settipane, 1999; Slavin, 1998). Patients with allergic rhinitis also suffer from more frequent and prolonged respiratory infections, and asthma has been shown to be more difficult to control unless allergic rhinitis is also managed (Gaugris et al, 2006; Cirillo et al, 2007).

Allergen immunotherapy is the only treatment that addresses the immune problem that causes allergies and can alter the natural history of disease. This treatment involves administration of increasingly larger amounts of commercial allergen extracts with the aim of inducing tolerance to allergen with natural exposure. This form of treatment has been found to be very effective at reducing the severity of allergic rhinitis and conjunctivitis and to have a beneficial impact in some patients with asthma. There is also preliminary evidence that early use may also reduce disease progression from allergic rhinitis to asthma and reduce the development of new sensitisation. Injection of allergen has been the traditional method of choice for several decades, but recent research has demonstrated the efficacy of high dose sublingual/oral immunotherapy, opening up this form of treatment to young children who

might otherwise not have been able to tolerate treatment by traditional methods (Pajno, 2007; Canonica and Passalacqua, 2006; Saltoun, 2002). **This form of therapy has been shown to be cost effective compared to medication alone (Keiding and Jorgensen, 2007; Petersen et al, 2005; Ariano et al, 2006).**

FIGURE 1-3: ALLERGIC RHINITIS

Source: Dr P Smith.

FIGURE 1-4: ALLERGIC CONJUNCTIVITIS

Source: Dr R Mullins.

1.2.2 ASTHMA

Asthma is an inflammatory condition affecting the largest to the smallest airways. The result is 'irritable' bronchial tubes that contract in response to many irritants. In some cases,

scarring of the airways with loss of lung capacity may result (Olaguibel Rivera et al, 2007). Most patients will have allergic rhinitis or eczema as well and there is also a strong genetic component. The major causes of airway inflammation are exposure to allergen (eg, dust mite, animals, cold air, mould spores or pollens), cigarette smoke and infections (the major trigger in infants). This provides a rationale for recommending avoidance of such factors, and using medications that reduce airway inflammation when symptoms are regular or severe (Rimmer and Ruhno, 2006).

Recurrent wheezing is common, affecting around one in three infants aged 3 years or younger, and one in ten children aged 6-7 years[5] (Asher et al, 2006). Allergy becomes a more important contributor as children age. Children with other evidence of allergy (eg, eczema, allergic rhinitis or food allergy), those sensitised to inhalant allergen and those with more regular symptoms (between respiratory infections), are more likely to have persistent symptoms into adult life. By contrast, those without evidence of allergy or frequent symptoms between respiratory infections, have a better prognosis, with around three quarters growing out of their symptoms by their adult years (Sears et al, 2003).

United Airways disease is a concept linking the inflammation that occurs in the upper and lower airways in patients with allergic disease. Around 80% of people with asthma suffer from rhinitis, and around one in four with rhinitis have asthma. In some, asthma may be the dominant presenting complaint, whereas in others, asthma may be silent or subclinical, sometimes manifesting as complaints of lack of fitness or exercise-related complaints. There is accumulating evidence that treatment of rhinitis may improve asthma control and reduce exacerbations (Rimmer and Ruhno, 2006; Foresi et al, 1996; Wade et al, 1993; Yawn et al, 1999; Taramarcaz and Gibson, 2003; Passalacqua et al, 2000). The principles of management are similar to those used in allergic rhinitis; allergen minimisation, use of medication and specific allergen immunotherapy. Use of a written management plan and regular review have been shown to reduce disease exacerbation and hospital attendance (Bhogel et al, 2006).

1.2.3 CHRONIC SINUSITIS, NASAL POLYPS AND THE ASPIRIN TRIAD

Chronic sinusitis is an inflammatory condition of the soft tissue lining of the sinuses. Symptoms include nasal congestion, loss of sense of smell and taste, bad taste and bad breath, facial pain, sore teeth and purulent nasal discharge. Sinus drainage pathways are often blocked, leading to secondary infection and many of the symptoms experienced. Not all patients with chronic sinusitis are allergic, and the degree to which allergic mechanisms (as opposed to other factors) contribute to this condition is uncertain, as opposed to acute sinusitis, where infections are much more common in those with allergic rhinitis (Cirillo et al, 2007). Theories as to its cause include chronic bacterial or fungal infection. There is no evidence that treatment specifically directed at allergies (allergen avoidance, immunotherapy) can alleviate the symptoms of sinusitis but it may relieve superimposed allergic symptoms (Dolor et al, 2001; Borish, 2002; Vining, 2006). Approximately 30% of people are aspirin sensitive. Most patients are co-managed by allergy/immunology specialists and ear nose and throat (ENT) surgeons.

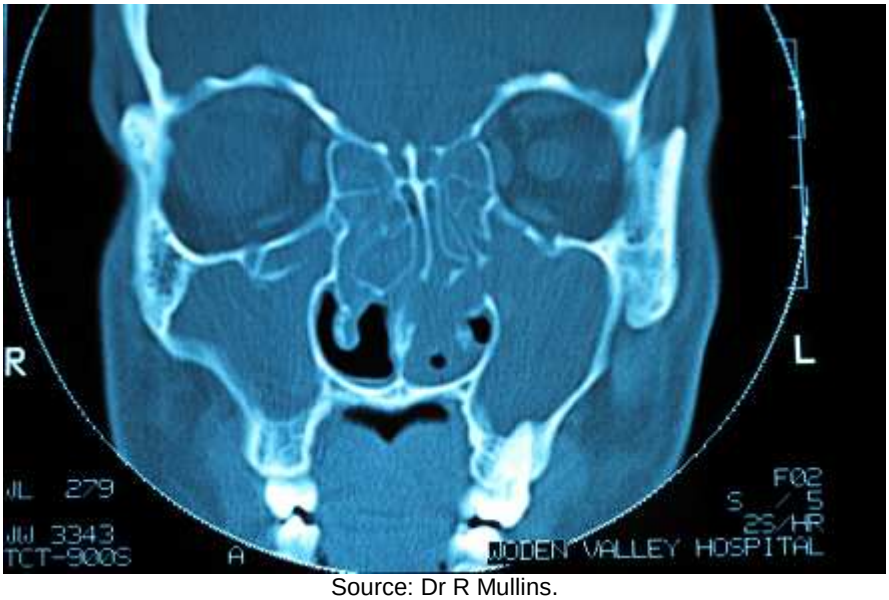
Nasal polyps are soft, jelly-like overgrowths of the lining of the sinuses that occur in around 1 in 200 people. They look like grapes on the end of a stalk. Most develop by the age of 40 years. Polyps do not always cause symptoms. As they often grow through the tunnel that connects the sinuses to the nose, the result is often a blocked nose. More importantly,

[5] Note these prevalence rates are somewhat different from the findings for Australia presented in Chapter 2.

they can block the tunnels connecting the nose to the sinus cavities. Like water in a stagnant pond, this often leads to frequent sinus infections. The cause is unknown, but chronic inflammation (from allergy or infection) may trigger polyps and make them grow faster, and come back faster after sinus operations. Sometimes other conditions may occur with greater frequency in people with nasal polyps. These include sinus infections, asthma and allergy to aspirin. Options for management include sinus surgery to remove them (but 50% eventually recur), cortisone tablets to shrink their size (but this only offers temporary relief, and treatment is limited by side-effects) and topical steroid sprays to slow their growth (Blaiss, 2005; Hissaria et al, 2006).

The aspirin 'triad' (also known as *Samter's triad*), is characterised by the development of adult onset asthma (not always allergic), nasal polyps and aspirin allergy. People with this condition over-produce inflammatory chemicals known as leukotrienes. These chemicals are made by white cells in the tissues, which then attract more white cells, which then produce more leukotrienes and so on. Leukotrienes also cause mucus production in the lungs and make wheezing worse by triggering contraction of the muscle around the airways in the lung. They also promote inflammation in the sinuses and cause nasal polyps to grow faster, leading to blocked sinuses, the development of frequent sinus infections and the need for antibiotics and sinus surgery. Even though these patients are allergic to aspirin, most can be made to tolerate high doses by starting off at a very low dose of aspirin initially and increasing it day by day. Once a higher dose is reached (generally one to two tablets per day), there is reduced production of leukotrienes. Studies following patients over ten years have shown the benefit of aspirin desensitisation to reduce asthma severity, the need for asthma medication, the rate of polyp regrowth, and the severity of sinusitis (Pfaar and Klimek, 2006).

FIGURE 1-5: CT SINUSES WITH POLYPS



Source: Dr R Mullins.

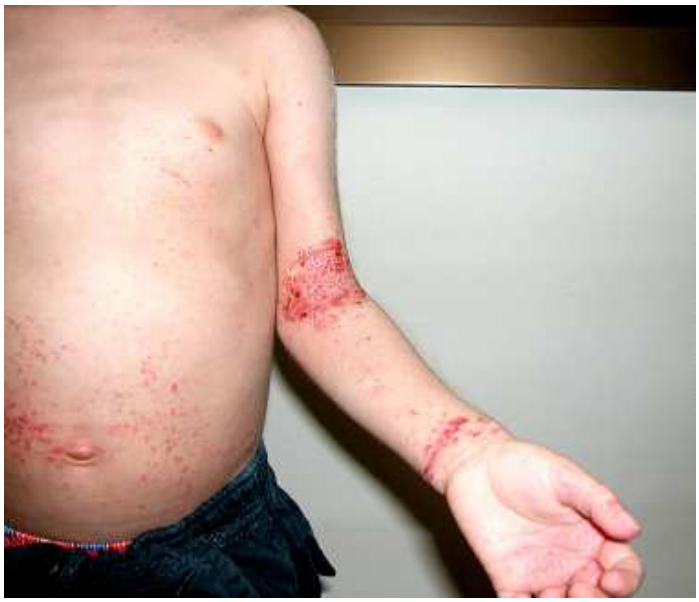
1.2.4 OTHER ALLERGIES

1.2.4.1 ATOPIC ECZEMA AND CONTACT DERMATITIS

One of the earliest signs of allergies is **atopic eczema**, affecting around one in five infants, reducing to around one in six children aged 6-7 years, one in ten children aged 13-14 years

and one in 14 adults (Asher et al, 2006)[6]. Dry scaly skin, scratch marks, weeping vesicles and sores can not only disturb sleep, but may also result in long term changes in skin pigmentation and thickening, and is sometimes complicated by bacterial infection of the skin (Gold and Kemp, 2005; Katelaris and Peake, 2006). A number of factors can make the symptoms of eczema worse – the warmth of bed clothes at night, winter heating, the use of soaps, swimming in chlorinated water, wearing wool or synthetics next to the skin, playing in sandpits, infection, allergen (such as dust mite or pet dander) and sometimes diet (Werfel et al, 2007). While atopic eczema may appear in isolation, more commonly it is accompanied by allergic rhinitis and asthma, and in young infants with severe eczema, food allergy may occur in up to 30% of cases. Severe eczema has a substantial effect on quality of life in the sufferer and their family, impacts on social functioning, influences career choices and may result in substantial out of pocket costs for families of young children. Beattie and Lewis-Jones (2006), studying a spectrum of chronic childhood diseases found that impact of allergic dermatitis on the health-related quality of life of children was greater than that from renal disease or cystic fibrosis. Measurements of the impact on mothers of having a child with eczema is greater than for that experienced with a child with deafness or insulin dependent diabetes (Kadyk et al, 2003; Jowett and Ryan, 1985; Housman et al, 2002; Faught et al, 2007; Kemp, 1999, Beattie and Lewis-Jones, 2006). In children with moderate to severe atopic eczema, around 50% will have persistent symptoms into adult life (Williams and Strachan, 1998).

FIGURE 1-6: ATOPIC ECZEMA



Source: Dr P Smith.

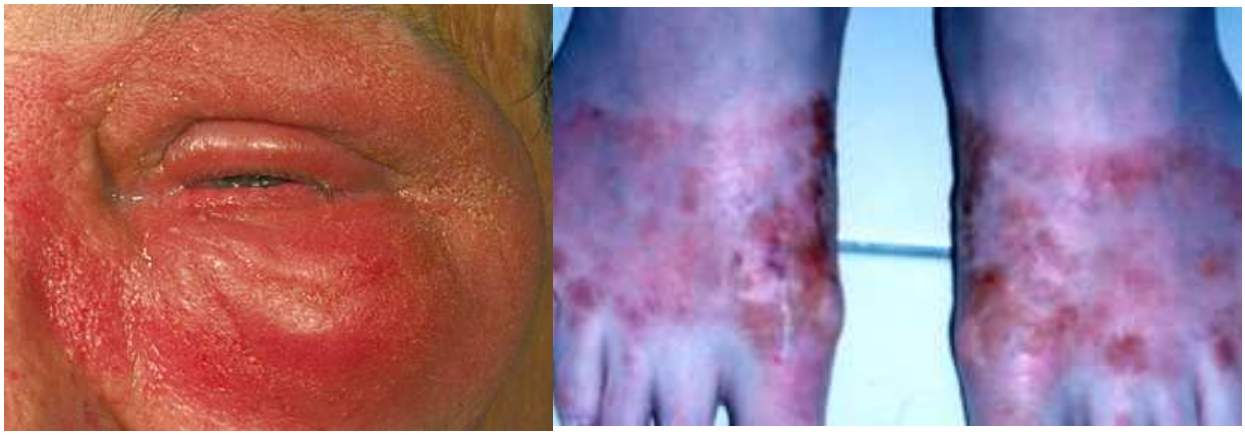
Contact allergic dermatitis (contact dermatitis) develops after skin contact with external allergens. A red, itchy and often blistering weeping rash develops, typically within a few days of contact with external allergens (Militello et al, 2006). Over 2,000 contact allergens have been identified, of which nickel, plants, perfumes, glues, dyes and cosmetic preservatives are the most common. Management involves identification and avoidance of the cause, and use of medication such as topical or oral corticosteroids if accidental exposure occurs.

Contact allergic dermatitis is a major occupational problem in some industries, such as those involved in the food industry, health professions and hairdressing (eg, latex allergy) (Amado

[6] Note these prevalence rates are somewhat different from the findings for Australia presented in Chapter 2.

and Taylor, 2006; Biebl and Warshaw, 2006; Dhir, 2006; Khumalo et al, 2006; Noonan and Moyle, 2005; Doutre, 2005; Belsito, 2005). Contact with airborne plant-derived allergens can also cause dermatitis. This is commonly known as 'Australian bush dermatitis', 'ragweed dermatitis' or 'weed dermatitis'. Dermatitis often occurs after being outside on windy days in the warmer months of the year, when wind-blown allergens come into contact with exposed areas of skin over the face, eyelids, sides of neck and 'V' area of the neck and upper chest. There is usually a sharp line between affected areas and normal skin protected by clothing.

FIGURE 1-7: CONTACT ALLERGIC DERMATITIS



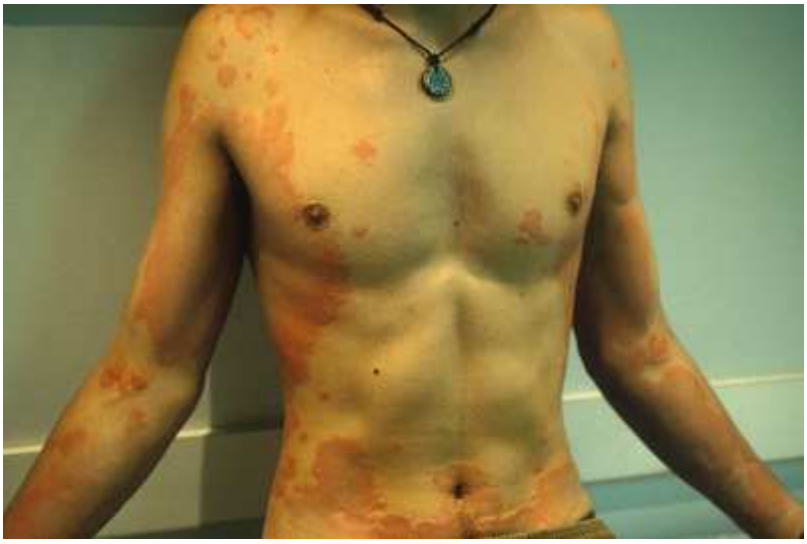
Left: Contact dermatitis due to eye drops. Right: Shoe dermatitis due to colophony allergy.
Source: Dr R Mullins.

1.2.4.2 URTICARIA /ANGIOEDEMA

Urticaria (hives, nettle rash) is a common condition characterised by itchy swelling of the skin. The lifetime incidence is estimated to be approximately one in six, with current prevalence estimated at one in one thousand. Infection is one of the most common triggers for symptoms, particularly in young children. Allergic reactions to food, medication or insect stings may also trigger short-lived episodes of hives, but in most cases, no cause is identified. Occasionally, urticaria is a recurrent problem that reappears throughout life, or a chronic condition that persists for many years (Greaves, 2000). In recent years, evidence has arisen suggesting that chronic urticaria may be an autoimmune disease (Gratten, 2004). The mainstay of treatment is use of non-sedating antihistamines, with the addition of corticosteroids or immunosuppressive medication in refractory cases (Powell et al, 2007; Zuberbier et al, 2006). Chronic disease is associated with sleep disturbance, reduced productivity, psychological morbidity and changes in quality of life comparable to that experienced in ischaemic heart disease (Poon et al, 1999; Beattie and Lewis-Jones, 2006). Severe symptoms frequently trigger attendance at hospital accident and emergency facilities, and resulted in 1,977 admissions to Australian hospitals in the 2004-05 financial year. Use of cheaper sedating antihistamines (as a cost-saving measure) is associated with sedation, impaired motor skills and increased risk of work-related and motor vehicle accidents (Nolen, 1997; Storms, 1997).

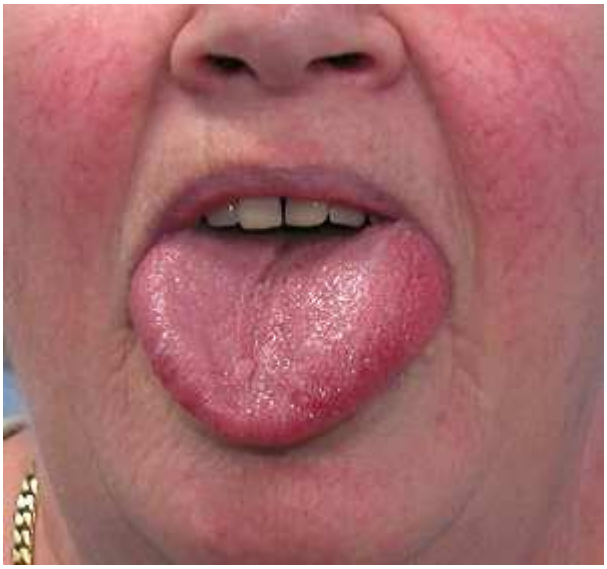
Angioedema is a related condition of the deeper parts of the skin, where swellings can also be painful, and sometimes involve the tongue or throat, causing difficulty breathing. Causes include infection, medications (specifically angiotensin converting enzyme inhibitors and non steroidal antiinflammatory drugs) and less commonly, hereditary angioedema due to deficient C1 inhibitor enzyme deficiency or dysfunction (Frigas and Park, 2006). Upper airway swelling (with or without difficulty breathing) may also prompt attendance at emergency facilities, is a source of anxiety and may sometimes be mistaken as anaphylaxis.

FIGURE 1-8: URTICARIA



Source: Dr R Mullins.

FIGURE 1-9: ANGIOEDEMA



Source: Dr P Smith.

1.2.4.3 STINGING INSECT ALLERGY AND BITES

Local itch and swelling are very common from insect stings, such as those inflicted by honey bees, wasps and 'Jack Jumper' ants (JJAs). They usually settle within a few days. Swelling can sometimes be severe, and can last up to a week. Fortunately, only a small proportion go on to develop generalised allergic reactions (such as hives all over) or more serious allergic reactions (anaphylaxis) with dangerous features, such as difficulty breathing or light headedness or loss of consciousness due to low blood pressure (vascular collapse) (Golden, 2007).

Population surveys estimate that approximately 1% of the population in endemic areas have experienced a potentially dangerous allergic reaction to JJA stings and that between 1% and 2.7% have experienced allergic reactions to honey bees (Brown et al, 2003, Douglas et al, 1998; Roberts-Thomson et al, 1985; Stuckey et al, 1982). JJA anaphylaxis is a uniquely Australian problem.

Allergic reactions to wasps are considered to be less common. Deaths from sting-related anaphylaxis in Australia are estimated at approximately 3.25 per year (bees 2; wasps 1; JJA 0.25 – Brown et al, 2001,2003a; McGain and Winkel, 2002). Management of these patients involves strategies to reduce the risk of accidental exposure, provision of emergency medication (injectable adrenaline, EpiPen) and the commencement of specific immunotherapy to 'switch off' the allergy and reduce the risk of further reactions (Golden, 2007; Brown et al, 2003b), shown to improve quality of life in those with this condition (Oude Elberink and Dubois, 2003). Commercial extracts of honey bee and wasp venom are available as registered products for treatment of affected patients. While level 1 evidence of effectiveness of JJA venom immunotherapy has been demonstrated in Australian studies (Brown et al, 2003c), availability of treatment has been hampered by the lack of funding to make such treatment more widely available, and for research studies to examine simplified treatment regimens.

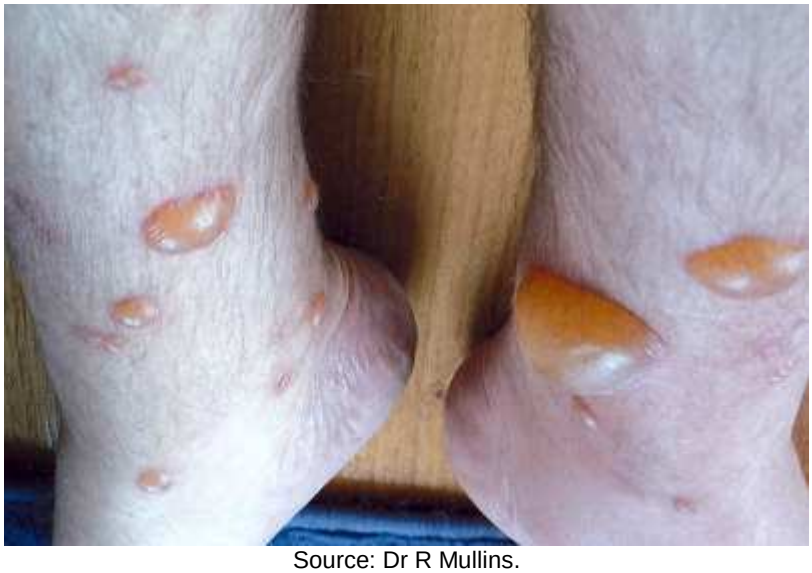
FIGURE 1-10: JACK JUMPER ANT

FIGURE 1-11: PAPER WASP

Source: Dr R Mullins.

Mosquitoes and 'March flies' can cause nasty bites, but allergic reactions are exceedingly rare. One of the most common causes of severe irritating reactions follow contact with caterpillars. The spines projecting from caterpillars (or their dormant pupae on trees or in letter-boxes) can cause severe local irritation and pain from released toxins. Local pain and sores may develop from spider bites as well. Allergic reactions to tick bites also occur usually with local swelling and itching only, but occasional life-threatening reactions to ticks have been reported, typically soon after the tick is removed (Brown and Hamilton, 1998). Most bites result in minor local swelling that settles within a few days. Occasionally, large hot local swellings that last several days to a week may occur, and can sometimes be mistaken for secondary infection. Rarely, local weeping blisters may occur at and around the bite site, which can be difficult to control and be distressing, particularly in young children.

FIGURE 1-12: BLISTERING REACTION TO INSECT BITES



Source: Dr R Mullins.

1.2.4.4 FOOD ALLERGY AND ASSOCIATED SYNDROMES

Food allergy is estimated to affect 6% of young children and 3-4% of adults[7] (Milss et al, 2007; Venter et al, 2006a,b; Osterballe et al, 2005; Sicherer and Sampson 2006).[8] Recent studies from the UK and USA suggest that peanut allergy has doubled in the last five years (Grundy et al, 2002; Sicherer et al, 2003). Admissions to hospital with anaphylaxis (which have been mainly attributed to food allergy) have also doubled in the last decade in both Australia and the UK, particularly in young children (Gupta et al, 2007; Mullins, 2007). The most common causes of food allergy in children are cow's milk, hen's egg, peanut/tree nuts and sesame seeds in young children. While the majority of those allergic to milk, egg, wheat or soy outgrow their allergies by school age, those allergic to nuts/peanuts, seeds or seafood usually have persistent allergy.

The most common symptoms in infants are urticaria and/or vomiting within two hours of ingestion. In adults, a more diverse range of foods can trigger symptoms, but the majority are triggered by peanut, tree nuts, sesame seed or seafood (Allen et al, 2006; Sicherer and Sampson, 2006; Nowak-Wegrzyn and Sampson, 2006). A diagnosis of food allergy has a significant effect on quality of life in children and their parents, comparable on formal measurement with having a child with insulin dependent diabetes. The source of stress is related more to perceptions of risk than actual episodes of allergic reactions, and the need for planning for outings, school camps, preparation of special meals and the need to liaise with other caregivers such as school and preschool staff (Marklund et al, 2004,2006,2007; Bollinger et al, 2006; Cohen et al, 2004; Avery et al, 2003; Sicherer et al, 2001; Hu et al, 2005). In adults with food allergy and anaphylaxis, psychological morbidity (including anxiety disorder and panic attacks) has been associated with episodes of anaphylaxis, which are frequently recurrent despite precautions to avoid the trigger (Sampson et al, 2006; Mullins, 2003).

[7]. In a survey of 232 childcare centres and preschools in the ACT and central Sydney in 2006 (13,573 children enrolled), 6.6% were reported to have food allergy (2.1% allergic to peanut), see Loblay R et al (2006).

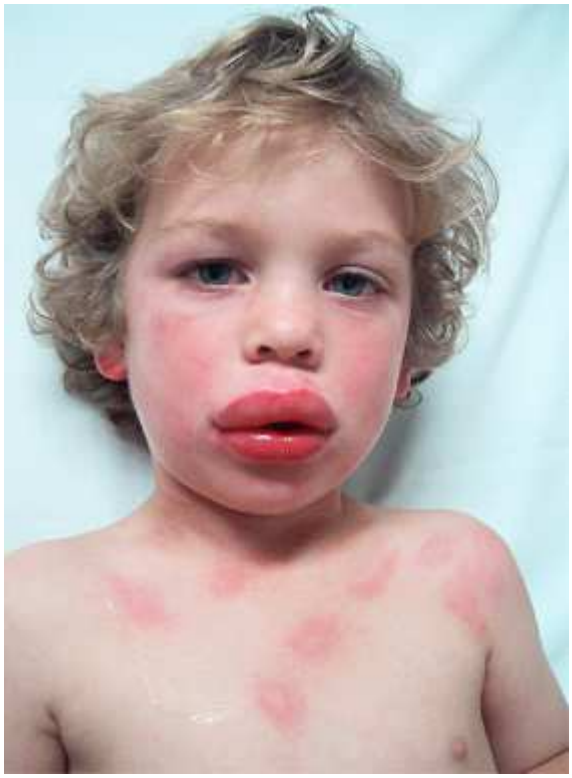
[8] In Australia, a questionnaire-based study of 4,173 South Australian school children aged 3-18 years (published in 2000) estimated an incidence of food allergy and food-induced anaphylaxis of 1.3% and 0.4% respectively (Boros et al, 2000).

Oral allergy syndrome (pollen-food syndrome): Around one if ten people with seasonal allergic rhinitis or conjunctivitis will develop itch and irritation of the tongue, mouth and throat after ingestion of some fresh fruits and vegetables, known as Oral Allergy Syndrome (Mullins, in press). The majority of patients are allergic to cross-reactive proteins common to some pollens and foods. Cooking normally destroys these protein allergens, so that the same food when cooked is often tolerated. While it is generally a benign disorder, angioedema or even anaphylaxis may occasionally occur, particularly if ingestion of a large amount of food allergen is followed by vigorous exercise. The mainstay of therapy is avoiding the food or cooking it well. Patients who are unable to tolerate fruit or vegetables in an uncooked form are forced to rely on well-cooked food in conjunction with vitamin supplements. Such people usually require advice from a specialist dietitian. There is preliminary evidence that this condition is becoming increasingly common in adults, a not unexpected finding when one considers the recent rise in allergic rhinitis (Egger et al, 2006; Mari et al, 2005; Yagami, 2002; Sloane and Sheffer, 2001; Bohle, 2007; Caballero and Martin-Esteban, 1998).

Eosinophilic oesophagitis is an inflammatory condition of the oesophagus, where food allergy may play a causative role in the majority of patients. In children, this condition tends to present as severe oesophageal reflux unresponsive to conventional medications, and adults can have a similar presentation, often accompanied by choking episodes and dysphagia of solid foods or even food impaction. In recent reported studies, some groups claimed that a combination of skin prick testing and food patch testing with staple foods, will identify potential food allergens which, if avoided, will result in a clinical improvement. This condition appears to not resolve. This is a complex medical condition requiring the advice of gastroenterologist, allergy specialists and dieticians. If suspected, referral to a gastroenterologist is recommended in the first instance to confirm the diagnosis, then an allergy specialist if confirmed. Therapy involves the use of diet manipulation, anti-reflux medication, the use of 'swallowed' asthma corticosteroids eg, Singulair (montelukast) and sometimes dilatation (stretching) of the constricted oesophagus (Noel et al, 2004; Markowitz et al, 2003; Lucendo et al, 2004).

Delayed immune-mediated reactions to food: The majority of allergic food reactions in infants result in immediate symptoms (eg, acute urticaria, vomiting or asthma). Occasional children, however, do not have reactions that occur quickly. Instead, delayed immune reactions start after several hours or days, most commonly in response to dairy products, soy or wheat (Allen et al, 2006; Sicherer and Sampson, 2006; Nowak-Wegrzyn and Sampson, 2006). Patients generally present with one or more of severe atopic dermatitis/eczema, chronic diarrhoea (sometimes accompanied by blood), failure to thrive, or severe reflux of food or formula. Symptoms occur due to inflammation of the skin or gut, and result from attraction of white cells from the blood into the tissues. Routine allergy testing is often negative, making diagnosis more difficult. Diagnosis usually rests on the history of possible reactions to food, and responses to food withdrawal and re-challenge. Most of these delayed reactions resolve by the age of 3 years. At times, even small amounts of food allergen passing through breast milk can aggravate atopic eczema or gut symptoms. Allergy testing of the infant may or may not be positive, depending on the mechanism of the sensitivity (immediate versus delayed). If one of these conditions is suspected, specialist advice is indicated.

FIGURE 1-13: CHILD WITH FOOD ALLERGY



Source: Dr P Smith.

Celiac disease is considered to be an autoimmune disorder resulting from exposure to dietary gluten within cereals, such as wheat, rye and barley. Previously considered to be a rare disease, population studies suggest a prevalence of approximately 1% of the population. Symptoms result from inflammation of the upper bowel, resulting in malabsorption of nutrients and presentation with fatigue, anaemia, iron deficiency and osteoporosis as well as the more classical symptoms of diarrhoea and weight loss. Management involves confirmation of the diagnosis by specific serological testing confirmed by biopsy of the duodenum and lifelong avoidance of dietary gluten (Monsuur and Wijmenga, 2006; NIH Consensus Development Conference on Celiac Disease, 2004; Craig et al, 2007; Kwon and Farrell, 2006).

1.2.4.5 ADVERSE REACTIONS TO MEDICATION

Allergic reactions to a large number of medicines can occur. Reactions to pain killers or arthritis tablets (such as aspirin, ibuprofen, naproxen) and antibiotics are the most common, but reactions have been described to many other medicines, including some herbal remedies such as echinacea, Royal Jelly and chamomile (Mullins RJ and Heddle R, 2004). Severity may range from mild rashes through to asthma and potentially life-threatening anaphylaxis. While most adverse reactions to medication are due to side effects or dose-dependent toxicity, rather than immune-mediated reactions, accurate diagnosis of drug-related allergy (where the immune system is involved) is essential (Romano and Demoly, 2007; Thien, 2006). Unnecessary avoidance of some medications (such as penicillin) may impede necessary treatment, may result in selection of more expensive medication instead or, in some cases (such as patients wishing to enter the Defence Forces), influence their career options. Conversely, lack of appreciation of the concept of cross-reactivity may expose the patient to the unnecessary risk of re-exposure.

Adverse reactions to drugs are common in hospitals and are a very significant and increasing cause of morbidity and mortality responsible for one-fifth of in-hospital adverse events (Leape et al, 1991). Many of these reactions are due to allergic drug reactions. In a recent large epidemiological survey from the UK, drug sensitivity accounts for 47% of all mortality due to generalised allergic shock (anaphylaxis) and anaesthetic allergy accounts for 19% of total anaphylaxis deaths, nearly half of all drug-related deaths (Pumphrey et al, 2004). Allergic reactions to antibiotics and anaesthetics are one of the most common causes of drug reactions occurring in hospitals with very significant adverse consequences with respect to length of stay and patient outcomes (Classen et al, 1997).

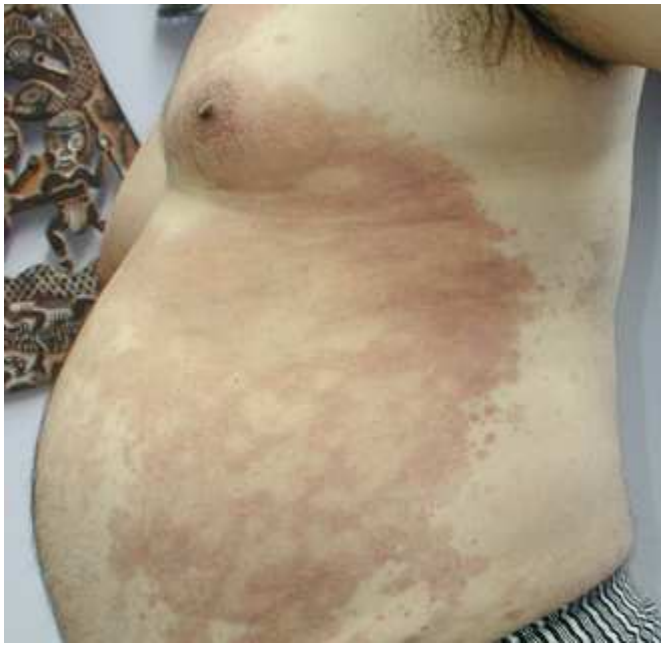
Aspirin allergies are estimated to occur in 1% of people overall, but in up to 10% of those with asthma (Vally et al, 2002). Allergic reactions to medicines are no more likely to occur in people with other allergies (such as hay fever or eczema) than anyone else in the general population. While there are reports of some families who have many people with allergic reactions to medicine, most drug allergies are not inherited.

In general practice surveys, allergic reactions to medication are estimated to have occurred in up to 1% of patients in the preceding six months. By contrast, allergic reactions to X-ray contrast agents and general anaesthetics (approximately one in 10,000 exposures) and vaccinations (approximately one in a million exposures) are relatively rare (Cashman et al, 1991; Fisher and Baldo, 1993; D'Souza et al, 2000).

When evaluating patients with possible drug allergy, the circumstances surrounding the episode are analysed to help determine the likelihood of allergy being responsible. Unfortunately, the circumstances of such reactions are not always clear from the history, making evaluation of possible 'drug allergy' a complex process. Assessment is complicated by the fact that allergy testing is of predictive value for only a limited number of IgE-mediated reactions to some medications such as penicillin, some other antibiotics and anaesthetic agents. Testing for some drug allergies can be expensive (eg, penicillin minor determinants), and often requires hospital-based allergy services for their performance. For other medicines, such as painkillers (eg, aspirin) or tablet-only antibiotics, there is no accurate test to confirm the presence of allergy, and there is no validated test to help prove or exclude delayed hypersensitivity reactions.

When it is important to prove or disprove sensitivity, deliberate challenge is sometimes required to determine the presence or absence of drug allergy. This is normally performed under medical supervision, using small doses first. Since some adverse reactions may be serious, the availability of specialised hospital-based allergy units is essential, even if initial evaluation is performed in community-based allergy/immunology practices.

FIGURE 1-14: ADVERSE DRUG REACTION



Source: Dr R Mullins.

1.2.4.6 LATEX ALLERGY

Natural latex or rubber is a natural product obtained from the sap of the *Havea* tree. Preservatives, stabilisers and antioxidants may be added during manufacture to assist its stability. It may be dipped into a mould, then heated and dried. A dry powder lubricant (usually cornstarch) is often added to prevent the rubber surfaces from sticking together. Allergic reactions can occur to latex protein as well as the chemical preservatives added to it, but not to cornstarch. Allergic reactions to latex may be divided into two groups; immediate hypersensitivity (mediated by IgE) and contact allergic dermatitis (Katelaris, 2006). Around 1% of the general population is latex allergic, whereas up to 7% of health care personnel have evidence of sensitisation to latex, with a lower proportion being clinically sensitive.

- With **immediate hypersensitivity,** reactions can occur within minutes and include hives or swollen lips or face at the site of contact. Others will develop irritation after wearing a condom, having a Pap smear taken or after dental treatment. Allergic rhinitis and asthma may occur, typically in an occupational (usually hospital) setting where frequent changing of gloves can result in suspension of fine latex particles in the air. More serious reactions can occur. In very sensitive people, rapid absorption of latex through moist surfaces such as the mouth, nose, throat, vagina or rectum can result in difficulty breathing, a drop in blood pressure or even shock and anaphylaxis. Those at greatest risk are health care workers, and those with a history of frequent latex exposure, such as patients with frequent surgery, particularly in childhood (Bousquet et al, 2006).
- **Contact allergic dermatitis** is a reaction to the chemicals added to rubber during manufacture, but only occasionally to latex proteins. Rough, scaly and sometimes weeping rashes can develop within hours or days of contact. As with irritant dermatitis, absorption of latex through damaged skin increases the risk of later developing immediate and delayed contact allergy with continued exposure.

Proteins in latex are present in some foods as well. Latex-allergic people sometimes find that some foods cause an itchy mouth or throat swelling. The most common foods described are banana and avocado and sometimes kiwi fruit, passionfruit, plums, strawberry, tomato or other fruits. Symptoms arise from cross-reactive allergic responses to protein allergens of similar structure present in latex, as well as other plants such as the fruit and vegetables mentioned above. These foods do not have to be avoided routinely – just if they cause problems.

Management of established disease involves avoidance and substitution of non-latex containing gloves in those with occupational exposures or in those undergoing medical procedures. Use of non-latex containing barrier contraceptives is also necessary. The provision of a MedicAlert bracelet is essential, in case a patient requires urgent medical care and is unable to warn health care workers of their sensitivity. There have been studies of immunotherapy to latex, but this is not established routine practice in this condition. Universal adoption in the workplace of low-protein, powder-free gloves and avoidance of latex in non-clinical areas (eg, cleaning, food preparation) has been shown to dramatically reduce exposure and the risk of developing sensitisation LaMontagne et al, 2006).

1.2.4.7 OCCUPATIONAL ALLERGY

Occupational allergy is defined as the presence of allergy-related symptoms caused or aggravated by occupational exposure. Given the frequency of allergic disorders and their increasing prevalence in Australia, identification of avoidable environmental triggers is an important part of management (Pedan and Bush, 2007; James and Crespo, 2007; Pacheco, 2007; Brant, 2007; Henneberger, 2007; Thyssen et al, 2007; Beach et al, 2007; Dhir, 2006). Examples of occupational allergy include:

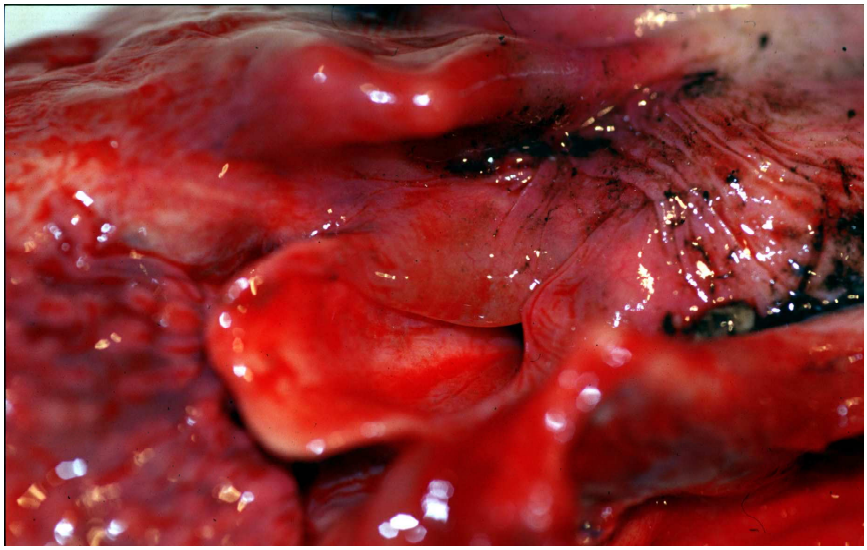
- contact dermatitis to preservatives in latex gloves – most commonly in health care workers;
- occupational asthma and contact allergic dermatitis from hairdressing chemicals in hairdressers, and from flours and enzymes in bread-derived products;
- occupational asthma and rhinitis from animal laboratory workers (and sometimes anaphylaxis);
- contact allergic reactions to food in chefs and food handlers, sometimes leading to secondary food allergy and anaphylaxis;
- contact allergic dermatitis to glues, perfumes, metals, garden plants, dyes and other chemicals – conditions affecting multiple industries; and
- other occupational asthma from multiple triggers including food proteins in processing plants, detergent enzymes, aluminium salts, paint products (such as isocyanates), plastics industries, wood dust, insects (such as storage mites, worms and flies), printing inks and soldering fumes.

An accurate identification of occupational triggers forms not only the basis of sound clinical management, but also forms the basis of occupational health and safety practices, and has economic, social and legal consequences. Furthermore, early identification of an occupational trigger may allow changes in work practice or occupation that may present as work-related problems from becoming (in some instances) a permanent disability that persists even after the triggering agent is removed.

1.2.4.8 ANAPHYLAXIS

Anaphylaxis is a serious allergic reaction, resulting from massive release of inflammatory mediators, resulting in one or more of difficulty breathing or vascular collapse. The most common triggers in infants and young children are foods, with drug, latex and stinging insect allergy being relatively uncommon. Poorly controlled asthma is the main risk factor for fatal anaphylaxis. The major triggers for anaphylaxis in adults are peanut, tree nuts, seafood and allergic reactions to medication and stinging insects. Death may occur from low oxygen levels due to upper airway swelling, constriction of airways in the lung (bronchospasm) and mucus plugging, and/or shock due to massive dilation of blood vessels, leakage of fluid from the bloodstream into the tissues and reduced cardiac function. The cornerstones of initial management are placing the patient in the supine position, intramuscular adrenaline into the lateral thigh, intravenous fluids, support of the airway and ventilation, and supplementary oxygen (Sicherer and Leung, 2006; Brown, 2005,2006; Simons, 2006; Sicherer and Simons, 2007; Pongracic and Kim, 2007; Brown et al, 2006).

FIGURE 1-15: SEVERE UPPER AIRWAY SWELLING IN CASE OF FATAL ANAPHYLAXIS



Source: Dr S Brown.

Estimates as to the incidence of new cases of anaphylaxis are approximately one new case per 5,000 people per year, although even this may be an underestimate (Lieberman et al, 2006)[9]. Evidence from the UK and Australia has shown evidence of an increased incidence of anaphylaxis, with a doubling in admissions to Australian hospitals with this diagnosis over the last 12 years, with a disproportionate five-fold increase in young infants less than 5 years of age (Gupta et al, 2007; Mullins, 2007). Specialist evaluation is recommended after a diagnosis of possible anaphylaxis, to identify or confirm the cause, to provide education on appropriate avoidance strategies, to assist drafting an emergency action plan and to advise whether immunotherapy (eg, for venom allergy) is appropriate. Such strategies have been

[9] A recent study of children treated in a Brisbane accident and emergency department estimated a much higher prevalence of 8 cases per 10,000 children aged less than 16 years (Braganza et al, 2005). Many of those who have experienced anaphylaxis will have further episodes; an average of once every two years overall, with potentially dangerous allergic reactions once every ten years (Mullins, 2003). The relatively low admission rate to Australian public hospitals with anaphylaxis (80.3 per million people per year) is the tip of the iceberg in terms of incidence as the majority of cases are treated in accident and emergency departments and discharged. Furthermore, Australian studies have also shown that up to 40% patients do not seek medical assistance during an episode (Mullins, 2003).

shown to reduce the rate of relapse and hospital admission (Kim et al, 2005; Choo and Sheikh, 2007; Kapoor et al, 2004).

Psychological morbidity and negative impact on quality of life is common in patients and their caregivers, and some require emotional support and counselling as well as medical advice (Mullins, 2003; Elberink, 2006). Deaths from anaphylaxis are relatively rare and, while attempts have been made to predict those at greatest risk, many of those described as having had fatal anaphylaxis have never had a serious allergic reaction in the past. Provision of a written management plan and patient education in use of EpiPen has been shown to reduce anxiety and the rate of hospital presentation (Greenberger et al, 2007; Pumphrey and Gowland, 2007).

FIGURE 1-16: EPIPEN USE

Source: Dr P Smith.

1.2.4.9 HYPEREOSINOPHILIA SYNDROMES

Hypereosinophilia is defined at the presence of sustained high blood levels of white cells known as eosinophils. Minor elevations are common in various allergic disorders such as asthma allergic rhinitis and atopic eczema. Sustained high levels, however, pose the risk of damage to the lining of the heart and nerve endings, regardless of the cause of the elevation, because of the presence of toxic granules within the eosinophil, which may release their contents into the tissues (Fletcher and Bain, 2007; Antoniu, 2006; Roufosse et al, 2006; Bain, 2004).

Causes of hypereosinophilia include drug allergy, parasitic disease (rare in Australia), malignancy (lymphoma), vasculitis, some autoimmune disorders, eosinophilic leukaemia and the idiopathic hypereosinophilia syndromes. Clinical manifestations may present as recurrent urticaria/angioedema, through to sinus disease with nasal polyps, asthma-like symptoms, lung infiltrates presenting with pneumonia-like symptoms (but unresponsive to antibiotics), recurrent abdominal pain, neuropathies (nerve damage) and cardiomyopathy resulting from damage to the heart. More serious cases may behave like a leukaemia even in the absence of malignancy. Treatment centres around immunosuppressive medication such as corticosteroids, cytotoxic and cancer chemotherapy agents, and interferon, as well as novel agents such as imatinib (Antoniu, 2006).

1.3 DIAGNOSIS OF ALLERGIC TRIGGERS – ALLERGY TESTING

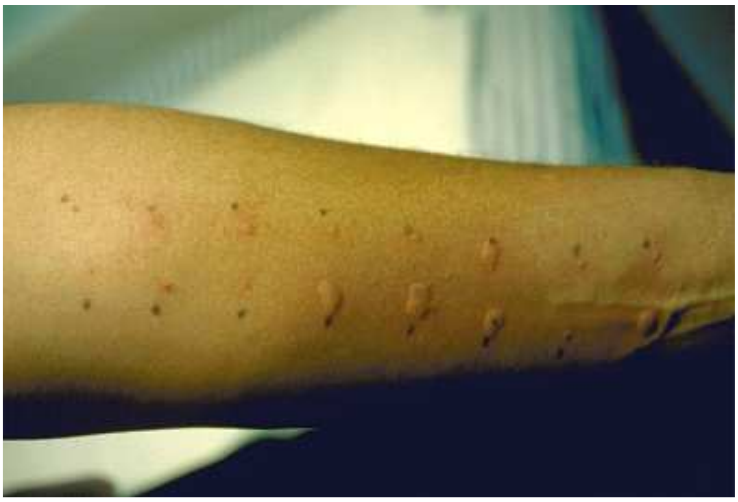
Allergy testing involves the detection of IgE antibodies directed against environmental allergens, either by skin prick testing (SPT) or blood allergy testing. This helps prove or

disprove the presence of allergy as a contributor to symptoms and facilitates the identification of avoidable triggers.

Skin prick testing: SPT is most commonly performed on the forearm, although the back is sometimes used. After first cleaning with alcohol, a drop of commercially-produced allergen extract is placed onto a marked area of skin. Using a sterile lancet, a small prick through the drop is made. This allows a small amount of allergen to enter the skin, where it comes into direct contact with tissue mast cells. If a person is sensitised, release of mast cell mediators results in the appearance of a small mosquito-like lump. Results are recorded 15-20 minutes after application and are best expressed in terms of the absolute wheal and flare size in millimetres. Testing is slightly uncomfortable, but usually well tolerated, even by small children.

Intradermal testing: Intradermal skin testing (IDT) is also used under some specific circumstances to detect allergen specific IgE. A small amount of very dilute allergen is injected into the upper layers of the skin, normally using a diabetic insulin syringe. It is a more uncomfortable test than SPT and so very rarely used in children. While it is more sensitive, is more likely to lead to false positive and clinically irrelevant results. For this reason, it is mainly used for evaluation of patients with sensitivity to antibiotics or insect venom.

FIGURE 1-17: SKIN PRICK TESTING SHOWING THE DEVELOPMENT OF WHEALS AFTER 15 MINUTES



Source: Dr R Mullins.

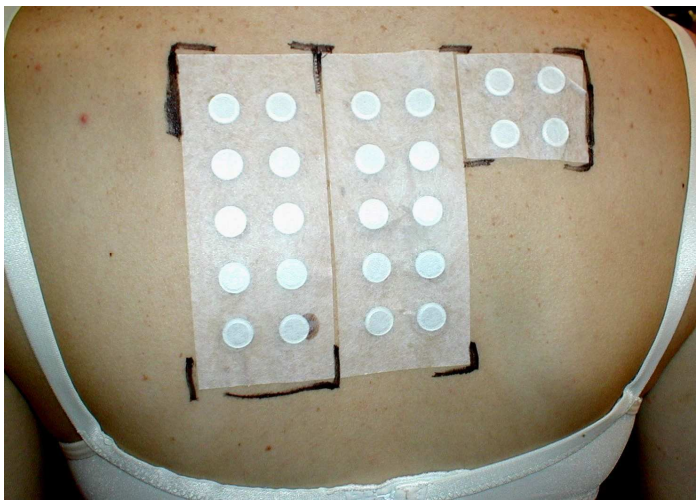
Blood allergy testing (ImmunoCap, Immulite, RAST): Blood allergy testing is also available for a selected range of allergens, and is most commonly used when SPT is not possible (eg, a patient taking antihistamines, or someone with severe atopic eczema) or inadvisable (eg, pregnancy). The usefulness of testing is limited by:

- the limited number of food allergen tests that have been validated for clinical relevance;
- the limited number of allergens currently available; and
- the complexities of current Medicare funding arrangements for the number of tests that are subsidised for any one blood collection.

Patch testing is frequently used in the evaluation of patients with non-IgE mediated allergic reactions, most commonly contact allergic dermatitis. Commercial extracts of allergen are applied under occlusion to the skin for a few days. The presence of a patch of dermatitis under the allergen extract indicates sensitivity. This testing is sometimes used for the

evaluation of selected patients with suspected delayed immune reactions to food or medications.

FIGURE 1-18: PATCH TESTING



Source: Dr R Mullins.

Alternative testing: A number of unproven tests have been proposed for evaluating allergic patients including cytotoxic food testing, kinesiology, Vega testing, pulse testing, reflexology and hair analysis. There is no scientific rationale for these methods. Results have not been reproducible when subject to rigorous testing and do not correlate with clinical evidence of allergy. No Medicare rebate is available and their use is not advised. Issues surrounding the use of such tests and lack of evidence of benefit has been examined in an ASCIA Position Statement: http://www.allergy.org.au/pospapers/unorthodox.htm (Beyer and Teuber, 2005).

Allergic disorders are chronic conditions that can impact negatively on quality of life, cause significant discomfort, affect sleep, and impair learning, memory and behaviour in children (Santos et al, 2006; Baiardini et al, 2006a,b; Chamlin, 2006). In children with severe food allergy, management in the community is complex and has the potential to cause significant anxiety within affected families regarding care in schools, risk of death and the need or otherwise for injectable adrenaline (Hu et al, 2005). For affected adults, allergic disorders lead to impaired quality of life, absenteeism from work, reduced productivity and can be a substantial financial burden. Most patients with allergic disorders have associated comorbidities, resulting in the need for multiple medical interventions. The strong genetic component in allergic disorders often results in several family members consuming multiple medications simultaneously for several years (Blaiss, 2000).

1.4 MORTALITY

Allergies represent a group of chronic disorders in which morbidity rather than mortality is predominant. The major sources of mortality are asthma, and less commonly anaphylaxis, drug allergy and complications arising from surgical care of sinusitis. Some deaths from anaphylaxis may also be erroneously classified as being due to asthma fatalities (Gupta et al, 2007) and even anaphylactic deaths may not be recognised (and thus be underreported)

given the lack of any specific features (Schwartz et al 1988, 1995; Low and Stables, 2006; Pumphrey and Roberts, 2000). Australian Institute of Health and Welfare (AIHW)[10] mortality data indicate 68 anaphylactic deaths over the period 1997 to 2004. A further 18 deaths over the same period have been attributed to adverse drug reactions, of which an uncertain proportion may have had an allergic origin, and so may or may not have been counted in the anaphylactic deaths described above. In 2004, 318 people died from asthma (ABS 2006d).

Available data on the relative risk of mortality for allergy-related conditions have been collected and combined according to their contribution to the overall prevalence of allergy. This makes it possible to estimate a combined relative risk of mortality due to allergy.

- A relative risk (RR) of mortality due to asthma of 1.03 was calculated by comparing the proportion of deaths in the asthma population, sourced from the AIHW publication *Asthma in Australia 2005,* with the deaths in the general population (sourced from the ABS). This RR of 1.03 was then applied to asthma and allergic rhinitis.
- A RR of 1.0 for sinusitis was sourced from the AIHW burden of disease publication (Mathers et al, 1999)[11].
- Combining these two data with their contribution to the overall prevalence of allergy (Section 2.1) provides an estimated RR of 1.02 for other allergies. These estimates were triangulated against other available data, including the AIHW anaphylaxis data above.

Overall, this amounted to a RR of 1.02 for all allergy. This RR was then applied to prevalence of allergy in 2007 to estimate that there are around 586 deaths due to allergy in 2007.

[10] AIHW special data request.

[11] That is, the relative risk of death for someone with chronic sinusitis is modeled as being the same as for the general population at large.

2. PREVALENCE

Prevalence refers to the number of people with allergic disease in a population at a given point or over a certain period of time (one year prevalence is estimated in this study).

Allergies have emerged as a major public health problem in developed countries during the twentieth century, with particular impacts on children and young adults (Kemp et al, 2006; Linneberg, 2005; Isolauri et al, 2004). Allergies – especially the 'big three' of allergic rhinitis, asthma and sinusitis - affect millions of Australians. Australia and New Zealand have among the highest prevalence of allergic disorders in the developed world, with over 20% of 13-14 year olds having asthma-like symptoms, compared to less than 5% of children in Eastern Europe, some Asian and African countries (Asher et al, 2001,2006; Robertson et al, 2004). According to public sector sources, four of the top ten most common long term self-reported illnesses in youth aged 12-24 years in Australia are allergic rhinitis ('hay fever' – 14%), asthma (9%), chronic sinusitis (5%) and undefined allergy (3.5%) (NSW Health, 1997; AIHW, 2007).

In addition to the prevalence reported for specific allergic conditions from the international literature (eg, Robertson et al, 1998; ISAAC Steering Committee, 1998) and Australian studies (eg, Wilson et al, 2006; Robertson et al, 2004; Downs et al, 2001) as presented in Chapter 1, Access Economics has investigated overall prevalence of allergies, by age and gender, using data from the Australian Bureau of Statistics (ABS). Current prevalence is presented in Section 2.1 while Section 2.2 looks at trends in the changing prevalence of allergies and Section 2.3 makes projections of prevalence to 2050.

2.1 CURRENT PREVALENCE OF ALLERGIC DISORDERS

The National Health Survey (NHS) (ABS, 2005) reports that in 2005 there were over three million cases of allergic rhinitis, over two million cases of asthma and over one million cases of chronic sinusitis. Additionally, there are a host of minor allergies that collectively accounted for another million cases (Table 2-1).

TABLE 2-1: PREVALENCE OF ALLERGY-RELATED CONDITIONS BY TYPE (CASES), AUSTRALIA, 2005

Condition	Cases (millions)
Allergic rhinitis	3.17
Asthma	2.01
Chronic sinusitis	1.82
Other allergies	1.04
Total cases	**8.04**

Source: ABS (2005).

- The NHS sought self-diagnosis from respondents for each of the four categories in Table 2-1 above (see Appendix B for relevant details from the survey questionnaire). The categories "asthma" and "chronic sinusitis" over-estimate allergies, as these include non-allergic asthma and non-allergic sinusitis. This report estimates the proportions of such conditions attributable to asthma from attributable fractions provided by ASCIA (see below).

- Where respondents gave further details on "other allergies", if the allergic conditions were organ-specific, the NHS includes them under "other diseases" for those organs. For example, "other eye diseases" contains both allergic and non-allergic conjunctivitis, and "other skin diseases" contains both allergic and non-allergic dermatitis/eczema[12].
- The Users Guide for the NHS (ABS, 2006c) states that the NHS category "other allergies" approximately matches the International Classification of Primary Care (ICPC-2) rubric A92 "Allergy/Allergic Reaction NOS" – see Table 2-2 below for details.[13] Where NHS respondents indicated non organ specific allergies, the NHS appears to have included these in its "Other Allergies" category. This would include conditions such as angioneurotic oedema, which are not always caused by allergies. On balance however, by excluding organ-specific allergies, the "other allergies" category is likely to under-estimate the prevalence of non-respiratory allergies[14].

TABLE 2-2: ICPC-2 RUBRIC "ALLERGY/ALLERGIC REACTION NOS"

Category	ICPC-2 Rubric
Allergic reaction	A92007
Allergic reaction; bee sting	A92011
Allergy	A92008
Allergy, food	A92004
Anaphylaxis; non-medication	A92012
Atopy	A92009
Oedema; allergic	A92006
Oedema; angioneurotic	A92010
Shock; anaphylactic	A92005

Source: Family Medicine Research Centre

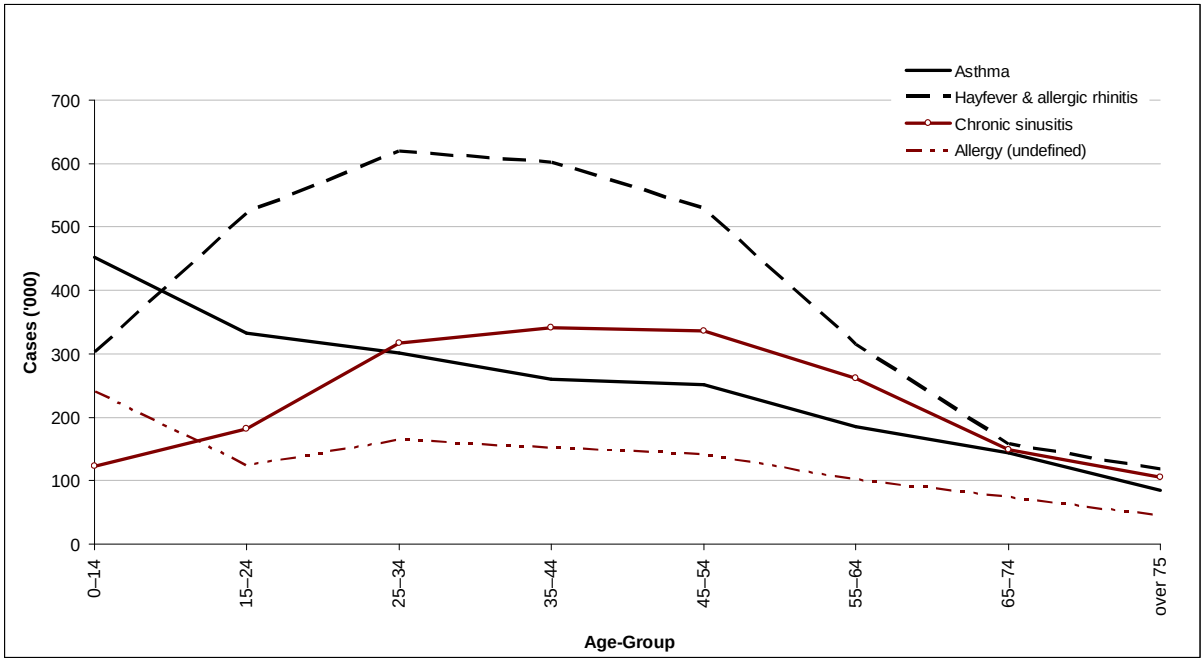
According to the NHS data, asthma is the predominant allergy of young people, with almost half a million cases occurring in children under the age of 15 during 2005. However, the number of asthma cases steadily falls thereafter, with allergic rhinitis becoming the most prevalent condition in the mid-teenage years. Allergic rhinitis peaks for people in their late twenties to early thirties. The same age group also sees chronic sinusitis rise to overtake asthma. Chronic sinusitis continues to increase in prevalence up until age 35-44, but allergic rhinitis still predominates to the oldest age groups (Figure 2-1).

[12] Asher et al (2006) surveyed 2,968 Australian children between the ages of six and seven years, and found that 17% had symptoms of eczema (the majority of which would probably be due to allergies). If prevalence rates in Australia were the same as in the US (Greaves, 2006) some 20,000 Australians would have urticaria.

[13] The Users' Guide also states that "Other Allergy" matches the ICD-10 category "Symptoms, signs & conditions nec: Allergy (undefined). However, there is no closely matching ICD-10 category. "Symptoms, signs & conditions" is ICD-10 chapter R, which contains no allergic conditions. ICD-10 Chapter T "Injury, poisoning and certain other consequences of external causes" has a category (T78) that is a reasonably close match to ICPC Rubric A92. While both matchings are approximate, given the ABS has given a numerical rubric for ICPC, this is probably a more reliable indication of "Other Allergy" than the ICD-10 matching, which is only a vague textual description.

[14] Using estimates derived from Australian and foreign studies, there could be up to 400,000 cases of food allergy (Sicherer and Sampson, 2006); 200,000 persons at risk of sting-related anaphylaxis (Douglas et al, 1998; Roberts-Thomson et al, 1985; Stuckey et al, 1982); and around 4,000 new cases of anaphylaxis per year (Lieberman et al, 2006).

FIGURE 2-1: PREVALENCE OF ALLEGIES BY AGE (CASES), AUSTRALIA, 2005



Source: ABS (2005).

To determine age and gender specific incidence rates, 2001 NHS data were used, because the 2005 NHS data did not cross-tabulate age and gender (Figure 2-2). Prevalence was greater among females between the ages of 15 and 75 years, consistent with published data (Osman et al, 2007). Asthma was the dominant allergy for those aged less than 15 years. The highest prevalence was found in young adults aged 25-34 years, when allergic rhinitis predominates.

FIGURE 2-2: ALLERGIES, PREVALENCE RATES BY AGE AND GENDER, AUSTRALIA, 2005

People may present with similar symptoms, yet not all have an allergic origin. As described in Section 1.2.1, patients with chronic rhinitis may have allergic rhinitis, or so-called non-allergic rhinitis, where only the former has a well-defined allergic mechanism. Similarly, a substantial proportion of people with asthma have no evidence of allergic sensitisation, a condition described as 'intrinsic asthma'. Published literature (Rimmer and Ruhno, 2006) and data supplied by Dr Mullins[15] suggest that the fraction of asthma that can be attributed to allergy (AF) is 85%, the figure used in this analysis.

While acute sinusitis is more common in patients with allergic rhinitis (Cirillo et al, 2007), it is more difficult to determine the contribution of allergic disease to chronic sinusitis. The estimate of Steinke and Borish (2004) that approximately half of chronic sinusitis could be attributable to allergy is consistent with Australian data indicating co-morbid allergic rhinitis in 49.5% of patients with chronic sinusitis (Mullins data). Gaby (2005), while agreeing that much of chronic sinusitis is allergic, considers that this is most likely to be allergic fungal sinusitis [16].

However, even after removing non-allergic asthma and non-allergic sinusitis, the sum of diagnosed allergy cases on the Mullins database is still 24% greater than the number of patients with allergic disease, consistent with the concept of comorbidity described elsewhere in this report[17]. Accordingly, in order to estimate the total number of people who suffer from allergies, we have scaled the NHS case totals down by 24% to estimate the number of people (as opposed to cases) of allergy in Australia. This yields a total prevalence of 4.08 million people who suffered from allergies in 2007 (Table 2-4), which is significantly smaller than the total number of cases of various allergic diseases, at 7.20 million, indicating the significant degree of comorbidity. Also, as shown in Table 2-3, a greater proportion of women (21.3%) suffer from allergies than do men (17.9%)

- A similar outcome was derived using BEACH (Bettering the Evaluation and Care of Health) data from the report *Allergies in General Practice, April 2000 – March 2006* published by the Australian General Practice Statistics and Classification Centre (AGPSCC, 2007). The sum of allergy cases in this case was 17% greater than the number of allergy patients. (The Mullins data are used in preference to the BEACH data, as the former can identify specific patient comorbidities whereas the later cannot).

[15] Data supplied by Dr Mullins from de-identified records, covering over 17,500 allergy patients seen in the ACT since 1995, from which diagnostic comorbidity can be estimated. (By way of comparison, the NHS surveys 25,000 households.) The possibility of referral bias in the data is acknowledged

[16] The evidence linking allergic sinusitis with comorbid allergic rhinitis is not as clear cut as it is for allergic asthma and allergic rhinitis. Accordingly, cases of allergic rhinitis are not automatically assumed to be double-counted when calculating the total number of people with (one or more) allergies. Moreover, acute sinusitis is much more common in people with allergic rhinitis.

[17] In fact for person prevalence, asthma can be ignored entirely. If a case of asthma is allergic, the person has already been accounted for under allergic rhinitis. And if the case of asthma is non-allergic, it is not counted.

TABLE 2-3: ALLERGY PREVALENCE RATES, 2007

Males	0–14	15–24	25–34	35–44	45–54	55–64	65–74	75+	Total
Allergic asthma	11.1%	10.1%	7.2%	6.3%	5.7%	5.4%	8.0%	5.2%	7.8%
Allergic rhinitis	8.8%	17.3%	21.6%	19.7%	16.9%	15.3%	11.4%	11.4%	15.6%
Allergic chronic sinusitis	1.7%	2.7%	4.5%	4.8%	4.8%	4.8%	4.0%	4.5%	3.8%
Other allergy	6.4%	3.6%	4.8%	3.6%	3.9%	2.9%	3.1%	4.8%	4.3%
Total	**12.8%**	**17.9%**	**23.4%**	**21.3%**	**19.3%**	**17.4%**	**14.0%**	**15.7%**	**17.9%**

Females	0–14	15–24	25–34	35–44	45–54	55–64	65–74	75+	Total
Allergic asthma	8.4%	11.0%	11.0%	8.7%	9.9%	9.6%	10.0%	7.8%	9.6%
Allergic rhinitis	6.6%	21.6%	22.3%	20.9%	21.7%	14.5%	11.9%	10.5%	16.6%
Allergic chronic sinusitis	1.4%	4.0%	6.7%	6.6%	7.4%	7.4%	6.9%	5.0%	5.4%
Other allergy	5.9%	5.7%	6.8%	6.6%	6.5%	6.7%	7.8%	3.7%	6.3%
Total	**10.5%**	**23.6%**	**27.1%**	**25.9%**	**26.9%**	**21.6%**	**20.1%**	**14.5%**	**21.3%**

In summary, in 2007 it is estimated that:

- 4.08 million Australians (19.6% of the population) have at least one allergy, of which 2.23 million (55%) are female and 1.85 million (45%) are male;

- the highest prevalence of allergies is in the working age population, with 78% of people with allergies aged 15 to 64 years (see chart below), and

- there are 7.20 million cases of allergy (ie, an average of 1.74 comorbid allergies per person).

TABLE 2-4: PREVALENCE OF ALLERGIES BY TYPE AUSTRALIA, 2007

Males

Age	Allergic Asthma	Allergic Rhinitis	Allergic Sinusitis	Other Allergy	Total Cases	Total Persons
0-4	71,726	56,978	11,224	41,447	181,376	82,929
5-9	74,164	58,915	11,606	42,856	187,541	85,748
10-14	78,603	62,440	12,301	45,421	198,765	90,879
15-19	74,307	127,671	20,230	26,722	248,929	132,068
20-24	76,047	130,659	20,703	27,347	254,757	135,159
25-29	51,675	155,766	32,216	34,548	274,205	168,301
30-34	51,564	155,431	32,147	34,474	273,615	167,939
35-39	47,952	151,235	36,602	27,691	263,480	163,005
40-44	46,713	147,328	35,656	26,976	256,673	158,794
45-49	43,458	127,860	35,911	29,148	236,376	145,905
50-54	39,143	115,165	32,346	26,254	212,907	131,419
55-59	34,365	97,707	30,881	18,693	181,646	111,390
60-64	28,715	81,643	25,804	15,620	151,781	93,076
65-69	32,472	46,357	16,052	12,430	107,311	56,601
70-74	25,011	35,706	12,364	9,575	82,656	43,597
75-79	13,237	29,193	11,431	12,210	66,070	39,958
80-84	9,022	19,898	7,792	8,323	45,035	27,236
85-89	4,323	9,534	3,733	3,988	21,577	13,050
90+	1,789	3,946	1,545	1,651	8,931	5,401
Total	804,286	1,613,432	390,543	445,372	3,253,632	1,852,455

Females

Age	Allergic Asthma	Allergic Rhinitis	Allergic Sinusitis	Other Allergy	Total Cases	Total Persons
0-4	51737	40,628	8,318	36,141	136,824	64,352
5-9	53599	42,090	8,618	37,442	141,748	66,668
10-14	56671	44,503	9,112	39,588	149,874	70,490
15-19	77679	152,366	28,064	40,015	298,124	166,724
20-24	80010	156,939	28,906	41,216	307,072	171,728
25-29	77192	156,421	46,719	47,873	328,205	189,843
30-34	79379	160,853	48,043	49,230	337,505	195,222
35-39	67386	162,441	51,461	51,585	332,874	200,790
40-44	65400	157,654	49,944	50,065	323,063	194,872
45-49	75254	165,531	56,118	49,560	346,463	205,117
50-54	68021	149,622	50,724	44,797	313,165	185,403
55-59	61570	93,279	47,415	43,012	245,276	138,938
60-64	50481	76,479	38,875	35,265	201,100	113,914
65-69	40819	48,630	28,125	31,823	149,398	82,119
70-74	33578	40,004	23,136	26,178	122,897	67,553
75-79	23450	31,512	15,000	11,024	80,987	43,515
80-84	19078	25,637	12,203	8,969	65,886	35,402
85-89	11632	15,631	7,440	5,468	40,172	21,585
90+	6858	9,216	4,387	3,224	23,685	12,726
Total	999,793	1,729,438	562,610	652,477	3,944,317	2,226,961

Persons

Age	Allergic Asthma	Allergic Rhinitis	Allergic Sinusitis	Other Allergy	Total Cases	Total Persons
0-4	123,463	97,606	19,543	77,588	318,200	147,281
5-9	127,763	101,005	20,224	80,298	329,289	152,416
10-14	135,274	106,944	21,412	85,009	348,639	161,369
15-19	151,986	280,037	48,294	66,737	547,054	298,792
20-24	156,057	287,598	49,610	68,563	561,828	306,887
25-29	128,866	312,187	78,935	82,421	602,410	358,144
30-34	130,942	316,284	80,190	83,703	611,120	363,161
35-39	115,339	313,676	88,063	79,276	596,354	363,795
40-44	112,114	304,982	85,601	77,040	579,737	353,666
45-49	118,712	293,391	92,029	78,708	582,840	351,023
50-54	107,164	264,787	83,070	71,051	526,072	316,822
55-59	95,935	190,986	78,296	61,705	426,922	250,328
60-64	79,195	158,122	64,679	50,885	352,881	206,990
65-69	73,291	94,987	44,177	44,254	256,709	138,720
70-74	58,590	75,710	35,500	35,753	205,553	111,149
75-79	36,687	60,705	26,431	23,234	147,057	83,473
80-84	28,100	45,535	19,995	17,291	110,921	62,638
85-89	15,955	25,165	11,174	9,456	61,749	34,634
90+	8,647	13,162	5,932	4,875	32,616	18,128
Total	1,804,078	3,342,870	953,153	1,097,849	7,197,950	4,079,416

Sources: ABS (2005) and the Mullins database.

2.2 CHANGING PREVALENCE OF ALLERGIC DISEASES

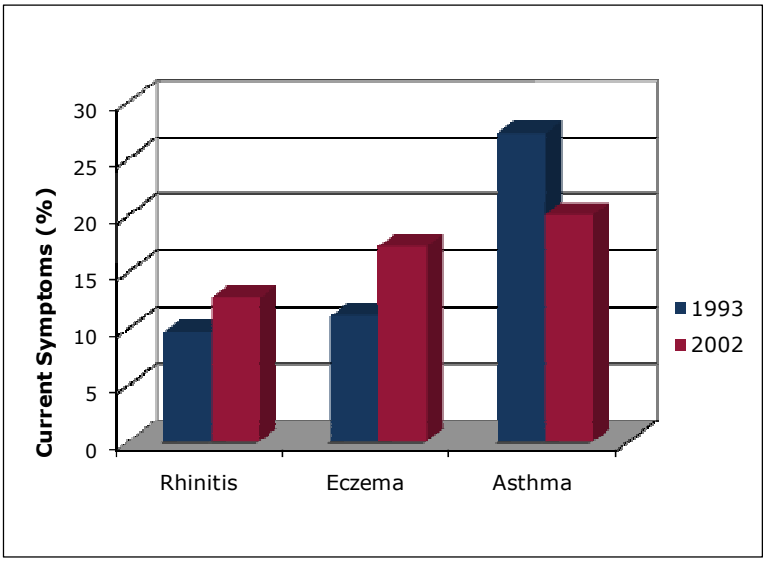
National and international studies have shown that allergies have become more common in recent times. The prevalence of allergic rhinitis and eczema has almost doubled over the last 10-15 years in Australia and New Zealand. Similar to observations in the UK and USA, there is preliminary evidence that food allergy and potentially fatal allergic reactions (anaphylaxis) have increased as well, predominantly in young children (Grundy et al, 2002; Sicherer et al, 2003). The emergence of new allergy-related disorders such as eosinophilic oesophagitis in adults and children (Cherian et al, 2006), and the unabated increase in demand for hypoallergenic infant formulae are additional evidence that this growth in allergic disorders is yet to plateau.

2.2.1 ASTHMA, ALLERGIC RHINITIS AND ATOPIC ECZEMA

The prevalence of asthma has increased substantially in Australia and New Zealand (and in other developed countries) for much of the last 20 years (Asher et al, 2006, Robertson et al, 1998; ISAAC, 1998), and has recently plateaued (Robertson et al, 2004) (Figure 2-3, Figure 2-4 and Figure 2-5). This has been achieved through the development of management plans in partnership between patient and medical professionals, community education, and understanding of the role of allergy and development of more effective medication.

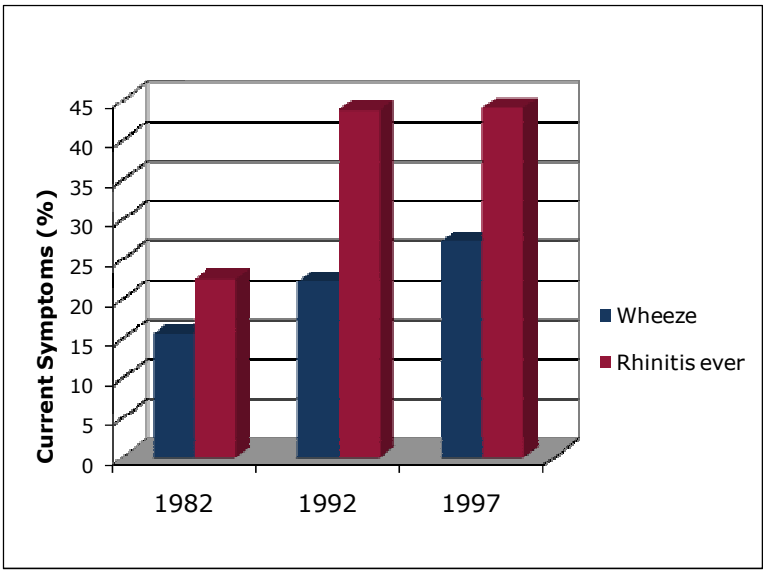
It is less well appreciated that other allergic disorders have also become more common over this time in Australia and New Zealand, as they have abroad. Using standardised questionnaires, studies of Australian and New Zealand children and adults have shown an approximate doubling in the prevalence of allergic rhinitis and eczema over the last 10-15 years (Robertson et al, 2004; Downs et al, 2001).

FIGURE 2-3: PREVALENCE OF RHINITIS, ECZEMA AND ASTHMA IN AUSTRALIANS AGED 6-7 YEARS, 1993 AND 2002



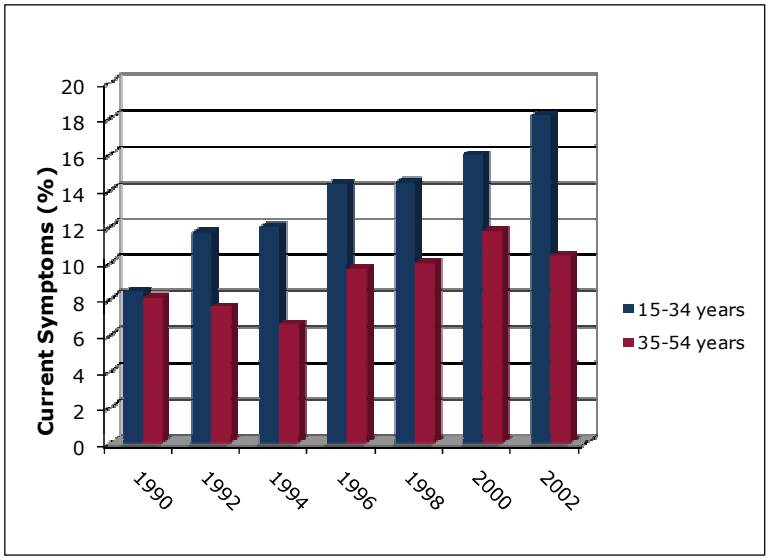
Source: Robertson et al (2004).

FIGURE 2-4: PREVALENCE OF WHEEZE AND RHINITIS IN AUSTRALIANS AGED 8-11 YEARS, 1982, 1992 AND 1997



Source: Downs et al (2001).

FIGURE 2-5: PREVALENCE OF ASTHMA IN AUSTRALIANS AGED 15-34 YEARS AND 35-54 YEARS, 1990-2002



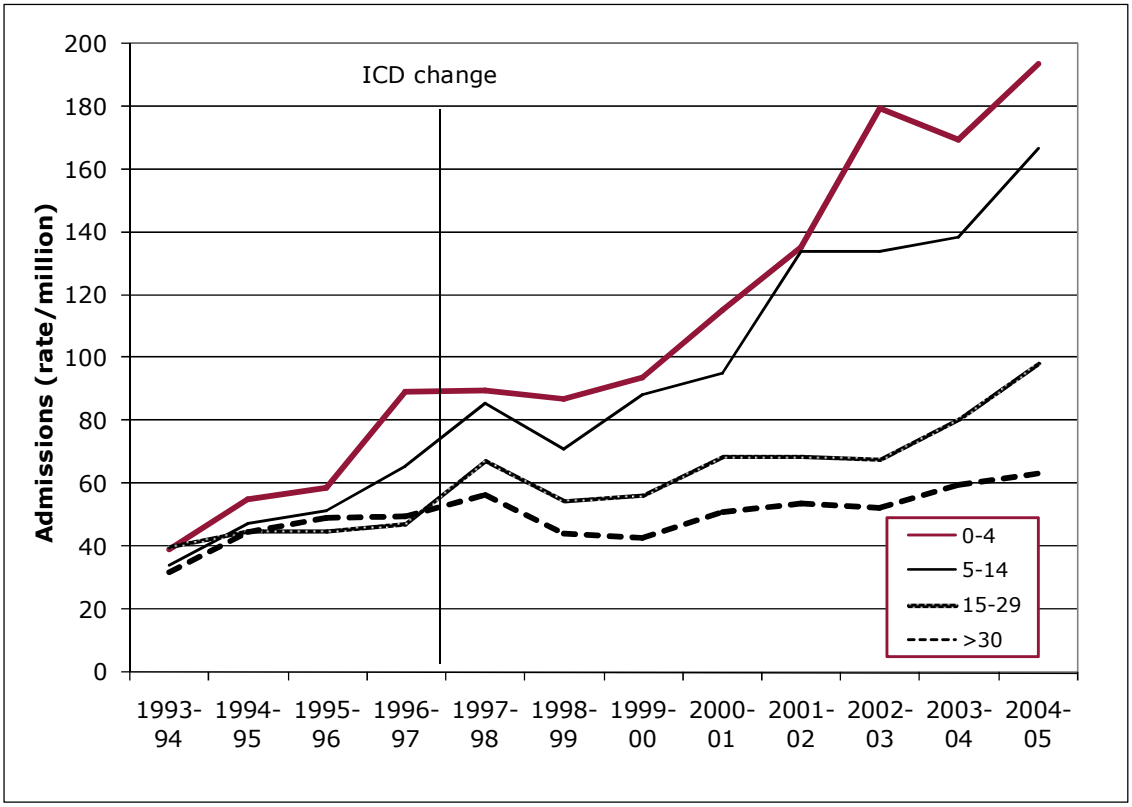
Source: Wilson et al (2006).

2.2.2 FOOD ALLERGY AND ANAPHYLAXIS

Recent studies from Australia and abroad suggest that food allergy and anaphylaxis are increasing as well. In a study of children aged 3-4 years old on the Isle of Wight (UK) using a combination of population surveys, SPT and challenge, sensitisation to peanut trebled from 1.1% to 3.3% between 1989 and 1994-6, with clinical reactivity increasing from 0.5% to an estimated 1.5% (Grundy et al, 2002). Similar changes in peanut allergy prevalence from 0.6% to 1.2% between 1997 and 2002 were derived from a random digit telephone survey of American children, although without confirmatory SPT or challenge (Sicherer et al, 2003).

While there have been no comparable epidemiological studies on food allergy in Australia, it is clear that hospital admissions for anaphylaxis have approximately doubled in Australia over the last 12 years, similar to findings in the UK (Mullins, 2007; Gupta et al, 2003). The changes in Australian age-adjusted admission rates for food induced anaphylaxis and total anaphylaxis over time were even more pronounced in young children aged 0-4 years, where admission rates increased five-fold over a 12 year period, and four-fold in older children aged 5-14 years, compared to an overall doubling in the population taken as a whole (Mullins, 2007).

FIGURE 2-6: AUSTRALIAN AGE-ADJUSTED HOSPITAL ADMISSION RATES FOR ANAPHYLAXIS

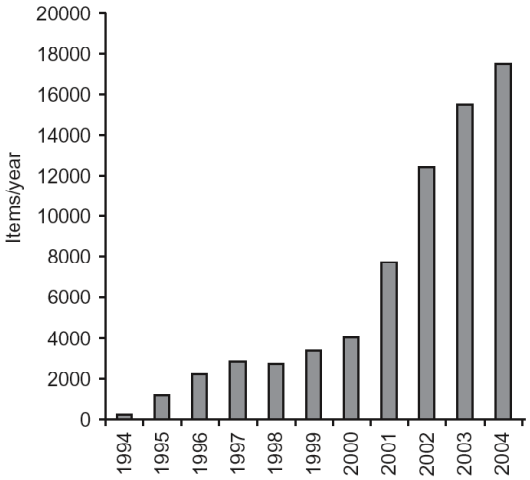


Source: Mullins (2007).

2.2.3 INDIRECT MEASURES OF CHANGING DISEASE PREVALENCE

Measuring demand for allergy-related medication is a less direct and therefore less accurate measure of changing prevalence of allergic disease. Hypoallergenic infant formula prescriptions have increased four-fold in the five years ending 2004 (Figure 2-7) but, with significant regional variation in prescribing rates, this may reflect increased awareness, access to specialist services or inappropriate prescribing as well as an increased incidence of food allergy in infants (Kemp, 2006). The last decade has also seen food allergy related disorders such as eosinophilic oesophagitis increasing from 0.05 to 0.89 cases per 100,000 Western Australian children between 1995 and 2004 (Cherian et al, 2006).

FIGURE 2-7: ELEMENTAL (HYPOALLERGENIC) INFANT FORMULA USE IN AUSTRALIA, 1994-2004

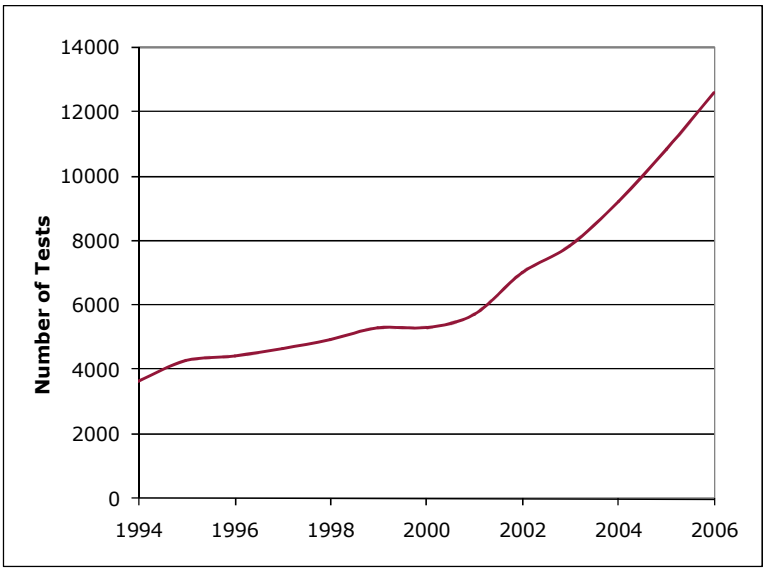


Amino acid formula (Neocate and EleCare) prescription items/year.

Source: Kemp (2006).

A second indirect measurement of demand for allergy assessment can be gleaned by examination of Australian data for allergy testing in infants aged 0-4 years, which has increased three-fold over the last 12 years (Figure 2-8). While there are many ways to interpret more frequent testing (increased community awareness of allergy, more frequent allergy testing of infants with atopic eczema), inhalant allergy is relatively infrequent in young infants, and the data are consistent with increased rates of atopy in children noted in published studies.

FIGURE 2-8: SPT IN AUSTRALIAN INFANTS 0-4 YEARS (ITEM 12000; LESS THAN 20 TESTS)



Source: Medicare Australia data: Item 12000 in children 0-4 yrs.

2.3 PREVALENCE PROJECTIONS

The literature and data from the previous section suggested that, although the prevalence of symptomatic asthma has plateaued, (Robertson et al, 2004) there is reliable evidence of a recent significant rise in the prevalence of allergic rhinitis, eczema, food allergy and anaphylaxis in Australia. These trends have important implications for public health, medical workforce planning, costs of care and the availability of public allergy/immunology services in Australia, that are currently lacking in some states of Australia (eg, Tasmania and the Northern Territory).

Data from the ABS National Health Surveys (1995, 2001 and 2004-05) was used to estimate trends in prevalence rates for the various allergic conditions modelled (Table 2-5). Some caution should be applied when using these figures, however.

- Only three points are available (ie, one from each survey) to estimate trends for each age-gender / disease combination. (Data are also available from the 1989 NHS, but only for short-term conditions, without any age or gender splits. The broad totals do, however, support the trends observed in later years.)
- The 1995 NHS, unlike later years, does not provide age or gender splits for long-term conditions. It does, however, provide age splits for the same conditions where they have only been experienced over a short term. The short-term age splits have been applied to the long term totals. Within these age splits, the gender ratios from 2001 have been applied.

Trends projected from ABS data support other available evidence that prevalence rates for total allergies are increasing. However, this appears to be mostly driven by strong growth in allergic rhinitis prevalence rates, as rates for allergic asthma, allergic chronic sinusitis and "other allergies" appear to be slowly decreasing. Linear estimation from the historical data suggests that the age-gender prevalence of allergies has changed in Australia over the period 1995-2005, for males and females together, by:

- -0.08% per annum for allergic asthma;
- 0.22% per annum for allergic rhinitis;
- -0.04% per annum for allergic sinusitis;
- -0.06% per annum for other allergies; and
- 0.09% per annum for all allergies.

These overall trends, however, mask important age, gender and disease specific time trends. For example, some allergies (such as allergic rhinitis) are increasing in all age groups. Others (such as asthma) appear to be in decline. While "other allergies" appears to be in decline (more so in females), the end result may differ according to the respective contributions to this group of food allergy and anaphylaxis, which have rapidly increased in recent years. A major contribution to the prevalence of allergic disease will of course be related to our aging population.

TABLE 2-5: PREVALENCE TRENDS BY AGE, GENDER AND ALLERGIC DISEASE, 1995-2005

Males

Asthma

	0–14	15–24	25–34	35–44	45–54	55–64	65–74	over 75
1995	14.3%	11.4%	6.1%	6.7%	5.5%	5.8%	8.6%	6.3%
2001	12.9%	13.3%	8.6%	6.6%	6.2%	5.8%	7.5%	5.0%
2005	11.1%	10.1%	7.2%	6.3%	5.7%	5.4%	8.0%	5.2%
Trend	-0.32%	-0.10%	0.13%	-0.05%	0.04%	-0.04%	-0.07%	-0.12%

Allergic Rhinitis

	0–14	15–24	25–34	35–44	45–54	55–64	65–74	over 75
1995	7.6%	16.7%	17.0%	18.6%	12.8%	13.9%	10.7%	6.1%
2001	8.1%	16.7%	22.5%	18.5%	15.6%	12.8%	13.7%	12.9%
2005	8.8%	17.3%	21.6%	19.7%	16.9%	15.3%	11.4%	11.4%
Trend	0.12%	0.05%	0.50%	0.10%	0.42%	0.11%	0.10%	0.58%

Allergic Sinitus

	0–14	15–24	25–34	35–44	45–54	55–64	65–74	over 75
1995	2.0%	3.6%	5.1%	5.6%	5.7%	5.0%	3.9%	2.9%
2001	2.3%	3.8%	4.7%	5.6%	5.7%	5.0%	4.7%	4.6%
2005	1.7%	2.7%	4.5%	4.8%	4.8%	4.8%	4.0%	4.5%
Trend	-0.02%	-0.08%	-0.06%	-0.08%	-0.09%	-0.02%	0.02%	0.17%

Allergy, other

	0–14	15–24	25–34	35–44	45–54	55–64	65–74	over 75
1995	5.9%	4.5%	4.7%	5.3%	5.0%	3.4%	3.0%	2.6%
2001	5.7%	4.9%	4.8%	3.9%	4.1%	2.9%	2.9%	4.8%
2005	6.4%	3.6%	4.8%	3.6%	3.9%	2.9%	3.1%	4.8%
Trend	0.05%	-0.08%	0.01%	-0.18%	-0.11%	-0.05%	0.01%	0.23%

Females

Asthma

	0–14	15–24	25–34	35–44	45–54	55–64	65–74
1995	10.9%	12.6%	9.5%	9.5%	9.9%	10.4%	9.6%
2001	9.8%	14.4%	12.9%	9.0%	10.6%	10.4%	9.2%
2005	8.4%	11.0%	11.0%	8.7%	9.9%	9.6%	10.0%
Trend	-0.24%	-0.12%	0.19%	-0.08%	0.01%	-0.07%	0.03%

Allergic Rhinitis

	0–14	15–24	25–34	35–44	45–54	55–64	65–74
1995	5.7%	21.1%	17.7%	20.1%	17.3%	13.2%	10.1%
2001	6.1%	20.7%	22.8%	19.4%	20.1%	12.1%	14.0%
2005	6.6%	21.6%	22.3%	20.9%	21.7%	14.5%	11.9%
Trend	0.09%	0.04%	0.49%	0.07%	0.44%	0.10%	0.22%

Allergic Sinitus

	0–14	15–24	25–34	35–44	45–54	55–64	65–74
1995	1.6%	5.3%	7.6%	7.9%	9.4%	7.7%	6.1%
2001	1.8%	5.5%	6.9%	7.7%	8.8%	7.6%	8.1%
2005	1.4%	4.0%	6.7%	6.6%	7.4%	7.4%	6.9%
Trend	-0.02%	-0.12%	-0.10%	-0.12%	-0.19%	-0.03%	0.10%

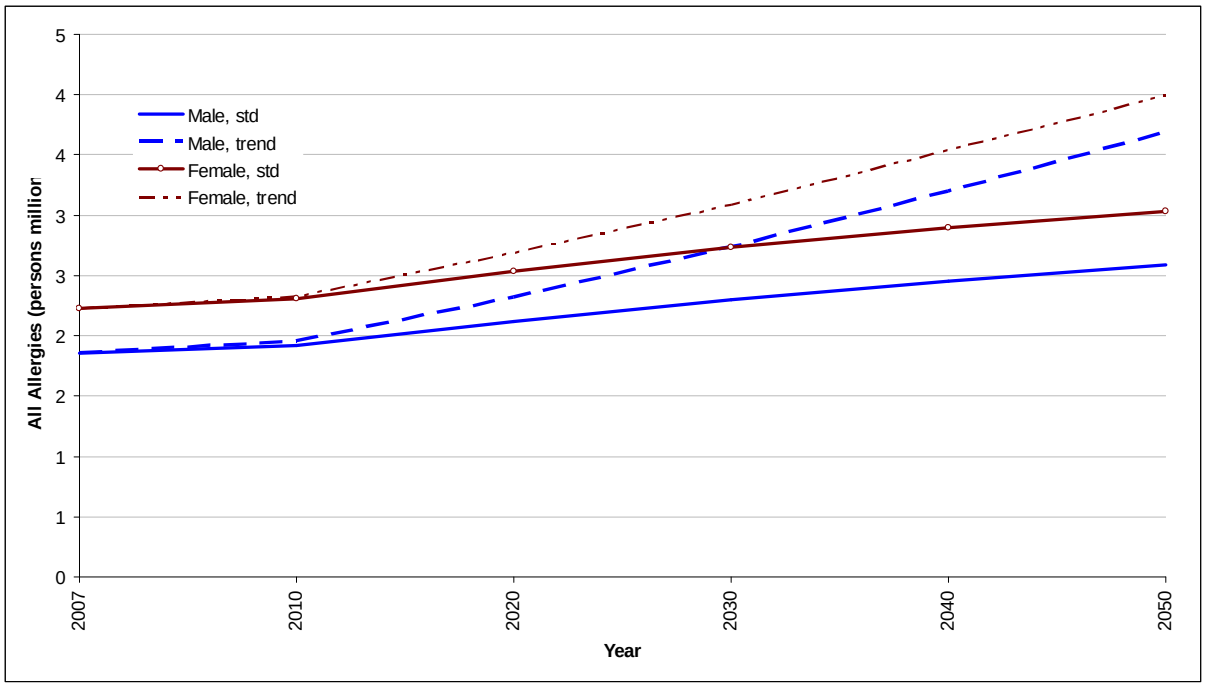
Allergy, other

	0–14	15–24	25–34	35–44	45–54	55–64	65–74
1995	5.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2001	5.2%	5.9%	4.5%	4.7%	5.3%	5.0%	3.4%
2005	5.9%	5.7%	6.8%	6.6%	6.5%	6.7%	7.8%
Trend	0.04%	0.60%	0.69%	0.67%	0.67%	0.68%	0.76%

Source: ABS (various years) National Health Surveys.

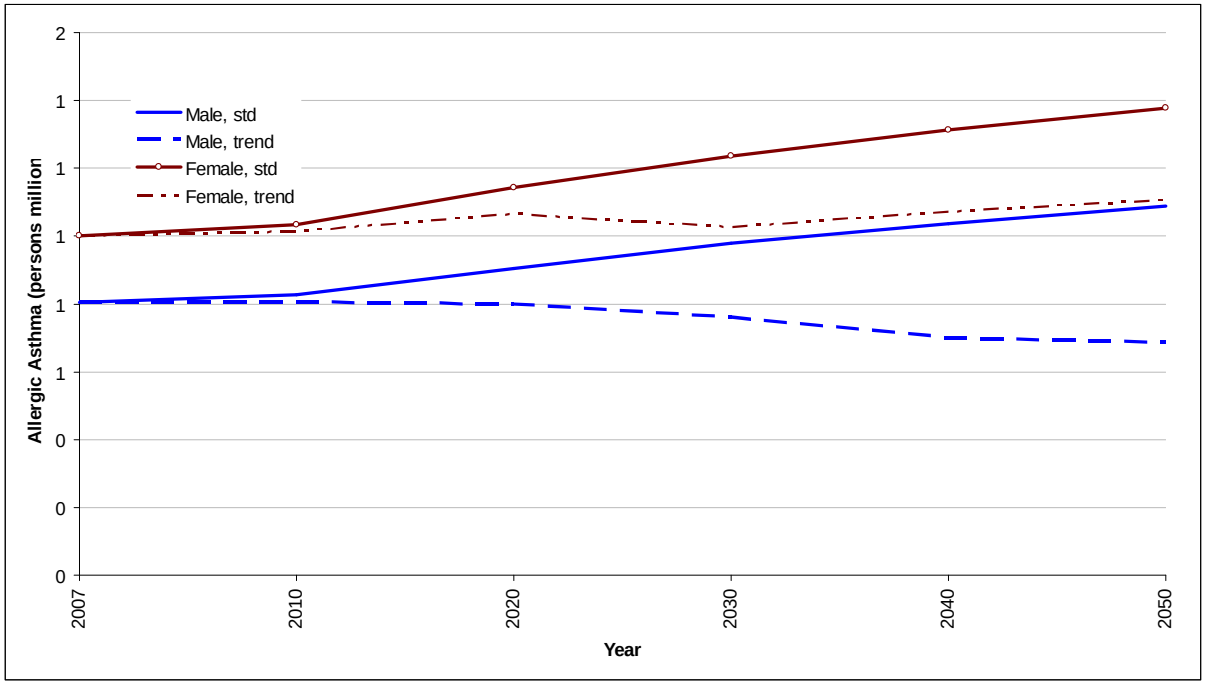
The solid lines in Figure 2-9 indicate the extent to which allergies may increase in the future simply due to a growing, ageing population (ie, assuming the same age-gender prevalence rates as used to estimate 2007 prevalence). The broken lines indicate the extent to which allergies can be expected to rise - beyond simple demographic effects – if rising prevalence rates were to continue at their historical pace. (The figures following are 'kinked' in 2010, because the distance between observations thereafter is ten years, while before 2010 it is only three years (2007-2010) so it appears flatter over the same length of x axis. 'Std' in the figures denotes using one standard prevalence rate (2005), rather than a different rate every year - 'trend'.)

FIGURE 2-9: PREVALENCE TRENDS FOR TOTAL ALLERGIES



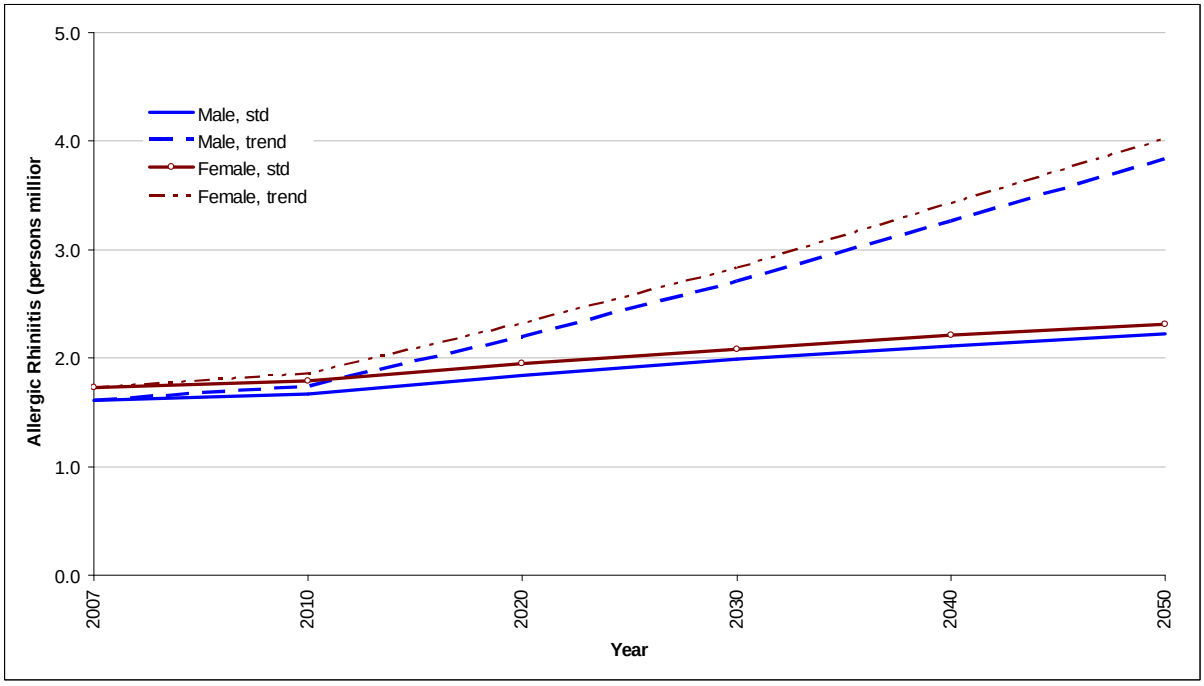
While demographic trends alone would cause the numbers of asthmatics to continue to increase, if historical prevalence trends hold, the total number of females with allergic asthma will stay roughly constant, and for males could actually fall (Figure 2-10).

FIGURE 2-10: PREVALENCE TRENDS FOR ALLERGIC ASTHMA



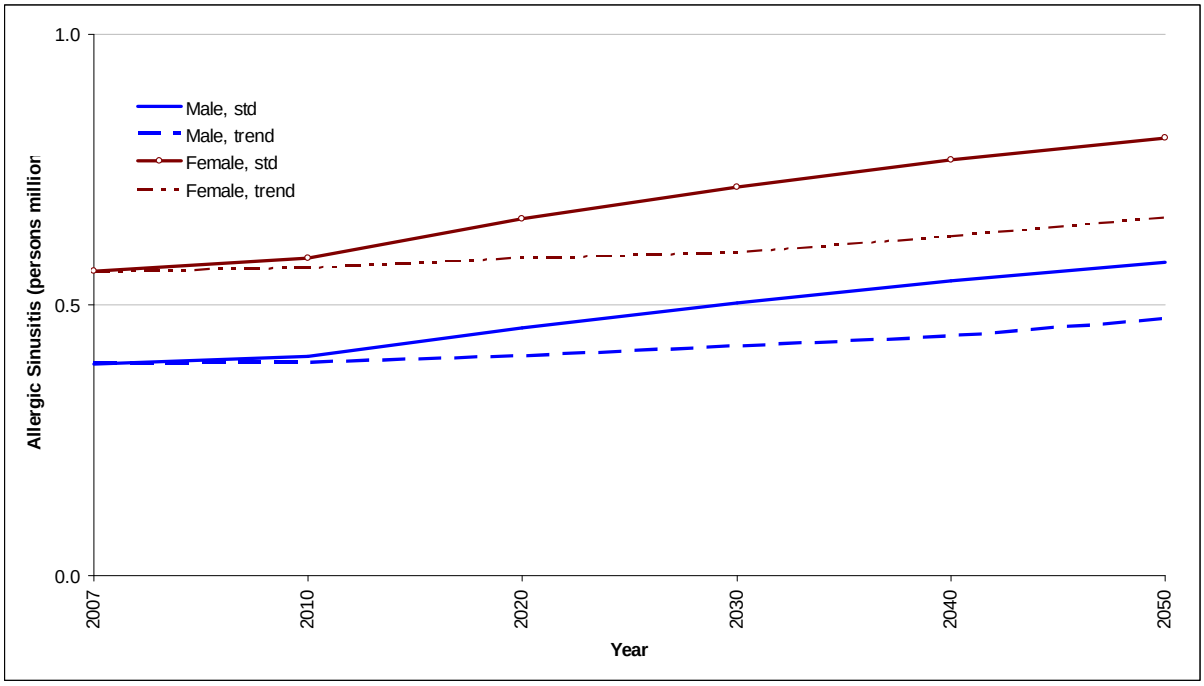
Allergic rhinitis is projected to grow at broadly similar rates for each gender from both demographic and trend effects (albeit slightly greater in both cases for females).

FIGURE 2-11: PREVALENCE TRENDS FOR ALLERGIC RHINITIS



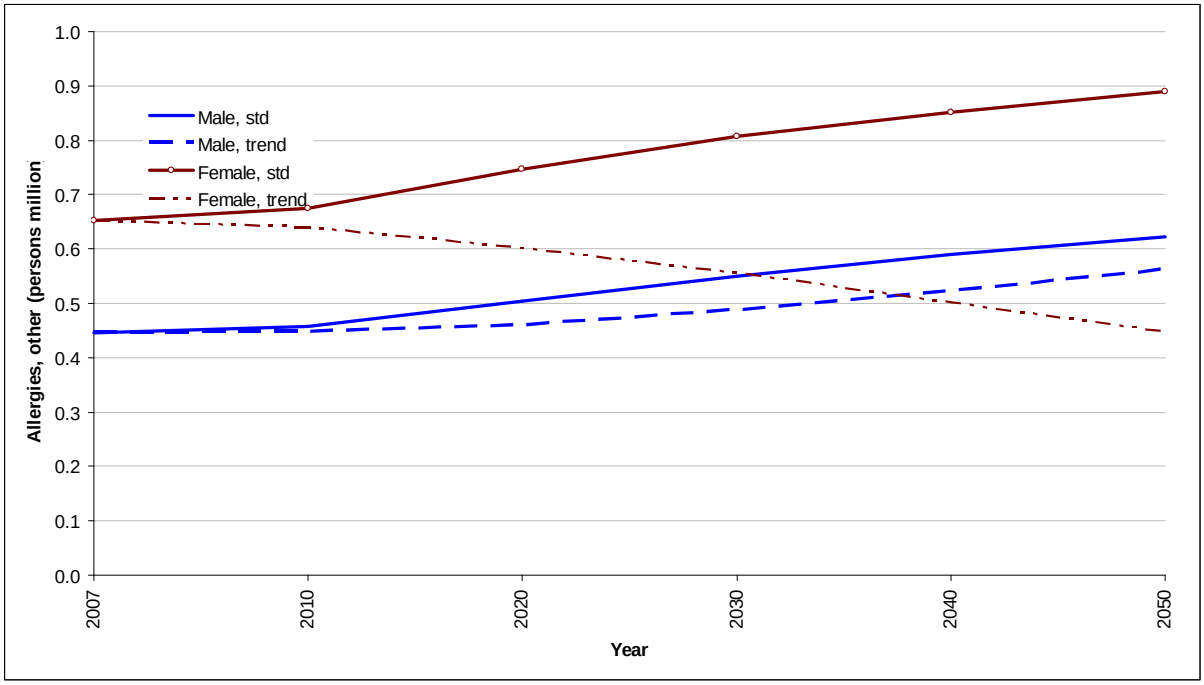
Allergic chronic sinusitis is also projected to have slower growth from trend rates than from demographic impacts alone. However, unlike asthma, total numbers for both genders are still projected to rise (Figure 2-12).

FIGURE 2-12: PREVALENCE TRENDS FOR ALLERGIC CHRONIC SINUSITIS



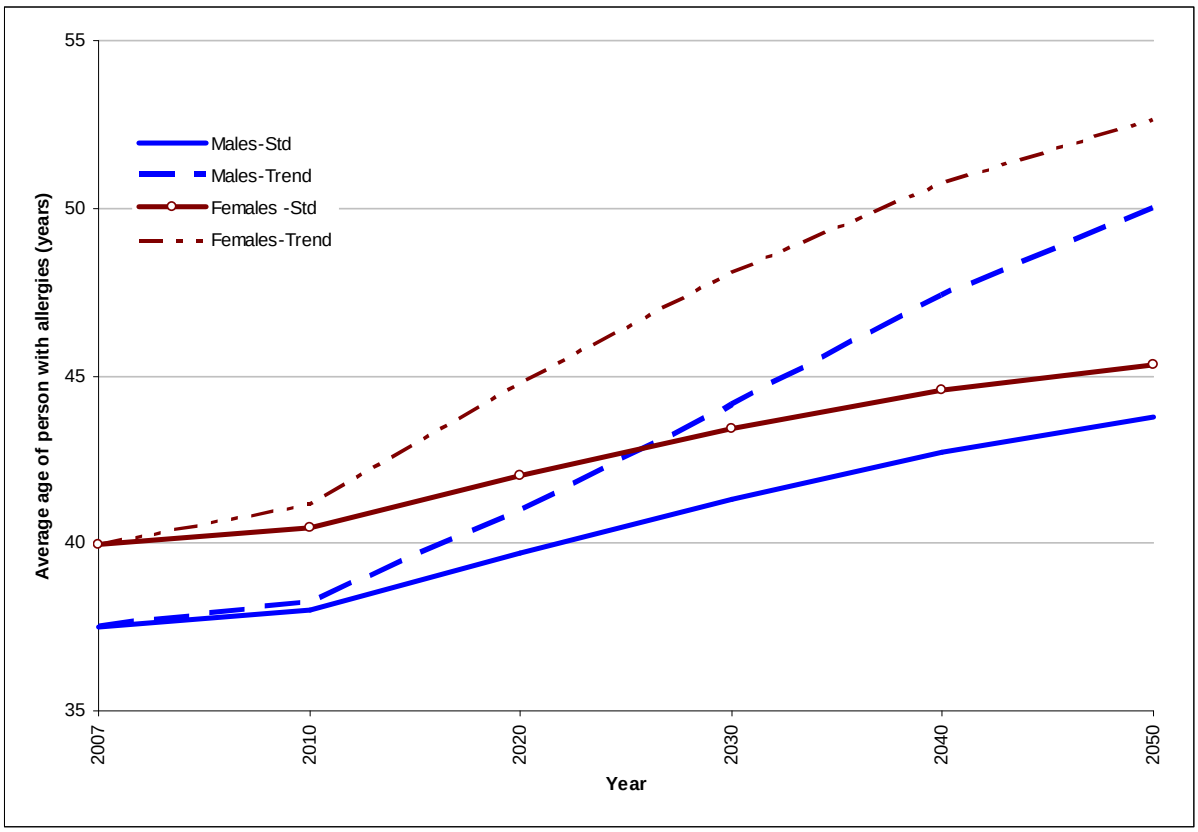
Prevalence rates for 'other allergies' among males are forecast to fall slightly in future years, also below population growth. However, prevalence rates for females are forecast to fall rapidly. Indeed, numbers of females are projected not only to fall below current numbers, but also below the number of males.

FIGURE 2-13: PREVALENCE TRENDS FOR OTHER ALLERGIES



Even if the frequency of allergic disorders remained static, the actual number of patients with allergic disorders will increase by 2050, simply based on demographic projections of the age and size of Australia's population. Frequency will, however, be influenced by time trends whereby some allergic disorders may become more common (such as allergic rhinitis and food allergy) and others less so (eg. "other allergy").

FIGURE 2-14: INCREASING AVERAGE AGE OF ALLERGY SUFFERERS



On simple population demographic projections, the numbers of all categories of allergy will increase in absolute terms by 2050. However, if current prevalence trends are to continue, the number of 'other allergies' would actually fall below current levels. Conversely, the number of people with allergic rhinitis would be over 70% higher than population growth and ageing alone would cause.

TABLE 2-6: PROJECTED ALLERGY PREVALENCE, 2007 TO 2050 (MILLION PERSONS)

Disease	2007	2050 no trend	2050 trend
Allergic asthma	1.80	2.47	1.79
Allergic rhinitis	3.34	4.54	7.86
Allergic sinusitis	0.95	1.39	1.14
Other allergies	1.10	1.51	1.01
Total	**4.08**	**5.62**	**7.68**

By 2050, if left solely to population movements, the prevalence rates of the total and most individual allergic diseases would actually fall slightly (to 19.1% of the population). However, again allowing for current trends to continue, a significant increase in allergic rhinitis prevalence, as well as some other allergies such as food allergy, will cause total allergy prevalence rates to be a third higher than they are today.

TABLE 2-7: PROJECTED ALLERGY PREVALANCE RATES, 2007 TO 2050 (% POPULATION)

Disease	2007	2050 no trend	2050 trend
Allergic Asthma	8.7%	8.4%	6.1%
Allergic Rhinitis	16.1%	15.4%	26.7%
Allergic Sinusitis	4.6%	4.7%	3.9%
Other Allergies	5.3%	5.1%	3.4%
Total	**19.6%**	**19.1%**	**26.1%**

3. HEALTH SYSTEM EXPENDITURE

Direct financial costs to the Australian health system comprise the costs of running hospitals and nursing homes (buildings, care, consumables), GP and specialist services reimbursed through Medicare and private funds, the cost of prescribed and over-the-counter pharmaceuticals (Pharmaceutical Benefits Scheme and private), allied health services, research and 'other' direct costs (such as health administration).

There are essentially two ways of estimating each element of cost for each group:

1 **top-down:** data may be able to provide the total costs of a program element and then allocate those costs by disease eg, health system expenditure by disease as estimated by the AIHW, for which asthma (but not non-asthma allergies) is a component; or

2 **bottom-up:** data may be available for the number of people with a disease who experience a cost impact from the disease ('n') and the average cost impact. The product is the total cost eg, the number of emergency department visits to treat food allergy in a year multiplied by the average cost of an ED visit.[18]

It is generally more desirable to use top-down national datasets in order to derive national cost estimates for large and well-studied diseases such as asthma, rather than extrapolate bottom-up data from smaller partial datasets. However, using top-down estimates can be problematic in some areas where data are limited (eg, health costs for non-asthma allergies). In these cases, to obtain parameters for implementing the bottom-up approach, statistical analysis of datasets and a literature review (focussing on Australian literature but sometimes supplemented by international material) has been used.

Available Australian data on diseases and injuries and their associated costs are subject to considerable uncertainties, with a number of these detailed below.

- **Surveys**:
  - lack of consensus about definitions;
  - variations in survey methodology eg, clinic or population focused;
  - gaps and consistency in data collections eg, different timeframes;
  - reluctance to report disease;
  - limited population size and representativeness of the sample; and
  - survey limitations eg, the wording of questions may affect the answers given.
- **Costs**:
  - patchy administrative information on what proportion of costs are attributable to different types of diseases;
  - focus on other aspects of diseases (such as treatment outcomes), rather than on costs;

[18] The bottom-up approach is also used to estimate some indirect cost items such as productivity losses from absenteeism, where the average wage rate is multiplied by the average number of days off due to allergies for the number of people to whom this applies. The top-down approach can often be used for program payments such as Centrelink payments or community programs such as palliative care, which are allocable by disease (although in the case of allergies palliative care expenditure is not required).

- comorbidities: there may be another disease that is responsible for part (or all) of the costs (such as the presence of another chronic disease having a large impact on costs);
- two-way correlation or causation between variables eg, low socioeconomic status (SES) predisposing to illness and illness in turn also reducing income/SES;
- factor X: there may be another underlying cause of both a disease and the resulting cost, which makes them look like one is caused by the other (for example, cigarette smoking resulting in both asthma and greater medical visits).

These issues are addressed by controlling for other factors where possible, and conducting sensitivity analysis.

Section 2.1 developed a total prevalence all allergic conditions by taking account of attributable fractions and netting out comorbidities. This in turn was used to derive a single combined prevalence rate for all allergic conditions, which was then applied to changing demographic cohorts to project prevalence in future years. A similar approach is adopted in this chapter for health costs. Total health costs for both asthma and all other allergies are developed for 2005 (the last year for which both NHS epidemiological and hospital casemix data are available). This total is then divided by the combined all-allergies prevalence rate to find the average health expenditure per person with allergies. Demographic changes are then applied to this per capita rate to find total expenditure in 2007.

3.1 ASTHMA

Estimates for the direct health system costs of asthma were drawn from statistics collected by the AIHW for all allergy-related disorders, based on an extensive process developed in collaboration with the National Centre for Health Program Evaluation for the Disease Costs and Impact Study (DCIS). The approach measures health services utilisation and expenditure (private and public) for specific diseases and disease groups in Australia (based on ICD-10 categorisation2). The DCIS methodology has been gradually refined over the past decade to now estimate a range of direct health costs from hospital morbidity data, case mix data, BEACH data, the NHS and other sources. Health system costs were estimated by age, gender and type of cost (hospital inpatient, hospital outpatient, out-of-hospital medical services, other professional services, pharmaceuticals, and research).

However, the AIHW include only 87.5% of total recurrent health expenditure in their estimates of expenditure by disease and injury, referred to as 'allocated' health expenditure. The 'unallocated' remainder includes capital expenditures, expenditure on community health (excluding mental health), public health programs (except cancer screening), health administration and health aids and appliances. **Allowance has been made for the unallocated components of health system expenditure in the AIHW estimates.** Top down expenditure on asthma of $803 million from the AIHW is presented in Table 3-1 for the year 2000-01.

TABLE 3-1: HEALTH SYSTEM EXPENDITURE FOR ASTHMA, 2000-01

Category	$m	%
Admitted patients	*97.58*	
Non-admitted services	*72.21*	
Total Hospital	**169.79**	21.1%
Aged care homes	16.50	2.1%
Out-of-hospital medical services	109.74	13.7%
Other professional services	20.56	2.6%
Prescription pharmaceuticals	*296.04*	
Over-the-counter pharmaceuticals	*73.83*	
Total pharmaceuticals	**369.87**	46.0%
Research	6.05	0.8%
Non-allocated expenditure	98.9	12.5%
Total expenditure	**791.42**	**100%**

Source: AIHW (2005).

Assuming that both allergic and intrinsic asthma generate roughly the same health system costs, then for each of the 2.20 million asthmatics reported in the 2001 NHS, average health expenditure would have been $360 (2001 dollars). This cost is updated to current (2007) dollars by using an average annual health expenditure inflation rate of 3.7%, to $448.

Multiplying this by the estimated number of allergic asthmatics in 2007 (1.80 million) yields a **total health system expenditure for allergic asthma of $808.0 million in 2007** This total is then added to the total health system expenditure for other allergies (Section 3.2) to obtain a total expenditure for 2007.

3.2 NON-ASTHMA ALLERGIES (NAA)

For non-asthma allergies (NAA), health expenditure estimates had to be derived bottom up from BEACH data (AGPSCC, 2007) – *Allergies in General Practice: April 2000 to March 2006* – which surveyed 27,916 people who visited their GP with at least one allergy (not including asthma). A total of 27,916 surveyed visits with allergy over six years translates to an average of 4,653 GP visits for allergy per year in the survey. Given the total BEACH sample size was 101,993 visits in 2006 (for all conditions) and Australians made 95 million visits to their GP that year, applying the population to sample size relativity to surveyed NAA visits results in a total of 4.33 million NAA encounters per year. This means that each of the 5.39 million cases of NAA in 2007 would have resulted in 0.8 GP encounters per person per year. However, allergy sufferers seem to have more than their fair share of comorbidities, as the BEACH data indicates that for each allergy visit they also needed 0.75 other (non-allergy) problems dealt with (the average is around 0.3 other problems). Not surprisingly, two of the top three other complaints were asthma and upper respiratory problems. This means that effectively only 57% of the cost of each encounter can be booked against NAA.

All Medicare fees and AMA fees in the estimates below are current at time of drafting (October 2007).

3.2.1 GP COSTS

Standard GP consultation costs

While people with allergy often had non-allergy issues that they wanted treated at the same visit, almost none wanted treatment for more than one allergy in the same visit. Although the

same person may have two NAA conditions, to treat these conditions would usually require two visits by this person (reactions may occur at different times, for example – an insect sting and a sinusitis attack – so visits appear to only rarely be able to be combined). As the number of NAA problems treated was only 1.01 per encounter, costs per visit are treated as synonymous with costs per (allergy) case. Average costs per case are then multiplied by total cases in 2007 to derive total medical and pharmaceutical expenditure.

The BEACH report does not provide data on the length of consultations, but as the overwhelming majority of total Medicare claims are for Level B consultations (less than 20 minutes), this is assumed to be the case for allergies too. Taking into account bulk-billing rates and AMA recommended fees[19], the average cost per encounter is $38.06 (Table 3-2).

TABLE 3-2: NAA GP COSTS

GP Costs	Cost per encounter	Bulk billing rate (%)
Standard Consultation of 20 minutes (MBS item 23)	$32.10	77
Private fee	$58.00	23
Average cost	**$38.06**	

Source: Medical Benefits Schedule Online
http://www.health.gov.au/internet/mbsonline/publishing.nsf/Content/Medicare-Benefits-Schedule-MBS-1

The estimated 4.33 million GP encounters for NAA in 2007 cost $94.4 million (after allocating GP fees between NAA and other problems dealt with at the same encounter).

Longer consultation costs

The most common therapy category, after pharmaceuticals (next Section), reported by BEACH for GPs consulting people with NAA, was 'at least one other treatment', which refers to clinical and procedural treatments provided by the GP. In total there were 6,100 of these treatments (representing 22% of encounters). Four times out of five (81%), where the GP provided further treatment, this was clinical in the form of advice, education and counselling on matters such as the nature of the allergy, and the treatments and medications necessary to ameliorate it. Where GPs specify that they have provided 'at least one other (clinical) treatment', these are modelled as MBS Level C consultations, for which the recommended public and AMA fees are $60.95 and $106.00 respectively. Using the same bulk-billing rates as for general consultations, this yields an average fee of $71.31. However, as BEACH only provides point-in-time snapshots rather than patient histories, these encounters are modelled as being the same ones already costed in Table 3-2 above, so only the difference between a Level B and Level C consultation ($33.25) is used in these cases.

It is estimated that, **of the 4.33 million GP encounters, 768,746 were longer (Level C) consultations** to deal with more complicated NAA cases. To account for other conditions managed at the same encounter, as with short consultations only 57% of the cost of these has been attributed to NAA. Since the cost of the short consultation (Level B) has already been included, these **long consultations add a further $14.6 million towards the total GP cost of NAA.**

[19] All bulk-billing percentages are from Medicare Online Statistics for the last quarter covered by the BEACH report (March 2006) - http://www.health.gov.au/internet/wcms/publishing.nsf/Content/medstat-mar06-tables-b.

Procedures provided by GPs

There were also 1,148 procedural treatments provided by GPs (4.1% of all NAA encounters). The five most common of these (listed below) accounted for 91% of procedural treatments given:

- sensitivity test;
- excision/removal tissue/biopsy/destruction/debridement/cauterisation;
- local injection/infiltration;
- dressing/pressure/compression/tamponade; and
- other therapeutic procedures/surgery not elsewhere classified.

The model uses a sensitivity test (MBS item 12000) - which appears to be the only allergy-specific treatment in the top five - as a cost proxy for these procedural treatments. The MBS fee for this service is $34.00 and the AMA fee $75.00, which on a bulk-billing rate of 77% yields an average fee of $43.74.

In total, there were an estimated **178,215 procedural treatments supplied by GPs for people with NAA as their main condition**. As with all other GP encounters, 43% of the fees for these services are allocated to non-NAA complaints, leaving a total **cost of $4.6 million for NAA GP procedures**. This brings the **total GP costs to $113.5 million in 2007**.

3.2.2 PHARMACEUTICAL COSTS

The most common action taken by GPs to treat NAA is to give medication. In fact there were more medication treatments than there were encounters in the BEACH sample. Including over-the-counter, GP-supplied and prescriptions, the 27,916 encounters resulted in 31,332 medication treatments. Of those patients given prescriptions, 24% were for more than one medicine. Based on the top ten categories of medication (which account for the majority of all scripts), the average cost of medicines (if prescribed) was $12.22 (Table 3-3).

TABLE 3-3: NAA PHARMACEUTICAL COSTS

Generic category	%	Pharmacy direct prices	Most common branded medicine
Betamethasone topical	9.6%	$6.99	Diprosone cream/ointment 0.5 mg
Mometasone	8.2%	$9.95	Elocon cream/ointment/lotion
Hydrocortisone topical	6.3%	$5.95	Egocort cream
Budesonide topical nasal	6.3%	$31.95	Rhinocort nasal spray 100 mcg
Amoxycillin/potass.clavulanate	5.0%	$16.95	Augmentin duo forte tablets 875 mg
Amoxycillin	4.7%	$9.95	Amoxil capsules 500 mg
Loratadine	4.0%	$9.95	Claratyne tablets 10 mg
Methylprednisolone aceponate	4.0%	$8.95	Advantan cream 1 mg 7
Triamcinolone topical	3.5%	$9.65	Aristocort cream/ointment
Roxithromycin	3.4%	$12.95	Rulide tablets 300 mg
Total	**55.0%**	**$12.22**	**Weighted average**

Source: AGPSCC (2007) and Pharmacy Direct – www.pharmacydirect.com.au, accessed 28 September 2007.

An estimated **4.86 million medications were prescribed for NAA in 2007, directly supplied or recommended (OTC), at a total cost of $59.4 million**.

These estimates may be conservative as they may understate the extent of pharmaceuticals used by people with NAA who self-medicate with across the counter antihistamines and nasal steroid sprays and low dose topical cortisone creams and those paying retail prices greater than discount prices quoted above. Self-prescribed asthma puffers, however, would be counted in the pharmaceutical cost of asthma.

- Private correspondence with Synovate-Aztec (a market research firm) indicates that Australians annually purchase around $125 million worth of OTC antihistamines and intranasal corticosteroids for allergy treatment. BEACH data does not separately identify OTC medicines that GPs recommend patients purchase. However, prescribed (as opposed to GP supplied or OTC) medications accounted for 77% of the total number of scripts. Assuming OTC and GP-supplied medications had equal shares of the remainder, and that OTC medications had the same average cost as all medications from costs above ($12.22) indicates that only some $6.8 million of OTC medications are purchased as a result of GP recommendations. Thus, including this marketing data would increase total medication costs by $118 million (or, averaged across all 4.1 million allergy sufferers, an extra $29 per person per year). However, due to data uncertainties, and erring on the side of caution, these costs have not been included in the model.

3.2.3 PATHOLOGY COSTS

The BEACH data show a total of 1,556 pathology tests ordered by GPs (5.6% of encounters) for NAA. The top four categories of MBS pathology groups accounted for 95% of these tests (Table 3-4), with blood allergy testing (RAST, ImmunoCap) being a common order of GPs. Proxy items have been chosen for each category according to either specificity to allergies, or else their overall frequency according to general Medicare statistics. Using a standard pathology bulk-billing rate of 86.3%, where a GP orders a pathology test for a patient, the average cost is estimated as $20.04.

TABLE 3-4: NAA PATHOLOGY COSTS

Category	Percent	Typical MBS#	MBS fee	Private fee	Average fee	Description
Chemistry	29%	66500	$9.75	$18.60	$10.96	Quantitation in serum, plasma, urine or other body fluid (except amniotic fluid), by any method except reagent tablet or reagent – 1 test
Immunology	25%	71075	$23.40	$52.00	$27.32	Quantitation of immunoglobulin E (total), 1 test
Haematology	22%	65070	$17.20	$32.50	$19.30	Erythrocyte, haematocrit, or haemoglobin count, calculation of red cell index, platelet or leucocyte count and manual or instrument generated differential count
Microbiology	19%	69303	$22.15	$42.00	$24.87	Culture or microscopy to detect pathogenic micro-organisms from nasal, throat, eye or ear swabs
Total	**95%**				**$20.04**	

Source: MBS Online and AGPSCC (2007).

Some **241,553 pathology tests were ordered by GPs** in relation to NAA in 2007, at an **estimated total cost of $4.84 million**.

3.2.4 SPECIALIST COSTS

GPs referred patients to specialists in 1,275 cases (4.6% of encounters)[20]. The majority of these referrals were to organ-specialists, with only 21% of patients being referred to allergists. For costing purposes, most specialist referrals are assumed to be MBS item 104 (Specialist Consultation) for which the MBS fee is $75.60, the AMA fee is $132.00, and the bulk-billing rate is 25.5%, yielding an average fee of $117.62.[21] However, allergists, immunologists[22] and respiratory physicians are assumed to use MBS item 110[23] (extended consultation), for which the MBS fee is $133.35 and the AMA fee $240.00, making an average of $212.80. This brings the total average specialist fee to $141.93, and the total cost to $28.1 million in 2007.[24]

TABLE 3-5: NAA SPECIALIST REFERRALS BY TYPE

		%	Fee
dermatologist	455	37%	$117.62
ENT	348	28%	$117.62
allergist	263	21%	$212.80
ophthalmologist	60	5%	$117.62
immunologist	48	4%	$212.80
paediatrician	37	3%	$117.62
respiratory physician	7	1%	$212.80
other specialist	27	2%	$117.62
	1245	**100%**	**$141.93**

Source: AGPSCC (2007).

GPs referred 197,930 of their patients to specialists in 2007 to provide advanced allergy treatment, at **a cost of $28.1 million**.

3.2.5 IMAGING COSTS

Finally, GP ordered an imaging test for 1.5% of their allergy patients (424 encounters). The top five imaging services (Table 3-6) accounted for over 90% of all imaging services. Using a bulk-billing rate of 60.2%, the average cost of such imaging services was $252.92.

[20] Referrals to allied health services, emergency departments and 'other' were also made in a 0.25% of encounters.

[21] Fees are higher for these three classes as advised by ASCIA, bulk billing rates are the same. Adding in the MBS 110 increases the average specialist fee to $141.93 (from $117.62) and total specialist expenditure to $28.1m from $23.3m.

[22] While allergist and immunologist can be considered synonymous terms, they are reported separately in BEACH data.

[23] Consultant physicians, as a class, have significantly longer appointments than other specialists.

[24] The costs quoted in the table may be an underestimate, as allergy skin prick testing, patch testing and measurements of lung function are used by several specialities as well as some GP's and pathology laboratories, which would result in higher Medicare-related and private (out of pocket) costs.

TABLE 3-6: ESTIMATED NAA IMAGING COSTS

Type	%	MBS Item	MBS Fee	AMA Fee	Average Fee
CT Sinus /facial bones	59.4%	56022	$225.00	$520.00	$342.41
X-ray Sinus	23.3%	57903	$47.30	$120.00	$76.23
X-ray Chest	5.7%	58500	$35.35	$90.00	$57.10
CT Brain	2.8%	56001	$195.05	$450.00	$296.52
X-ray Facial bones	1.2%	57912	$47.15	$120.00	$76.14
Total	**92.5%**				**$252.92**

Source: AGPSCC (2007) and MBS Online.

A total of **65,822 diagnostic imaging services were requested by GPs in 2007** in support of their patients with NAA, at a **cost of $16.6 million**. This estimate is conservative, as BEACH data do not include imaging services ordered by specialists.)

3.2.6 HOSPITAL INPATIENT COSTS

The National Hospital Cost Data Collection[25] provides top-down data for the treatment of 'Allergic Reactions' (AR-DRG X61Z) in 2005[26]. The average cost per separation was $1,235 with almost half of this (46.5%) being for emergency and critical care (Table 3-7). Data from 2005 do not include private hospitals, although 2003 data show that average private hospital costs were 19% lower than their public counterparts, yielding a cost per private separation of $1,002. In 2005 there were 4,405 separations (92% of which were in public hospitals) for a total cost of $5.36 million. Assuming that admissions for allergic reactions rises in line with the general population, **in 2007 there would have been 4,532 separations**, which in current prices (using health inflation of 3.7%) brings the **inpatient cost to $5.9 million**.

[25] http://www.health.gov.au/internet/wcms/publishing.nsf/Content/88F4E78E15620A80CA2571CB0004DDAA

[26] X61Z includes anaphylactic shock due to food, anaphylactic shock due to drugs, other serum reactions, angioneurotic oedema, and "unspecified allergies"

TABLE 3-7: COST PER SEPARATION FOR 'ALLERGIC REACTIONS', PUBLIC HOSPITALS, 2005

Category	Direct	Overhead	Total	%
Emergency Depts	$323	$92	$415	33.6%
Ward Nursing	$139	$34	$173	14.0%
Critical Care	$122	$37	$159	12.9%
Ward Medical	$112	$14	$126	10.2%
On-costs		$63	$63	5.1%
Hotel		$56	$56	4.5%
Non clinical salaries		$45	$45	3.6%
Supplies	$19	$25	$44	3.6%
Pathology	$34	$8	$42	3.4%
Pharmacy	$37	$5	$42	3.4%
Depreciation		$26	$26	2.1%
Imaging	$19	$3	$22	1.8%
Allied	$12	$3	$15	1.2%
Operating Rooms	$4	$1	$5	0.4%
Specialist Procedure Suites	$1	$0	$1	0.1%
Prosthetics		$1	$1	0.1%
Total	**$822**	**$412**	**$1,235**	**100%**

While the National Hospital Data Collection does not provide specific cost estimates for other allergic conditions, approximations can be used. Hence for allergic respiratory conditions, this report uses DRG E02C "Other respiratory procedures (without complications); and for allergic skin conditions, the DRG J67A "Minor skin disorders".[27]

The AIHW records that in 2004-05, there were 2,525 hospitalisations for skin allergies (see Table 3-8). Allowing for growth in line with population indicates 2,598 separations in 2007. The average cost in public hospitals (81% of separations) was $3,194 per separation in 2004-05. Assuming private hospitals are 19% cheaper, the average price was $2,592. Allowing for health inflation brings the average cost per separation in 2007 to $3,311. **Multiplying this by the 2,598 separations in 2007 gives a total hospital cost of $8.60 million**.

TABLE 3-8: SKIN ALLERGY SEPARATIONS, 2004-05

ICD-10 Category	Number of separations
L50.0 Allergic urticaria	1,369
L20 Atopic dermatitis	956
L23 Allergic contact dermatitis	200
Total	**2,525**

Source: AIHW Hospital Morbidity Database http://www.aihw.gov.au/hospitals/inhm_datab.cfm.

Similarly, the AIHW records that there were 5,388 separations for allergic respiratory conditions in 2004-05 (see Table 3-9 below). Allowing for growth in population indicates 5,544 separations in 2007. The average cost in public hospitals (56% of hospitalisations) was $3,240, and private hospitals $2,624. Allowing for health inflation brings the average

[27] In 2004-05 the AIHW records that there were 88 hospitalisations for "allergic and dietetic gastroenteritis and colitis" and 35 hospitalisations for "acute atopic conjunctivitis". These have not been costed.

cost per separation in 2007 to $3,193. **Multiplying this by the 5,544 separations in 2007 gives a total hospital cost of $17.70 million**.

TABLE 3-9: ALLERGIC RESPIRATORY SEPARATIONS, 2004-05

ICD-10 Category	No.
Allergic Rhinitis	427
Allergic Sinusitis (=49.4% of chronic sinusitis)	4,961
Total Allergic Respiratory hospitalisations	**5,388**

Source: AIHW Hospital Morbidity Database http://www.aihw.gov.au/hospitals/inhm_datab.cfm.

There were a total of **12,674 hospital separations for (non-asthma) allergic conditions 2007,** at a **cost of $32.2 million**.

3.2.7 SUMMARY OF NAA COSTS, 2007

For health expenditure to be presented on the same basis as asthma costs, allowances are made for hospital outpatients (non-admitted), aged care homes, allied health, research and non-allocated health costs using similar proportions relative to the total as those for asthma (Table 3-10). Total health expenditure for NAA in 2007 was thus estimated as $349.3 million. Dividing this by the estimated 4.08 million people with allergies in 2007 yields health expenditure per person of $85.63 per annum[28].

TABLE 3-10: TOTAL HEALTH SYSTEM EXPENDITURE, NON-ASTHMA ALLERGIES, 2007

Category	$m	%
GP visit	$113.5	32.5%
Medication	$59.4	17.0%
Specialists	$28.1	8.0%
Pathology	$4.8	1.4%
Imaging	$16.6	4.8%
Hospital inpatients	$32.2	9.2%
Hospital outpatients	$31.9	9.1%
Aged care homes	$7.3	2.1%
Research	$2.7	0.8%
Allied health	$9.1	2.6%
Non-allocated health costs	$43.7	12.5%
TOTAL	**$349.3**	**100%**

[28] The individual cost burden varies widely, and falls more heavily on those with severe and chronic disease. Costs of antihistamines are approximately $24/month, nasal corticosteroids approximately $25/month, and the PBS patient contribution to a single asthma medication or eczema topical corticosteroid at around $33/month. It is therefore not difficult for a patient with chronic urticaria to spend $288/year, a patient with severe allergic rhinitis $588/year (on antihistamines and a nasal steroid, and even more if they need eyedrops as well), or a patient with allergic rhinitis, asthma and atopic eczema needing all medications approximately $984/year out of pocket. These costs are not subsidised by the PBS nor do they count towards the Medicare safety net.

3.3 TOTAL HEALTH SYSTEM EXPENDITURE BY BEARER

Adding the 2007 total expenditures for asthma ($808.0 million) and other allergies ($306.8 million) yields a total expenditure for that year of $1.16 billion. Dividing this by the number of persons with allergies (4.08 million) produces an annual expenditure per person of $283.71.

Based on the average distribution of who bears total health expenditure costs derived from AIHW (2007), the burden of this cost is apportioned as shown in Table 3-11. The largest shares are borne by the Federal Government (eg, Medicare and Pharmaceutical Benefits subsidies) and State Governments (eg, hospital costs).

TABLE 3-11: DISTRIBUTION OF ALLERGY HEALTH COSTS, 2007

Health Costs	$m	%
Individuals	$163.9	14.2%
Family/Friends	$37.5	3.2%
Federal Government	$496.5	42.9%
State Government	$288.2	24.9%
Society/Other	$171.3	14.8%
Total	**$1,157.4**	**100%**

4. OTHER FINANCIAL COSTS

In addition to health system costs, allergy also imposes a number of other important financial costs on society and the economy, including the following.

- **Productivity losses** of people with allergic disease comprise those from employment impacts, absenteeism and/or premature mortality.
- **Carer costs** comprise the value of care services provided in the community primarily by informal carers and not captured in health system costs.
- **Other costs** comprise the cost of aids, home modifications and other pertinent financial costs not captured elsewhere.
- **Transfer costs** comprise the DWL associated with government transfers such as taxation revenue foregone, welfare and disability payments.

It is important to make the economic distinction between real and transfer costs.

- **Real costs** use up real resources, such as capital or labour, or reduce the economy's overall capacity to produce goods and services.
- **Transfer payments** involve payments from one economic agent to another that do not use up real resources, for example, a disability support pension, or taxation revenue.

Data on other financial costs are drawn from a variety of sources – for example, the literature (focusing on Australian literature but sometimes supplemented by international material), data from the ABS Survey of Disability, Ageing and Carers (SDAC), ABS data on Average Weekly Earnings (AWE) and so on.

4.1 PRODUCTIVITY LOSSES

Productivity losses are the cost of production that is lost when people with allergy are unable to work because of the condition. They may work less than they otherwise would (either being employed less, being absent more often or being less productive while at work) or they may die prematurely. Access Economics adopts a human capital approach to measurement of productivity losses in developed countries.

4.1.1 EMPLOYMENT IMPACTS

Allergy can affect a person's ability to work. If employment rates are lower for people with allergy, this loss in productivity represents a real cost to the economy. Data for the reduction in employment due to allergy was sourced from the ABS SDAC, which reported the likelihood of being employed if persons experienced allergy (72.9%) compared with the likelihood of being employed if they were in the general population (73.9%). Therefore, people with allergy had an overall employment reduction of around 1%. This data was then combined with average weekly earnings (AWE) and employment rates for each respective age-gender group to calculate the lost earnings due to reduced employment.

> The annual cost of **lost earnings due to reduced employment is estimated at around $1.1 billion** in 2007.

4.1.2 ABSENTEEISM AND LOST HOUSEHOLD PRODUCTIVITY

Allergy can adversely affect work performance through absence from work due to the allergy ('absenteeism'). Absenteeism is measured by looking at the number of work days missed by people with allergy. Data for absenteeism were obtained from the ABS NHS, which reported that there were 3,209,200 people with allergy taking 1,083,200 days away per year due to their own illness[29]. This meant there were 0.34 days per person per year of absenteeism due to allergy. The same number of days is estimated to be lost, for those who do not work, from their household productivity, which is valued at 30% of the average wage rate.

Based on these parameters and the AWE for each age-gender group, Access Economics estimates that in 2007, **the total cost of absenteeism due to allergy is $196 million**. This includes around $166 million due to absenteeism for people in paid work and around $31 million in lost household productivity for those in unpaid work.

4.1.3 PRESENTEEISM

Allergy can also affect a person's ability to work effectively while at work ('presenteeism'). Presenteeism can be estimated by multiplying the number of days worked with allergy by the percentage reduction in effectiveness on days worked with allergy. For example, four days worked with allergy with a 50% decrease in work effectiveness would result in an estimate of two reduced effectiveness work days.

Lamb et al (2006), studying a broad cross section of 8,267 employees at 47 employer locations across the US between 2001 and 2002, found that employees who experienced allergic rhinitis did so for 52.5 days per year, and were unproductive for 2.3 hours per typical 8-hour work day while they were symptomatic. Given the lack of data and the relative similarities between the populations, these results have been applied to Australia. This allows us to isolate the days with lower productivity at 48.9 days per year and calculate a reduction of productivity of 3.9% per year for those with allergy. Using this proportion and the AWE for each age-gender group, the lost work effectiveness (or lost productivity) can then be calculated.

Access Economics estimates that in 2007, **the total cost of presenteeism due to allergy is $4.2 billion**.

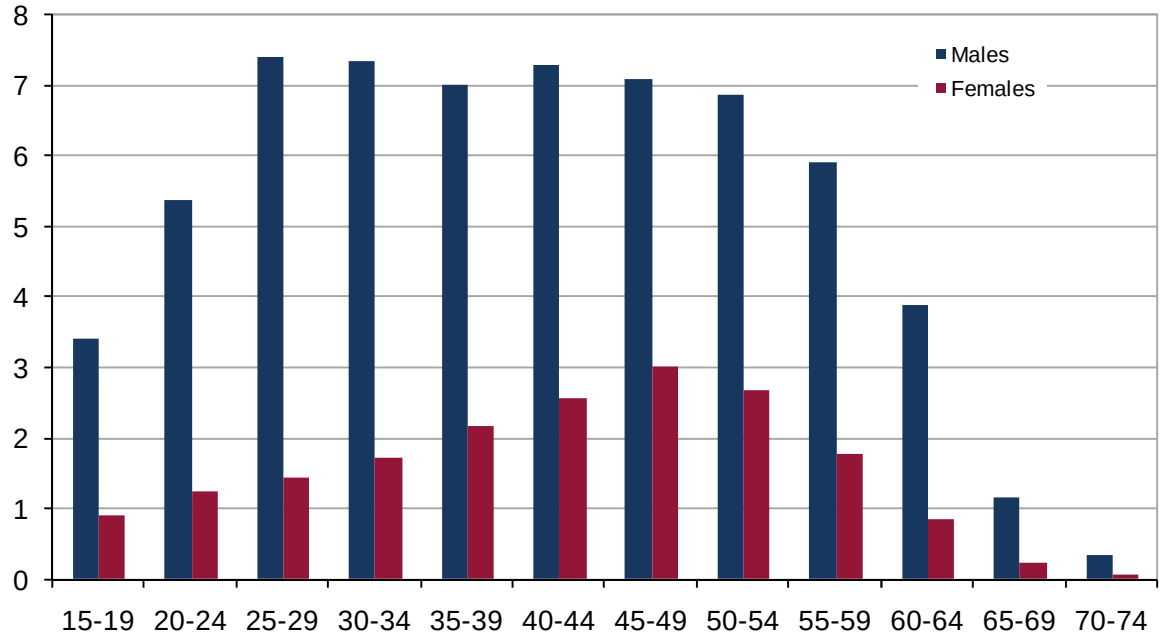
4.1.4 PREMATURE DEATH

Section 1.4 estimated 586 deaths due to allergy in 2007 (298 males and 289 females). Based on this case mortality risk, and incorporating employment rates and estimates of average lifetime earnings for different age groups, the present value of lost earnings due to mortality among those who would otherwise have been employed is shown in Figure 4-1.

[29] That is, as opposed to taking time off to care for someone else's illness

The estimated annual cost due to lost productivity from premature death due to allergy is $83.6 million in 2007.

FIGURE 4-1: ALLERGY, COSTS OF PREMATURE MORTALITY BY AGE AND GENDER ($ MILLION)



Source: Access Economics based a RR of mortality of 1.02 for allergy across all ages.

Premature death also leads to additional search and hiring costs for replacement workers. These are estimated as the number of people with allergy who die prematurely (by age and gender) multiplied by their chance of being employed multiplied by the search and hiring cost brought forward three years (the search and hiring cost is estimated as 26 weeks at AWE and the three year bring forward reflects average staff turnover rates in Australia).

In 2007, additional search and hiring costs are estimated as $118,172 for people with allergy, based on the present value of bringing forward three years of average cost of staff turnover (26 weeks at AWE).

4.1.5 LOST TAXATION REVENUE

Reduced earnings due to reduced workforce participation, absenteeism and premature death also have an effect on taxation revenue collected by the Government. As well as forgone income (personal) taxation, there will also be a fall in indirect (consumption) tax, as those with lower incomes spend less on the consumption of goods and services.

Personal income tax forgone is a product of the average personal income tax rate (18.3%) and the forgone income. With allergy and lower income, there will be less consumption of goods and services, with the indirect taxation rate estimated as 15.1%. These average taxation rates are derived for 2007 from the Access Economics macroeconomic model (AEM).

Around $1.9 billion in lost potential tax revenue is estimated to be incurred in 2007, due to the reduced productivity of people with allergy.

Lost taxation revenue is considered a transfer payment, rather than an economic cost per se. However, raising additional taxation revenues does impose real efficiency costs on the Australian economy, known as **deadweight losses (DWLs)**. Administration of the taxation system costs around 1.25% of revenue raised (derived from total amounts spent and revenue raised in 2000-01, relative to Commonwealth department running costs). Even larger DWLs arise from the distortionary impact of taxes on workers' work and consumption choices. These distortionary impacts are estimated to be 27.5% of each tax dollar collected (Lattimore, 1997 and used in Productivity Commission, 2003:6.15-6.16, with rationale). Altogether the DWL is 28.75% of the value of the taxation forgone (Section 4.5).

Access Economics estimates that around **$0.7 billion in deadweight loss is incurred in 2007**, due to the additional taxation required to replace that forgone due to lost productivity of people with allergy (Table 4-1).

TABLE 4-1: LOST EARNINGS AND TAXATION DUE TO ALLERGY, 2007

Average personal income tax rate*	18.3%
Potential personal income tax lost	$1.1 billion
Average indirect tax rate*	15.1%
Potential indirect tax lost	$0.8 billion
Total potential tax revenue lost	$1.9 billion
Deadweight loss from additional taxation	**$0.5 billion**

* Source: Access Economics macroeconomic model (2007).

Welfare payments made to people who are no longer working must, in a budget-neutral setting, also be funded by additional taxation. The DWLs associated with welfare transfers are calculated in Section 4.5, where the nature of DWLs is explained in more detail.

4.2 CARER COSTS

Carers are people who provide informal care to others in need of assistance or support. Most informal carers are family or friends of the person receiving care. Carers may take time off work to accompany people with allergy to medical appointments, stay with them in hospital, or care for them at home. Carers may also take time off work to undertake many of the unpaid tasks that the person with allergy would do if they did not have allergy and were able to do these tasks.

Data from the 2003 SDAC sourced specifically for this report identified around 81,500 primary carers who cared for people with allergy as their main condition.

However, it is important to avoid double counting the people with allergy who would have received care anyway. As such it is necessary to identify the 'excess' amount of care provided to people with allergy by calculating the usage rates of informal care for people with allergy (2.1% of people with allergies have a primary carer, where allergy is the main condition) and comparing them to informal care usage rates for the general Australian population (2.4% of the general population have a primary carer, with very little difference in the age-gender distribution of the respective populations). In summary, SDAC data show that the use of carers is neither significantly lower nor higher by age and gender than for the

general population. Hence, it was concluded that **no additional costs (attributable to allergy) were incurred due to the use of informal carers.**

- This is not to say that there are no additional costs imposed on people who care for people with allergies even where they would still have cared for them in the absence of the allergy. Parents, for example, may spend considerable time moisturising a child with severe atopic dermatitis, undertaking allergen avoidance measures, taking them to medical appointments, or in extra time required to shop or prepare special meals for a child with food allergy. However, in the absence of solid data, no attempt has been made to quantify these costs.

4.3 AIDS AND HOME MODIFICATIONS

People with allergies use aids such as dust mite covers, asthma medication spacers, asthma nebulisers, wet dressings for eczema, special vacuum cleaners, HEPA filters and allergen avoidance measures. However, in the absence of allergy-specific studies, cost estimates for aids and home modifications are derived from previously estimated average costs for all persons with disabilities.

Aids and home modifications are those not captured in formal health sector or disability services costs that include equipment and technology in order to assist with daily living. Estimates of aids and modifications costs are based on data from the ABS SDAC for people with allergy as their main condition. These data are then compared to utilisation rates of aids and modifications for the rest of the SDAC survey population to estimate the 'excess' aids and modifications used by people with allergy, relative to people without allergy.

Results from SDAC show that of those who reported allergy as their main condition:

- 66.9% used at least one type of self care aid compared to 48.3% without;
- 15.8% used mobility aids compared to 12.8% without; and
- 11.5% made modifications to their home compared to 10.9% without.

Costs for various products are based on prices provided by the Independent Living Centre NSW, the Victorian Aids and Equipment Program and previous studies undertaken by Access Economics, inflated to 2007 prices. While some equipment and modifications require large outlays but should last a number of years (eg, nebuliser machines), other devices need to be replaced more regularly (eg, plastic spacers crack in dishwashers)..

Overall, **the cost for aids and equipment for people with allergy was estimated at around $259.1 million in 2007** – or $64 per person with allergy.

As it is not known how much of this cost is subsidised by governments, paid for by the person with allergy or their family and friends, or paid for through community programs, the amount is allocated in four equal portions to the Federal Government, State and Territory governments, family and friends and society/other.

4.4 FUNERAL COSTS

The 'additional' cost of funerals borne by family and friends of people with allergy is based on the additional likelihood of death associated with allergy (Section 1.4) in the period that the person experiences it. However, some patients (particularly older patients) would have died during this time anyway. Eventually everyone must die and thus incur funeral expenses – so

the true cost is the cost brought forward (adjusted for the likelihood of dying anyway in a given year). The BTRE (2000) calculated a weighted average cost of a funeral across all States and Territories, to estimate an Australian total average cost of $3,200 per person for 1996, or **$4,154 per person who died in 2007**.

> The **bring forward of funeral costs** associated with premature death for people with allergy is estimated at around **$2.4 million in 2007.**

4.5 DEADWEIGHT LOSSES FROM TRANSFERS

4.5.1 WELFARE AND INCOME SUPPORT PAYMENTS

Transfer payments represent a shift of resources from one economic entity to another. The act of taxation and redistribution creates distortions and inefficiencies in the economy, so transfers also involve real net costs to the economy.

Data regarding the number of people on income support payments was sourced from Centrelink Australia, specially for this report. It was difficult to specifically identify individuals on income support due to allergy as this condition is not separately isolated in the Centrelink data. Instead, data from available allergy-related conditions such as asthma and eczema were used and combined with allergy-related attributable fractions to conservatively estimate the number of income support recipients due to allergy. The most commonly received Centrelink work related benefit was the Disability Support Pension (DSP), which Access Economics conservatively estimates 5,726 people living with allergy were receiving due to their allergies in June 2007. There were also an estimated 1,962 people with allergy receiving Newstart Allowance (NA) and 37 people receiving Sickness Allowance (SA), due to their allergies.

The value of these payments in 2007 is estimated to be around $89 million[30]. However, some of these people would have ordinarily received welfare payments which must be netted out to estimate the additional welfare payments due to allergy, using a Melbourne University study (Tseng and Wilkins, 2002) about the 'reliance' of the general population (aged 15-64 years) on income support of around 12%. Factoring down the $89 million by this 12% gives a **cost of welfare reliance on DSP, NA and SA due to allergy of around $78 million per annum in 2007**.

4.5.2 DEADWEIGHT LOSSES

The welfare payments calculated immediately above are, like taxation revenue losses, not themselves economic costs but, rather, a financial transfer from taxpayers to the income support recipients. The real resource cost of these transfer payments is only the associated DWL.

DWLs refer to the costs of administering welfare pensions and raising additional taxation revenues. Although invalid and sickness benefits and forgone taxation are transfers, not real costs (so should not be included in the estimation of total costs) it is still worthwhile

[30] Based on a payment of $446.60 per fortnight for DSP; and $429.80 for NSA and SA.

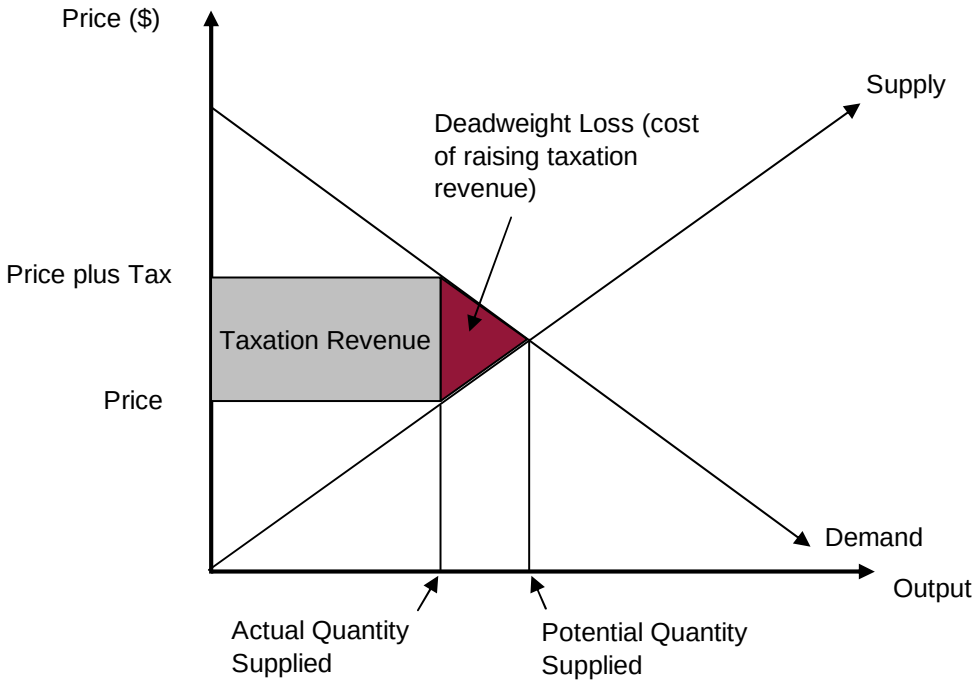
estimating them as that helps us understand how the total costs of allergy are shared between the taxpayer, the individual and other financiers.

There are two sources of lost tax revenue that result from the lower earnings – the potential income tax forgone and the potential indirect (consumption) tax forgone. The latter is lost because, as income falls, so does consumption of goods and services. The average personal income tax rate used is 18.3% and the average indirect taxation rate used is 15.1%, based on parameters for 2007 from the Access Economics macroeconomic model.

Transfer payments (Government payments/services and taxes) are not a net cost to society as they represent a shift of consumption power from one group of individuals to another in society. If the act of taxation did not create distortions and inefficiencies in the economy, then transfers could be made without a net cost to society. However, through these distortions, taxation does impose a DWL on the economy.

DWL is the loss of consumer and producer surplus, as a result of the imposition of a distortion to the equilibrium (society preferred) level of output and prices. Taxes alter the price and quantity of goods sold compared to what they would be if the market were not distorted, and thus lead to some diminution in the value of trade between buyers and sellers that would otherwise be enjoyed (Figure 4-5).

FIGURE 4-2: DWL OF TAXATION



The rate of DWL used in this report is 27.5 cents per $1 of tax revenue raised plus 1.25 cents per $1 of tax revenue raised for Australian Taxation Office administration, based on Productivity Commission (2003) in turn derived from Lattimore (1997), ie, 28.75% overall. The total extra tax dollars required to be collected include:

- the taxation revenue lost as a result of allergy and its impacts (with $0.5 billion of DWL in the case of allergy);
- the value of government services provided (including the Government-funded component of health system costs, with $0.2 billion of DWL); and

- the additional induced social welfare payments required to be paid (with $22 million of DWL).

Thus the DWL for people with allergy in 2007 is estimated at around $0.8 billion.

4.6 SUMMARY OF OTHER FINANCIAL COSTS

In total, **the non-health related financial costs of allergy pain are estimated to be around $6.6 billion in 2007**.

TABLE 4-2: SUMMARY OF OTHER FINANCIAL COSTS OF ALLERGY, 2007

	$ million
Productivity costs	**5,598.1**
Lower productivity	4,192.9
Absenteeism	195.9
Lower employment	1,125.5
Premature death	83.6
Search and hiring costs	0.1
Carer costs	**0.0**
Aids and modifications	**259.1**
Funeral costs	**2.4**
Deadweight loss	**782.7**
Total other financial costs	**6,642.3**

5. BURDEN OF DISEASE

The disability, loss of wellbeing and premature death that result from allergic disease are more difficult to measure, but have been analysed in this chapter in terms of the years of healthy life lost, both quantitatively and qualitatively, known as the 'burden of disease', with an imputed value of a statistical life year (VSLY) so as to compare these costs with financial costs of allergy.

5.1 METHODOLOGY – VALUING LIFE AND HEALTH

Since Schelling's (1968) discussion of the economics of life saving, the economic literature has properly focused on **willingness to pay** (willingness to accept) measures of mortality and morbidity risk. Using evidence of market trade-offs between risk and money, including numerous labour market and other studies (such as installing smoke detectors, wearing seatbelts or bike helmets etc), economists have developed estimates of the **Value of a 'Statistical' Life (VSL).**

> The willingness to pay approach estimates the value of life in terms of the amounts that individuals are prepared to pay to reduce risks to their lives. It uses stated or revealed preferences to ascertain the value people place on reducing risk to life and reflects the value of intangible elements such as quality of life, health and leisure. While it overcomes the theoretical difficulties of the human capital approach, it involves more empirical difficulties in measurement (BTE, 2000:20-21).

Viscusi and Aldy (2002) summarise the extensive literature in this field, most of which has used econometric analysis to value mortality risk and the 'hedonic wage' by estimating compensating differentials for on-the-job risk exposure in labour markets, in other words, determining what dollar amount would be accepted by an individual to induce him/her to increase the possibility of death or morbidity by a given percentage. They find the VSL ranges between US$4 million and US$9 million with a median of US$7 million (in year 2000 US dollars), similar but marginally higher than the VSL derived from US product and housing markets, and also marginally higher than non-US studies, although all in the same order of magnitude. They also review a parallel literature on the implicit value of the risk of non-fatal injuries.

> A particular life may be regarded as priceless, yet relatively low implicit values may be assigned to life because of the distinction between identified and anonymous (or 'statistical') lives. When a 'value of life' estimate is derived, it is not any particular person's life that is valued, but that of an unknown or statistical individual (Bureau of Transport and Regional Economics, 2002:19).

Weaknesses in this approach, as with human capital, are that there can be substantial variation between individuals. Extraneous influences in labour markets such as imperfect information, income/wealth or power asymmetries can cause difficulty in correctly perceiving the risk or in negotiating an acceptably higher wage.

Viscusi and Aldy (2002) include some Australian studies in their meta-analysis, notably Kniesner and Leeth (1991) of the ABS with VSL of US2000 $4.2 million and Miller et al (1997) of the National Occupational Health and Safety Commission (NOHSC) with quite a

high VSL of US2000$11.3m-19.1 million (Viscusi and Aldy, 2002, Table 4, pp92-93). Since there are relatively few Australian studies, there is also the issue of converting foreign (US) data to Australian dollars using either exchange rates or purchasing power parity and choosing a period.

Access Economics (2003) presents outcomes of studies from Yale University (Nordhaus, 1999) – where VSL is estimated as $US2.66m; University of Chicago (Murphy and Topel, 1999) – US$5m; Cutler and Richardson (1998) – who model a common range from US$3m to US$7m, noting a literature range of $US0.6m to $US13.5m per fatality prevented (1998 US dollars). These eminent researchers apply discount rates of 0% and 3% (favouring 3%) to the common range to derive an equivalent of $US 75,000 to $US 150,000 for a year of life gained.

5.1.1 Disability Adjusted Life Years (DALYs) and Quality Adjusted Life Years (QALYs)

In an attempt to overcome some of the issues in relation to placing a dollar value on a human life, in the last decade an alternative approach to valuing human life has been derived. The approach is non-financial, where allergy, suffering and premature mortality are measured in terms of DALYs, with 0 representing a year of perfect health and 1 representing death (the converse of a QALY where 1 represents perfect health). This approach was developed by the World Health Organization, the World Bank and Harvard University and provides a comprehensive assessment of mortality and disability from diseases, injuries and risk factors in 1990, projected to 2020 (Murray and Lopez, 1996). Methods and data sources are detailed further in Murray et al (2001).

The DALY approach has been adopted and applied in Australia by the AIHW with a separate comprehensive application in Victoria. Mathers et al (1999) from the AIHW estimate the BoD and injury in 1996, including separate identification of premature mortality; Years of Life Lost due to Premature Mortality (YLL), and morbidity; Years of Healthy Life Lost due to Disability (YLD) components. In any year, the disability weight of a disease (for example, 0.18 for a broken wrist) reflects a relative health state. In this example, 0.18 would represent losing 18% of a year of healthy life because of the inflicted injury.

The DALY approach has been successful in avoiding the subjectivity of individual valuation and is capable of overcoming the problem of comparability between individuals and between nations, although nations have subsequently adopted variations in weighting systems. For example, in some countries DALYs are age-weighted for older people although in Australia the minority approach is adopted – valuing a DALY equally for people of all ages.

The main problem with the DALY approach is that it is not financial and is thus not directly comparable with most other cost measures. In public policy making, therefore, there is always the temptation to re-apply a financial measure conversion to ascertain the cost of an injury or fatality or the value of a preventive health intervention. Such financial conversions tend to utilise 'willingness to pay' or risk-based labour market studies described above.

The Department of Health and Ageing (based on work by Applied Economics) adopted a very conservative approach to this issue, placing the value of a human life year at around A$60,000 per annum, which is lower than most international lower bounds on the estimate.

> *"In order to convert DALYs into economic benefits, a dollar value per DALY is required. In this study, we follow the standard approach in the economics literature and derive the value of a healthy year from the value of life. For*

example, if the estimated value of life is A$2 million, the average loss of healthy life is 40 years, and the discount rate is 5% per annum, the value of a healthy year would be $118,000.[31] Tolley, Kenkel and Fabian (1994) review the literature on valuing life and life years and conclude that a range of US$70,000 to US$175,000 per life year is reasonable. In a major study of the value of health of the US population, Cutler and Richardson (1997) adopt an average value of US$100,000 in 1990 dollars for a healthy year.

Although there is an extensive international literature on the value of life (Viscusi, 1993), there is little Australian research on this subject. As the Bureau of Transport Economics (BTE) (in BTE, 2000) notes, international research using willingness to pay values usually places the value of life at somewhere between A$1.8 and A$4.3 million. On the other hand, values of life that reflect the present value of output lost (the human capital approach) are usually under $1 million.

The BTE (2000) adopts estimates of $1 million to $1.4 million per fatality, reflecting a 7% and 4% discount rate respectively. The higher figure of $1.4 million is made up of loss of workforce productivity of $540,000, loss of household productivity of $500,000 and loss of quality of life of $319,000. This is an unusual approach that combines human capital and willingness to pay concepts and adds household output to workforce output.

For this study, a value of $1 million and an equivalent value of $60,000 for a healthy year are assumed.[32] In other words, the cost of a DALY is $60,000. This represents a conservative valuation of the estimated willingness to pay values for human life that are used most often in similar studies.[33]" (DoHA, 2003, pp11-12)."

As the citation concludes, the estimate of $60,000 per DALY is very low. The Viscusi (1993) meta-analysis referred to reviewed 24 studies with values of a human life ranging between $US 0.5 million and $US 16m, all in pre-1993 US dollars. Even the lowest of these converted to 2003 Australian dollars at current exchange rates, exceeds the estimate adopted ($1m) by nearly 25%. The BTE study tends to disregard the literature at the higher end and also adopts a range (A$1-$1.4m) below the lower bound of the international range that it identifies (A$1.8-$4.3m).

The rationale for adopting these very low estimates is not provided explicitly. Certainly it is in the interests of fiscal restraint to present as low an estimate as possible.

In contrast, the majority of the literature as detailed above appears to support a higher estimate for VSL, as presented in Table 5-1, which Access Economics believes is important to consider in disease costing applications and decisions. The US dollar values of the lower bound, midrange and upper bound are shown. The 'average' estimate is the average of the range excluding the high NOHSC outlier. Equal weightings are used for each study as the:

- Viscusi and Aldy meta-analysis summarises 60 recent studies;

[31] *In round numbers, $2,000,000 = $118,000/1.05 + $118,000/(1.05)^2 + … + $118,000/(1.05).*[40] [Access Economics comment: The actual value should be $116,556, not $118,000 even in round numbers.]

[32] The equivalent value of $60,000 assumes, in broad terms, 40 years of lost life and a discount rate of 5%. [Access Economics comment: More accurately the figure should be $58,278.]

[33] In addition to the cited references in the text, see for example Murphy and Topel's study (1999) on the economic value of medical research. [Access Economics comment. Identical reference to our Murphy and Topel (1999).]

- ABS study is Australian; and
- Yale and Harvard studies are based on the conclusions of eminent researchers in the field after conducting literature analysis.

Where there is no low or high US dollar estimate for a study, the midrange estimate is used to calculate the average. The midrange estimates are converted to Australian dollars at purchasing power parity (as this is less volatile than exchange rates) of USD=0.7281AUD for 2003 as estimated by the OECD.

Access Economics concludes the VSL range in Australia lies between $3.7m and $9.6m[34], with a mid-range estimate of $6.5m. These estimates have conservatively not been inflated to 2007 prices, given the uncertainty levels.

TABLE 5-1: INTERNATIONAL ESTIMATES OF VSL, VARIOUS YEARS

	US$m			A$m
	Lower	Midrange	Upper	0.7281
Viscusi and Aldy meta-analysis 2002	4	7	9	**9.6**
Australian: ABS 1991		4.2		5.8
NOHSC 1997	11.3		19.1	
Yale (Nordhaus) 1999		2.66		**3.7**
Harvard (Cutler and Richardson) 1998	0.6	5	13.7	6.9
Average*	2.9	**4.7**	7.4	**6.5**

* Average of range excluding high NOHSC outlier, using midrange if no data; conservatively not inflated

A$m conversions are at the OECD 2003 PPP rate

5.1.2 DISCOUNT RATES

A discount rate is used to convert future income or a cost stream into the equivalent value in today's dollars.

Choosing an appropriate discount rate for present valuations in cost analysis is a subject of some debate, and can vary depending on what type of future income or cost stream is being considered. There is a substantial body of literature, which often provides conflicting advice, on the appropriate mechanism by which costs should be discounted over time, properly taking into account risks, inflation, positive time preference and expected productivity gains.

The absolute minimum option that one can adopt in discounting future income and costs is to set future values in current day dollar terms on the basis of a risk free assessment about the future (that is, assume the future flows are similar to the certain flows attaching to a long term Government bond).

Wages should be assumed to grow in dollar terms according to best estimates for inflation and productivity growth. In selecting discount rates for this project, we have thus settled upon the following as the preferred approach.

[34] Calculated from the non-indexed studies themselves. Converting the Access Economics average estimates from USD to AUD at purchasing power parity (PPP) would provide slightly higher estimates - $3.9 million and $10.2m, with the same midrange estimate.

- **Positive time preference**: Access Economics uses the long term nominal bond rate of 5.8% pa (from recent history) as the parameter for this aspect of the discount rate (If there were no positive time preference, people would be indifferent between having something now or a long way off in the future, so this applies to all flows of goods and services).
- **Inflation**: The Reserve Bank has a clear mandate to pursue a monetary policy that delivers 2% to 3% inflation over the course of the economic cycle. This is a realistic longer run goal and we therefore use a value of 2.5% pa for this variable (It is important to allow for inflation in order to derive a real (rather than nominal) rate). Health inflation over recent years has been somewhat higher, at around 3.2%.
- **Productivity growth**: The Commonwealth Government's *Intergenerational Report 2007* assumed productivity growth of 1.5% in the decade to 2010 and 1.75% thereafter. We suggest 1.75% for the purposes of this analysis as many of the productivity costs extend past 2010.

There are then three different real discount rates that should be applied:

- To discount income streams of future earnings, the discount rate is:

  5.8 - 2.5 - 1.75 = 1.55%.
- To discount health costs, the discount rate is:

  5.8 - (3.2 - 1.75) - 1.75 = 2.6%.
- To discount other future streams (healthy life) the discount rate is:

  5.8 – 2.5 = 3.3%

While there may be sensible debate about whether health services (or other costs with a high labour component in their costs) should also deduct productivity growth from their discount rate, we argue that these costs grow in real terms over time significantly as a result of other factors such as new technologies and improved quality, and we could reasonably expect this to continue in the future.

Discounting the VSL of $3.7m from Table 5-1 by the discount rate of 3.3% over an average 40 years expected life span (the average from the meta-analysis of wage-risk studies) provides an estimate of the Value of a Statistical Life Year (VSLY) of $162,561.

5.2 BURDEN OF DISEASE DUE TO ALLERGY

5.2.1 DISABILITY WEIGHTS

One of the main costs of allergy is the loss of wellbeing and quality of life that it entails. This can be estimated by initially allocating a disability weight to allergy.

The disability[35] weights used in this study are based originally on those available from the AIHW (Mathers et al, 1999).

- The available disability weight of 0.03 for people with asthma and the disability weight of 0.061 for people with sinusitis were used to conservatively estimate an overall disability weight for people with allergy of 0.037. This (weighted average) estimate was

[35] The disability weights used in DALYs are objectively assessed by experts, and are preferred over the various subjective health utility indexes used in QALYs. QALYs also do not incorporate mortality.

obtained by applying the attributable fractions of asthma and sinusitis to allergy outlined in Section 2.1 to estimate an overall disability weight for all allergies.

5.2.2 YEARS OF LIFE LOST DUE TO DISABILITY

Based on the disability weight outlined above and the total number of people experiencing allergy, the YLD for allergy has been calculated by gender (Table 5-2), for the year 2007.

In total, YLD for allergy was an estimated 150,313 DALYs in 2007.

TABLE 5-2: ESTIMATED YEARS OF HEALTHY LIFE LOST DUE TO DISABILITY (YLD), 2007 (DALYS)

	Estimated disability weight	Prevalence	YLD
Males	0.037	1,852,455	68,257
Females	0.037	2,226,961	82,056

5.2.3 YEARS OF LIFE DUE TO PREMATURE DEATH

Based on the relative risk of mortality due to allergy outlined above in Section 1.4, it is estimated that there are around **586 deaths per year due to allergy**. The years of life lost due to premature death (YLL) have been estimated from the age-gender distribution of deaths by the corresponding YLL for the age of death in the Standard Life Expectancy Table (West Level 26) with a discount rate of 3.3% and no age weighting (Table 5-3).

In total, YLL for allergy was an estimated 5,831 DALYs in 2007.

TABLE 5-3: YEARS OF LIFE LOST DUE TO PREMATURE DEATH (YLL) DUE TO ALLERGY, 2007

	15-29	30-39	40-49	50-59	60-69	70-79	80+	Total
Males	298	245	310	455	567	632	559	3,066
Females	133	141	268	402	481	561	779	2,765
Persons	431	386	578	857	1,048	1,193	1,338	5,831

5.2.4 TOTAL DALYS DUE TO ALLERGY

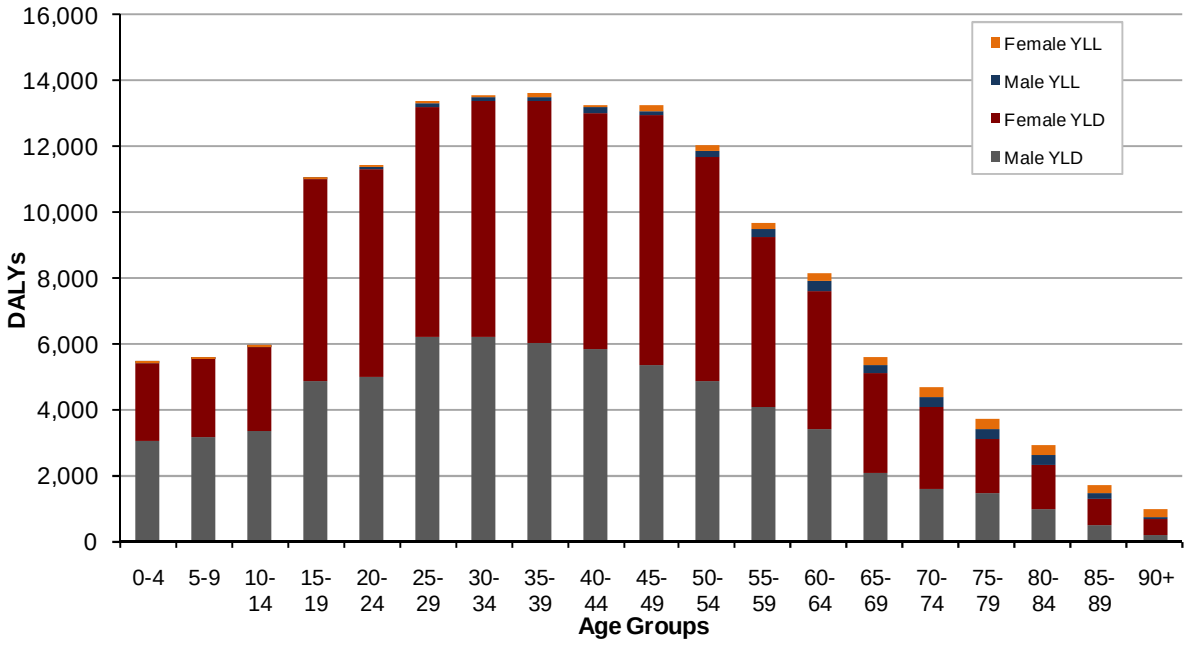
The overall loss of wellbeing due to allergy is estimated as 156,144 DALYs.

Figure 5-1 illustrates the YLD and YLL components by age and gender. The greatest impact of allergy is in young adulthood to middle age, reflecting the physiology of allergy and higher YLD due to the large number of Australians with allergy in this cohort.

- 77% of DALYs occur in the 15-64 age group – demonstrating that allergy has a significant impact on the workforce age population.

Indicative of the greater prevalence and hence greater YLD, it can also be seen that the largest loss of wellbeing due to allergy in Australia is among women (54% of total DALYs).

FIGURE 5-1: LOSS OF WELLBEING DUE TO ALLERGY (DALYS), BY AGE AND GENDER, 2007



Multiplying the number of DALYs by the VSLY ($162,561) provides an estimate of the gross dollar value of the loss of wellbeing due to allergy.

The estimated gross cost of lost wellbeing from allergy is $25.4 billion in 2007. This reflects the relatively high prevalence of allergy in the community and its disability weight of 0.037.

5.2.5 NET VALUE OF A HEALTHY LIFE LOST

Bearing in mind that the wage-risk studies underlying the calculation of the VSL take into account all known personal impacts – suffering and premature death, lost wages/income, out-of-pocket personal health costs and so on – the estimate of $25.4 billion should be treated as a 'gross' figure. However, costs specific to allergy that are unlikely to have entered into the thinking of people in the source wage/risk studies should not be netted out (eg, publicly financed health spending, care provided voluntarily). The results after netting out are presented in Table 5-4.

TABLE 5-4: NET COST OF LOST WELLBEING, $MILLION, 2007

Gross cost of wellbeing	**25,383**
Less production losses net of tax	3,646
Less health costs borne out-of-pocket	164
Net cost of lost wellbeing	**21,573**

The net cost of lost wellbeing due to allergy is estimated to be $21.6 billion in 2007.

6. SUMMARY OF ECONOMIC IMPACTS

The economic cost of allergy in 2007 is summarised in Table 6-1.

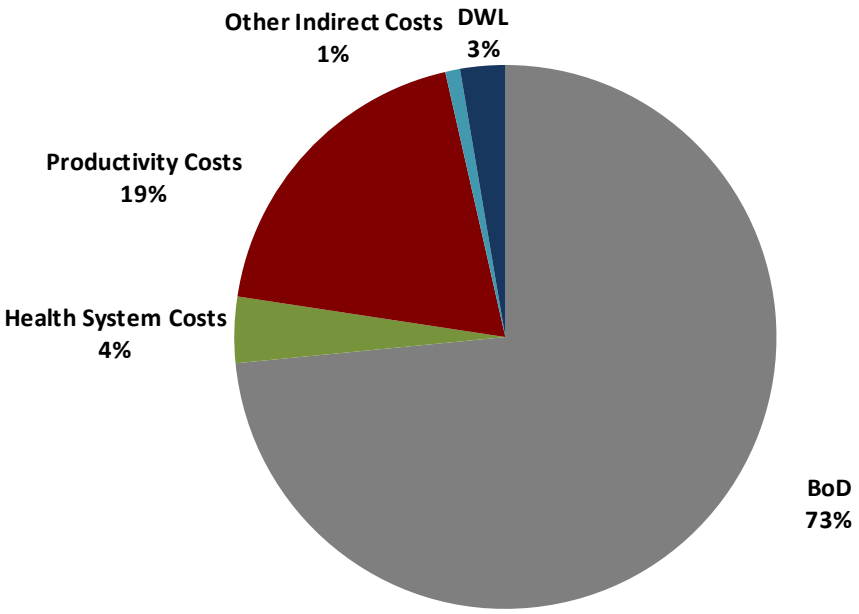
- The total cost of allergy was estimated at $29.4 billion – or $7,200 per person with allergy.
- **The total financial cost of allergy was $7.8 billion in 2007.** This excludes the burden of disease component (the economic value of disability and premature mortality).
  - These are real economic costs that include productivity losses (72%), health system costs (15%), deadweight losses (DWLs) (10%), and other indirect costs (3%).

TABLE 6-1: ALLERGY COST SUMMARY, 2007

	Individuals	Family/ Friends	Federal Government	State and Territory Governments	Employers	Society/ Other	Total
Total cost ($ million)							
Burden of disease	21,573	0	0	0	0	0	21,573
Health system costs	164	38	497	288	0	171	1,157
Productivity costs	3,646	0	1,860	0	93	0	5,598
Carer costs	0	0	0	0	0	0	0
Other Indirect costs	0	67	65	65	0	65	262
Deadweight losses	0	0	0	0	0	783	783
Transfers	-78	0	78	0	0	0	0
Total financial costs	*3,732*	*105*	*2,499*	*353*	*93*	*1,019*	*7,800*
Total costs including burden of disease	**25,305**	**105**	**2,499**	**353**	**93**	**1,019**	**29,373**
Cost per person with allergy ($)							
Burden of disease	5,288	0	0	0	0	0	5,288
Health system costs	40	9	122	71	0	42	284
Productivity costs	894	0	456	0	23	0	1,372
Carer costs	0	0	0	0	0	0	0
Other Indirect costs	0	16	16	16	0	16	64
Deadweight losses	0	0	0	0	0	192	192
Transfers	-19	0	19	0	0	0	0
Total financial costs	*915*	*26*	*613*	*87*	*23*	*250*	*1,912*
Total costs including burden of disease	**6,203**	**26**	**613**	**87**	**23**	**250**	**7,200**

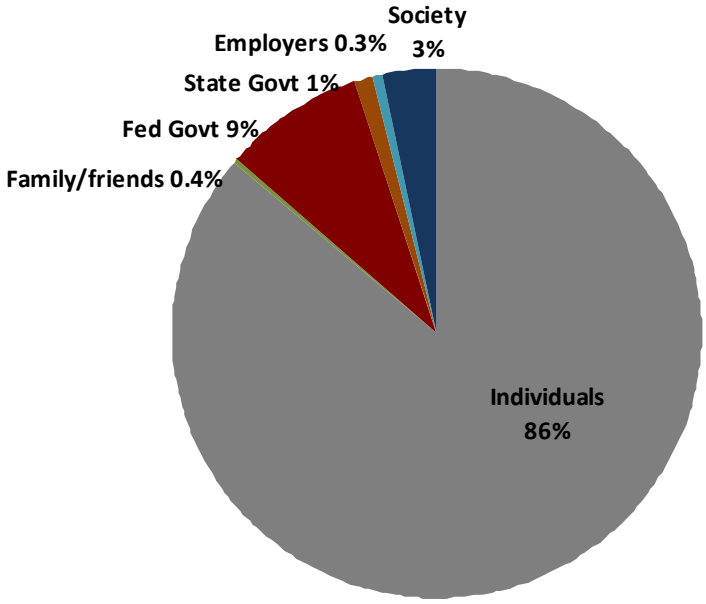
When analysing the total costs of allergy in 2007, the BoD accounts by far for the largest share (at 73%). Productivity costs are the next largest component, making up 19% and reflecting the relatively high prevalence and productivity impact of allergy among the working age population. Health system costs represent a further 4%, while DWLs and other indirect costs make up the remaining 4% (Figure 6-1).

FIGURE 6-1: TOTAL COSTS OF ALLERGY BY TYPE, 2007



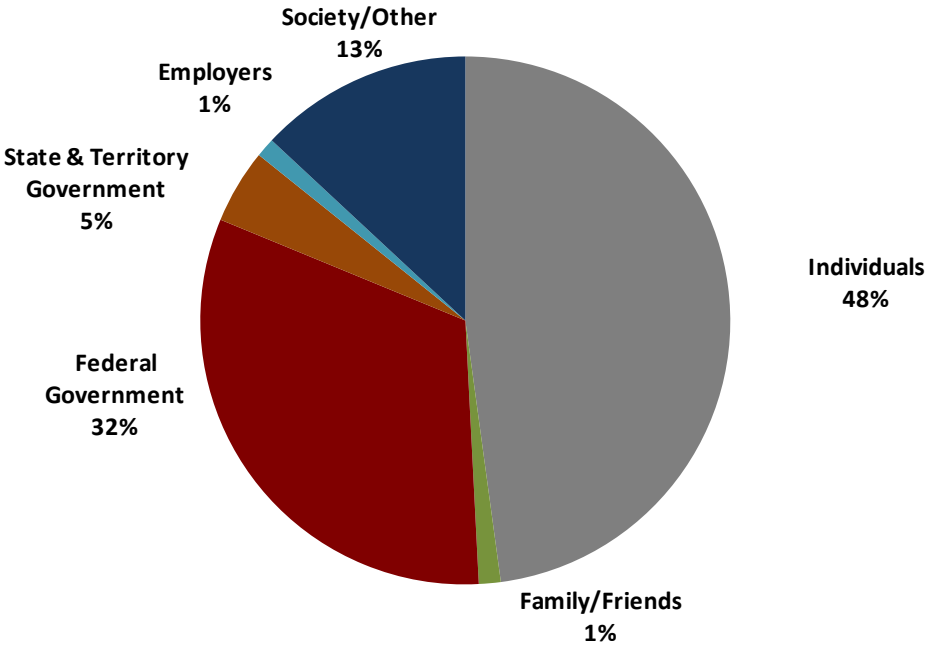
The largest share of allergy costs is borne by people with allergy themselves who, principally due to the large BoD costs, bear 86% of total costs; 9% of total costs are borne by the Federal Government, due primarily to their share of health system and productivity costs. State and Territory governments 1%, Employers bear less than 1%, while the remaining 3% is borne by society and family and friends.

FIGURE 6-2: TOTAL COSTS OF ALLERGY BY BEARER, 2007



If just the financial costs are considered, the relative shares by bearer are shown in Figure 6-3, with individuals bearing the largest share owing to the productivity impacts (48%), followed by the Federal Government (32%).

FIGURE 6-3: FINANCIAL COSTS OF ALLERGY BY BEARER, 2007



The costs of allergies can be compared to other diseases that Access Economics has evaluated using the same methodology. For example, the burden of disease from allergies ($21.5 billion) is almost twice as large as those estimated for arthritis ($11.7 billion) or hearing loss ($11.7 billion).[36] Similarly, the financial cost of allergies ($7.8 billion) is greater than that for schizophrenia ($1.8 billion) and bipolar disorder ($1.6 billion) combined.[37]

[36] Access Economics (2005) and (2007).

[37] Access Economics (2002) and (2003)

7. ALLERGY/IMMUNOLOGY SPECIALIST WORKFORCE

This chapter examines the distribution of specialist allergy/immunology services across Australia, including projections for future requirements. An allergy/immunology specialist is defined as a registered medical practitioner with recognised specialist qualifications in allergy/immunology whose work is principally concerned with the discipline of allergy/immunology, including patient consultations, medical research, administration, teaching and medico legal consultations. The positions may be based in private practice, or may be salaried hospital or university positions. It does not include other practitioners who are not registered as allergy/immunology specialists (but who practise in this area as part of their work), nor speciality trainees.

The analysis in the chapter is qualitative in nature, and it is recommended that a more rigorous quantitative analysis is undertaken to more thoroughly assess need (demand) and supply for services. Recommended modelling would utilise Medicare data to assess service utilisation by age and gender of the patient and would project this demand over future years based on different prevalence scenarios. Factors such as workplace feminisation impacts and changing work preferences should be incorporated with sensitivity analysis conducted on these key parameters, to accurately determine areas of shortfall and to plan future training and placement needs. However, for the purposes of this report, some very basic analysis is undertaken here that, nonetheless, reveals a potentially important policy challenge.

7.1 DATA SOURCES AND ASSUMPTIONS

A prime data source for the analysis was an internal anonymous workforce survey of ASCIA members performed in the first quarter of 2007. There were 84 respondents from 112 active clinicians (of a total 130 Australian members) ie, a response rate of 75% of the active workforce. Age of planned retirement and number of retirees were calculated from survey data. Of the replies, 25% were from females, similar to the 20% overall female proportion of ASCIA specialist members. The AMWAC/AIHW report *Female Participation in the Australian Medical Workforce,* reported that the proportion of female specialists (on average) work shorter hours, retire on average at least five years earlier than male specialists and contribute fewer FTE. However, for the purposes of this chapter, data were *not* adjusted based on gender, which has the effect of making any projected workforce shortages more conservative than if feminisation impacts were included.

Additional data examined included AIHW workforce data and data on trainees and recent graduates provided by the Royal Australasian College of Physicians. Population data were derived from ABS population estimates for 2007 using the Access Economics Macroeconomic Model. For each jurisdiction, the number of clinicians known to be practising in a State/Territory was used. Since ACT and NSW clinicians serve an overlapping patient population, ACT and NSW data were pooled. ASCIA is not aware of any qualified allergy/immunology specialists who have not been identified by this data. For the purposes of discussion, one Full Time Equivalent (FTE) is defined as a clinician providing 25 hours of clinical patient care per week which, based on the current working hours relative characteristics from the survey (22.7 clinical of 43.1 total, Section 7.2), would imply a 47.5-hour full-time week for all activities (ie, including administration, pathology and teaching). Sensitivity analysis would be recommended around this parameter in more detailed modelling.

7.2 CURRENT WORKFORCE

Number and distribution: There are currently 112 clinically active allergy/immunology specialists involved in patient care who are ASCIA members practising in six States and Territories; there are currently no allergy/immunology specialists in Tasmania or the Northern Territory. All specialists are based in or near capital cities, although some undertake rural clinics. There is approximately one allergy/immunology specialist per 185,600 people in Australia, and one FTE allergy/immunology specialist per 202,200 people in Australia, with significant regional variation. In Queensland there are relatively few specialists overall, and no public paediatric allergy/immunology services in Queensland hospitals, although plans to establish such a service in 2008 were announced by the Queensland Health Minister in May 2007. Recent announcements to enhance allergy services in Western Australia were also announced in September 2007.

TABLE 7-1: ALLERGY/IMMUNOLOGY SPECIALISTS, BY JURISDICTION, 2007

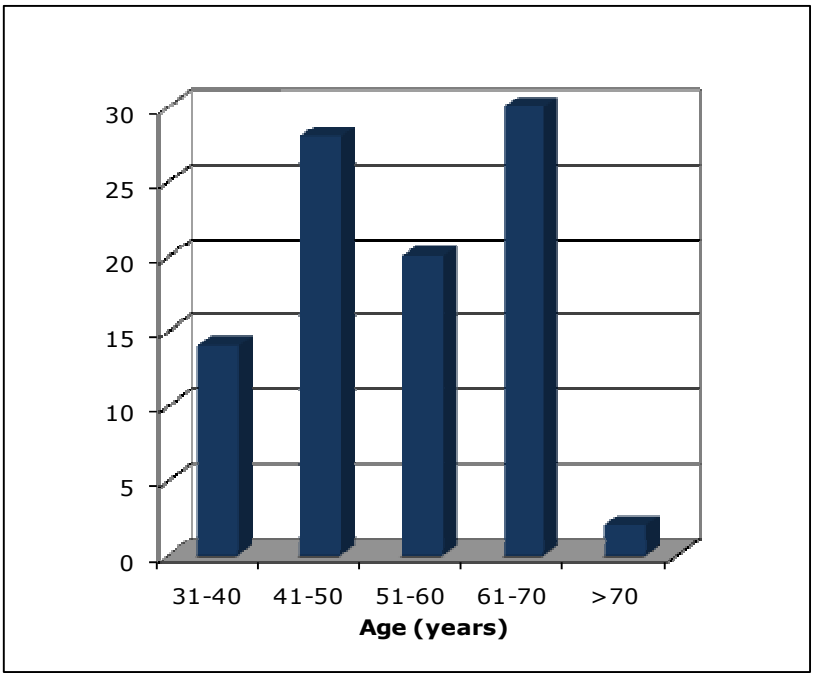
State	No. of specialists	Average clinical hrs/week	FTE	Population* (ABS 2004)	No./100,000	FTE/100,000
National	112	22.7	102	20,793,375	0.54	0.49
ACT/NSW	53	22.1	47	7,214,104	0.73	0.65
VIC	23	26.2	24	5,128,000	0.45	0.47
QLD	9	23.5	8	4,117,746	0.22	0.21
WA	14	20.8	12	2,075,025	0.67	0.56
SA	13	22.6	12	1,555,703	0.84	0.76
NT	0	0	-	209,791	-	-
TAS	0	0	-	490,297	-	-

Source: ASCIA survey data and AEM. * Population is not the sum of the states because of small population in Territories (eg, Christmas Island).

Note: There is substantial variation in the clinical hours worked/week in various jurisdictions. While the sample size is too small to assume that these differences are statistically significant, in reality relatively minor regional variations in clinical hours worked (eg. in states with major research institutes such as WA) may have a major impact on clinical service availability and waiting times that may not be reflected in simple FTE/100,000 data, as reflected in Table 7.4.

Age and Gender: The mean and median age of specialists in the survey was 51 and 47 years respectively (range 28-70 years). The largest ten-year cohort of those surveyed was aged between 61 and 70 years (25%). The proportion of female specialists and trainees was 20% and 57% respectively. Around 25 specialists are expected to retire in the five years following 2007, and 45 in the following ten years (based on a survey question asking when they expected to retire).

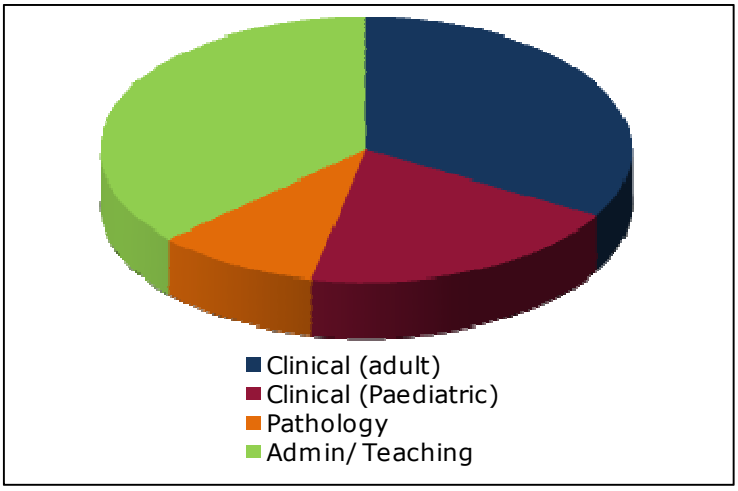
FIGURE 7-1: AGE DISTRIBUTION OF ALLERGY/IMMUNOLOGY SPECIALISTS, AUSTRALIA (YEAR)



Source: ASCIA survey data.

Working hours and characteristics: The mean number of hours worked was found in the survey to be 43.1 per week (median 43.0; range 12-70). Approximately 22.7 hours per week are spent in direct patient care of children (36.1%) and adults (63.9%). Between the ages of 35 and 64 years, most specialists work 40 hours or more per week, while those over the age of 65 years tend to work part time. Other duties include immunopathology (4.3 hours per week) and administration and teaching (15.9 hours/week).

FIGURE 7-2: HOURS WORKED, CLINICAL PRACTICE AND OTHER ACTIVITIES



Source: ASCIA survey data

Training Arrangements: All training programs are based in large city teaching hospitals, most full time, and last between three to five years depending on the mixture of immunopathology, clinical, research or combined training programs chosen. Information from Dr M Cook and Dr R Wong from the Joint Immunology and Allergy training program run by the Royal Australasian College of Physicians and Royal College of Pathologists of Australasia estimate that, as of July 2007, there were 27 approved allergy/immunology

training positions and 28 trainees in Australia, with four expected to graduate with specialist qualifications by the end of 2007, and around six per year thereafter. The age of current trainees ranges from 28 to 42 years (median 31.5 years) and 16 of current trainees (57%) are women. In the years 2002 to 2007, the median age of graduation with full specialist qualifications was 35 years (range 33 to 47 years). This may increase with the impact of graduate medical programs on the age of entry to specialist training schemes. The training centres are shown in Table 7-2.

TABLE 7-2: AUSTRALIAN ALLERGY/IMMUNOLOGY TRAINING CENTRES (2007)*

Centre	Jurisdiction
Canberra Hospital / ACT Pathology	ACT
Campbelltown Hospital	NSW
Children's Hospital, Westmead (CHW - paediatrics)	NSW
Concord Repatriation General Hospital	NSW
Liverpool Hospital / SWAPS Liverpool Hospital	NSW
SSWAPS/ Royal Prince Alfred (RPA)	NSW
SEALS / Sutherland (Pathology)	NSW
HAPS / John Hunter Hospital	NSW
St Vincent's Hospital	NSW
Sydney Children's Hospital (paediatrics)	NSW
Westmead Hospital/ICPMR	NSW
Princess Alexandra Hospital (subject to availability)	QLD
Queensland Health Pathology Service at Royal Brisbane & Womens Hospital (Pathology)	QLD
Flinders Medical Centre	SA
Royal Adelaide Hospital	SA
IMVS: Institute for Molecular & Veterinary Sciences / Royal Adelaide Hospital (Pathology)	SA
Women's & Children's Hospital (paediatrics)	SA
Alfred Hospital	VIC
Women's and Children's Health, Royal Children's Hospital, VIC (paediatrics)	VIC
Royal Melbourne Hospital / MHSPS	VIC
Fremantle Hospital / Pathwest	WA
Princess Margaret Hospital for Children / Pathwest (paediatrics)	WA
Royal Perth Hospital / Pathwest	WA
Sir Charles Gairdner Hospital / Pathwest QEII Medical Centre	WA

Source: * As of 10 July 2007.

7.3 ADEQUACY OF THE CURRENT ALLERGY/IMMUNOLOGY WORKFORCE

Assessing the adequacy of the current workforce: In the absence of a thorough modelled workforce analysis, there are a number of qualitative indicators of the adequacy of a medical workforce. Although no single measure can provide a definitive assessment, by examining each of the following metrics it is possible to gain a qualitative indication of whether the workforce is meeting current demand or if there is a significant shortfall or oversupply:

- regional variations in specialist: population ratio (SPR) and access to care;
- comparisons with other specialities;
- waiting times for consultations; and
- perceptions of allergy/immunology specialists of the adequacy of the current workforce.

Regional variation in allergy/immunology services: The regional variation in SPR suggests that the workforce is inadequate in Tasmania and the Northern Territory where there are no specialists and in Queensland were there are relatively few specialists overall and no public hospital paediatric allergy/immunology services. Access to services in rural areas is likely to be lower across all jurisdictions, as almost all services are based in major regional or capital cities.

International comparisons: Australia has approximately 0.65 allergy/immunology specialists per 100,000 population (130 Fellows in a population of 20 million) positions, about the same as Canada (213 Fellows in a population of 33 million) and is low compared to the USA (1.05 per 100,000)[38]. Comparable data are not available for Europe (where most allergy/immunology services are provided by a variety of non-vocationally trained speciality physicians), nor for the UK (where allergy care is similarly fragmented and in short supply).

Comparison with other specialties: Allergy/immunology is a relatively small specialty, comprising only 112 clinically active individuals, which is only 0.65% of an estimated 17,134 practising specialists in Australia (AMWAC, 2004). The number of FTE per population allergy/immunology specialists is substantially less than that of thoracic medicine, dermatology, ENT surgery and paediatrics, even though allergy/immunology specialists consult in each of these areas as well as specialty-specific conditions such as anaphylaxis, food allergy, autoimmune disease and immunodeficiency.

TABLE 7-3: SPECIALIST POPULATION RATIO, SELECTED SPECIALTIES, FTE PER 100,000

Speciality	FTE per 100,000
Paediatric surgery	0.30
Cardiothoracic surgery	0.50
Neurosurgery	0.60
Infectious disease	0.60
Intensive Care	0.60
Vascular surgery	0.60
Allergy/Immunology	**0.65**
Haematology	0.80
Rheumatology	1.2
Endocrinology	1.3
Thoracic Medicine	1.4
ENT Surgery	1.5
Dermatology	1.7
Paediatrics	3.8

Source: Data derived from AMWAC Report 2004.4.

[38] Marshall (2007) and Dr D Fischer, personal communication, 25 June 2007.

Consultation waiting times: For non-urgent conditions, mean waiting times for initial consultations from the survey are estimated as 13 weeks in private consulting rooms and 18 weeks for public hospital clinics (where available), with urgent cases given priority. The waiting time in Queensland for a standard first consultation is well above the average for both private and public patients. The range of waiting times, however, is much longer; up to 48 weeks in some States and almost double that time in Queensland.

TABLE 7-4: AVERAGE CONSULTATION WAITING TIMES (WEEKS), PRIVATE AND PUBLIC CLINICS

	Urgent		Non-urgent		Range Overall
Location	Public	Private	Public	Private	
ACT	3	2	18	6	2-24
NSW	1	1	15	11	1-36
VIC	1	1	12	8	1-24
QLD	5	5	29	32	5-84
WA	2	2	11	10	2-36
SA	9	3	22	12	3-48

Source: ASCIA Survey[39].

Conclusions: Overall, qualitative indicators suggest potential undersupply of allergy/immunology specialists with serious shortages in some States and in rural areas. Further, specialists working in the field[40] report that health care system changes have resulted in public hospitals becoming less willing to resource training positions or provide unfunded outpatient clinical services. This impacts not only on the provision of some essential clinical services that cannot be provided in private practice, but also hampers the training of undergraduates, general practitioners, other specialities and nursing staff.

7.4 PROJECTIONS OF SUPPLY AND DEMAND

Supply Trends: Based on the retirement intentions of respondents to the ASCIA survey, a retirement age of 66 years was used for projection purposes. The representation of women in the workforce is currently 20% and it is expected that the proportion of women in the workforce will increase, as the number of female trainees continues to increase (currently 57%) and the large, predominantly male, cohort of specialists aged 55 years and over proceeds through to retirement. Based on recent graduates from the program and the number and stage of current trainees, an estimated four specialists will qualify by the end of 2007 and **six specialists per year will graduate** into the workforce over the next 5-10 years. The entry of these individuals into specialist clinical work may be delayed if they undertake a period of additional research or clinical training abroad (as many do). It is anticipated that at least 41% of current allergy/immunology specialists will retire in the next ten years (although 55% of respondents indicated their plans to do so over the same period). Over the past five years 2002-2007, 14 new allergy/immunology specialists graduated with specialist qualifications at a median age of 35 years (range 33-47 years). Current retirement projections are shown below. It should be noted that these are minimum numbers, based on

[39] Since the completion of the survey, non-urgent waiting times in the ACT have increased ACT to 3 months (private clinics), 6 months (adult public clinics) and 9 months (paediatric public clinics; Dr Carolyn Hawkins, personal communication). Public hospital waiting times in WA are currently 7 weeks (urgent cases) and 22 weeks (non urgent; Dr Richard Loh, personal communication). ASCIA plans to repeat a more detailed workforce and patient access survey at the end of 2007.

[40] R Mullins personal communication 15 October.

those who responded to the 2007 workforce survey, and no data on planned retirements are available from the 28 active members who did not respond to the survey. If additional specialists from this group also retire (as is likely), then workforce shortages are likely to be substantially greater than the data indicated in Table 7-5 and Table 7-6. Indeed, factoring up by 1/75% to allow for the retirements from this group, would suggest the same number of specialists (115) at the end of 2017 as in 2007. Trainees may not ultimately undertake clinical work, in which case specialist numbers may actually contract over the next decade.

TABLE 7-5: PLANNED WORKFORCE RETIREMENT 2007-2017

Year	Planned Retirement	Cumulative Total
2007	1	1
2008	3	4
2009	9	13
2010	4	17
2011	4	21
2012	5	26
2013	1	27
2014	4	31
2015	10	41
2016	1	42
2017	4	46

Source: ASCIA Survey.

TABLE 7-6: ENTRY AND EXIT FROM THE WORKFORCE, BEST CASE WITH CURRENT POLICY

Year	Cumulative retirements	Cumulative new specialists*	End-year balance	Population (est; AEM)	Specialist/ 100,000	FTE/ 100,000**
2007	1	4	115	20,790,666	0.55	0.50
2012	26	34	119	21,965,001	0.54	0.49
2017	46	64	129	23,105,185	0.56	0.51

Source: ASCIA survey for retirements Dr M Cook and Dr R Wong re trainee numbers and ABS re population projections. * Calculated on the basis of six new graduates per year. ** Calculated based on FTE representing 25 hours patient care/week and no gender-related adjustments to FTE.

TABLE 7-7: ENTRY AND EXIT FROM THE WORKFORCE, LIKELY CASE WITH CURRENT POLICY

Year	Cumulative retirements*	Cumulative new specialists*	End-year balance	Population (est; AEM)	Specialist/ 100,000	FTE/ 100,000**
2007	1	4	115	20,790,666	0.55	0.50
2012	35	34	111	21,965,001	0.51	0.45
2017	61	64	115	23,105,185	0.50	0.43

Source: ASCIA survey for retirements Dr M Cook and Dr R Wong re trainee numbers and ABS re population projections. * Factored up by 1/75% compared to best case. ** Calculated on the basis of six new graduates per year. ** Calculated based on FTE representing 25 hours patient care/week initially and with gender-related adjustments to FTE from 1.10 (2007) to 1.12 (2012) to 1.15 (2017).

Addressing current regional shortfalls: Using a benchmark approach, to bring all jurisdictions into line with the levels of service availability in NSW and the ACT (one

allergy/immunology specialist per 136,000 population) would require the provision of 41 additional specialists – 21 extra in Queensland, 15 extra in Victoria, 4 in Tasmania and 1 extra in WA, while relocating a SA specialist to the NT (Table 7-8).

TABLE 7-8: GEOGRAPHICAL RE-DISTRIBUTION OF SPECIALISTS TO MEET NSW/ACT BENCHMARK, 2007

State	Current no. of specialists	Current No./ 100,000	Benchmark No.	Change	Shortage (change cf. actual)
National	112	0.54	152.7	40.7	36%
ACT/NSW	53	0.73	53.0	-	0%
VIC	23	0.45	37.7	14.7	64%
QLD	9	0.22	30.3	21.3	236%
WA	14	0.67	15.2	1.2	9%
SA	13	0.84	11.4	-1.6	-12%
NT	0	-	1.5	1.5	total
TAS	0	-	3.6	3.6	total

Source: Access Economics based on ASCIA survey data.

Estimating future growth and needs: Australia's population is estimated to be growing at a rate of 1.3% per annum net, taking into account birth and death rates and net migration. Assuming the maintenance of the same SPR, population growth alone of an additional 2.3 million over the next ten years would require an additional 17 specialists over the same period. These estimates do not take into account the potential for increased service demand driven by changing epidemiology of allergic disorders (allergic rhinitis, food allergy and anaphylaxis in particular) in Australia over the last ten years.

Taking into account extra retirements, the training lag (such that new entrants in 2007 would be graduates at end-2010), feminisation impacts (increasing the FTE ratio from 1.10 to 1.15) and population growth, to correct the maldistribution and achieve the NSW/ACT benchmark over the ten-year period in a manner believed to be achievable given training capacity would require increasing the number of graduates from six per year to 12 per year (Table 7-9). There is no allowance for attrition of students, mortality of students or specialists, other non-retirement workforce exits or higher allergy prevalence.

TABLE 7-9: ENTRY AND EXIT FROM THE WORKFORCE, POLICY TO INCREASE TRAINING PLACES BY 3 PER ANNUM FROM 2008

Year	Cumulative retirements*	Cumulative new specialists*	End-year balance	Compared to likely case	Specialist/ 100,000	FTE/ 100,000**
2007	1	4	115	115	0.55	0.50
2012	35	37	114	111	0.52	0.46
2017	61	127	178	115	0.77	0.67

Source: ASCIA survey for retirements Dr M Cook and Dr R Wong re trainee numbers and ABS re population projections. * Factored up by 1/75% compared to best case. ** Calculated on the basis of 6 graduates in 2008 increasing to 33 in 2017. ** Calculated based on FTE representing 25 hours patient care/week initially and with gender-related adjustments to FTE from 1.10 (2007) to 1.12 (2012) to 1.15 (2017).

Australia would need 178 allergy/immunology specialists by 2017 to correct the maldistribution and achieve the NSW/ACT benchmark over the ten-year period. This

contrasts with the likely 115 specialists who would be available if training places were kept at six per year. The additional 63 specialists could be achieved by training 127 over the period rather than 64, given the simple assumptions of this basic modelling. There would not be much impact by 2012, with the SPR only 0.52 compared to 0.51 in the likely case; however, the benefits would start to emerge from 2013 onwards.

7.5 WORKFORCE CHALLENGES

The analysis suggests that there are significant regional and rural difficulties in accessing specialist care and that the overall supply of allergy/immunology specialists may be inadequate to meet growing demand. Not only is there a current (and anticipated) shortage of trained allergy/immunology specialists, but there is little skilled capacity in primary medical care to manage many of these disorders. Contributing factors to this have been the relatively limited allergy/immunology content in medical school curricula and privatisation of many hospital-based allergy/immunology services over the last 20 years, which together have constrained clinical exposure to the speciality by medical students and doctors in training, including by other relevant specialities such as paediatrics. Low levels of exposure and training can result in poor diagnosis and management of allergic/immune disease that, in turn, can contribute to suboptimal patient outcomes, patient disillusionment with conventional medicine and increased uptake of unproven allergy testing and therapies (Mullins et al, 2005; MacLennan et al, 2002; Goldrosen and Straus, 2004).

Training places: A balance in supply to match a continued minimum growth rate in demand could be achieved by increasing the number of allergy/immunology training places, in a staged manner (by three extra per year), from 6 in 2008 to 9 in 2009, 12 in 2010 and so on, to reach 33 in 2017. Given the 4-5 year training program, there would be delays in flow on effects to the number of available specialists, but this training trajectory would be achievable in the medium term, with the projected trend in requirements able to be further monitored and recommended increases in training positions adjusted if necessary.

Ideally, training positions should be increased proportionately more in the comparatively less well endowed State of Queensland, as well as in South Australia and Victoria, to allow for outreach services or rotations through the Northern Territory and Tasmania, respectively. In the short term it is likely that expanded services in allergy/immunology in under serviced areas will require recruitment of specialists from other areas to establish units and train future specialists. This may initially require outreach programs and specialist and trainee rotations to be negotiated across State borders. Given recent changes in epidemiology, particular emphasis should be given to increasing the number of paediatric allergy/immunology trainees.

Gender issues: With workforce feminisation, each specialist on average is likely to contribute fewer lifetime hours in the future relative to the past (females lifetime hours are estimated as around 75% of male hours across all specialties), which needs to be taken into account when considering calculating the number of training places required to meet future needs (AMWAC & AIHW 1996b). More detailed modelling of the allergy/immunology workforce by age and gender would help improve the projections to more accurately account for feminisation than the approximations utilised here.

Funding of training places and specialist units: The changes that are occurring in allergy/immunology practice are likely to continue and, as a result, the trend away from public hospital practice may lead to a decline in support for the funding of traditional hospital-based allergy/immunology training positions, normally funded by State governments. While opportunities exist for novel methods of training, such as the piloting of private/public training

facilities in the future, hospital-based allergy/immunology services are essential for the provision of some essential clinical services (such as potentially dangerous drug and food challenges). They can serve as a resource for community education as well as research. The existence of allergy/immunology departments in public hospitals provides a crucial recruitment tool for future specialists and is also an opportunity to increase exposure and skills for those entering primary care or other specialties at a later date.

A number of current training places in Australia are dependent on the availability of funding, which is not always guaranteed. Some are funded on a temporary basis from hospital fellowships, or from a combination of one or more of university, hospital discretionary and pathology laboratory-derived funds. New allergy/immunology training positions may need to be specifically and fully funded because most allergy/immunology services (being provided on an outpatient basis) do not attract resources under the current Commonwealth funding arrangements to hospitals. Consideration to guaranteed funding of current positions is thus also a priority.

Changes to the training program are likely to require a financial commitment from both the Commonwealth and State/Territory governments, including funding specifically designated to take into account the funding of registrar positions and either VMO or staff specialist supervisors, together with the ancillary services required to maintain a fully functioning hospital-based service.

It is recommended that Commonwealth, State and Territory health departments undertake negotiations with the Royal Australasian College of Physicians, the Royal College of Pathologists of Australasia and the Australasian Society for Clinical Immunology and Allergy for the establishment of additional training positions; with the additional positions to be introduced gradually where suitable support and training programs are available. Introduction of short-term measures to meet localised service shortfalls may be required, given that the increased number of graduates will not make an effective contribution to the workforce until 2012 at the earliest.

Structure of training: The increase in the number of trainees may require examination of a number of alternative models of training outside teaching hospitals, including a mix of public and private accredited training facilities.

Ancillary education: Shortage of allergy/immunology specialists, regional inequality and privatisation of many hospital-based allergy services has a flow on effect in a lack of adequate exposure and training for other medical students (notably general practitioners) nurses, ancillary health care workers and the public. Increased ancillary education in undersupplied areas is also considered a priority, since these staff assist clinicians in patient management, and are involved in community outreach schemes for patient and community education.

8. RECOMMENDATIONS FOR THE FUTURE

In Australia there is a lack of public and professional appreciation of the impact of allergic and immune disorders on quality of life, and even less of the economic impact to society and individuals who suffer allergic disease. Raising awareness of the economic and health impacts is an important factor in facilitating the early recognition and control of allergic disease.

Development of a framework of best practice for management of allergic disease in Australia will be enhanced by:

- timely access to specialist allergy/immunology services;
- access to early and accurate diagnosis;
- access to affordable and cost-effective therapy and novel therapies;
- support for community and medical education outside the current paradigm;
- support for local research to develop interventional strategies to reduce the burden of disease in the community; and
- development of a model of allergy as a chronic disease.

8.1 SPECIALIST ALLERGY/IMMUNOLOGY SERVICES

There is significant regional variability in access to specialist allergy/immunology services within Australia, with some regions such as Tasmania and the Northern Territory having no access to specialist services. Other States such as Queensland have no public hospital-based services for dealing with the increasing number of children with allergic disorders. Anecdotal evidence suggests that in some cases minimum standards of care and service provision are not met. It is possible that the shortage of mainstream services in Australia has also contributed to the proliferation of dubious allergy practice in the field of complementary and alternative medicine, where unproven techniques for diagnosis and treatment are used.

The analysis in the previous chapter of this report suggests that there may be too few allergy/immunology specialists in Australia (and New Zealand) to meet the growing needs of the population, in terms of delivering direct care in dedicated allergy/immunology centres and in providing training for other specialists, general practitioners and practice nurses. It should be possible for milder cases of allergy to be recognised and treated in primary medical care so that only the most severe or complex cases need referral to specialist services.

Management by an allergy specialist is an effective model for patient care, as most patients with allergic disorders have multiple comorbidities, and organ based specialists are poorly equipped to manage disorders falling outside their particular specialty. The community is likely to be best served by a combination of community and hospital-based specialist allergy/immunology services, and a well educated medical and paramedical community able to deal with more common and less serious issues.

The overall supply of allergy/immunology specialists in Australia is inadequate and there are significant regional and rural difficulties in accessing specialist care. Without prompt corrective action, the workforce may move towards a situation of worsening undersupply. The current projected levels of graduate output are unlikely to be sufficient to meet expected future requirements.

The shortage of services in Australia has been accompanied by a proliferation of dubious allergy practice in the field of complementary and alternative medicine, where unproven techniques for diagnosis and treatment are used. These result in delayed and ineffective treatment, and at times inappropriate and occasionally harmful treatment. This can place an additional burden on the conventional healthcare system, where patients need to be re-educated and re-evaluated regarding the presence or absence of allergic disease, at times when none exists.

Access to care is currently impeded by a number of factors including:

- the rise in prevalence of allergic diseases saturating current service capacity;
- regional inequalities in accessing specialist services in some States, Territories and rural areas; and
- current and anticipated specialist workforce shortages.

The provision of additional specialists is currently hampered by:

- the relatively low number of trainees currently;
- the lack of guaranteed training places in some institutions; and
- health care system changes resulting in public hospitals becoming less willing to resource training positions or provide unfunded outpatient clinical services. The privatisation (or closure) of many hospital-based allergy/immunology services has impacted not only the provision of some essential clinical services that cannot be provided in private practice, but clinicians report it also hampers the training of undergraduates, general practitioners, other specialities and nursing staff[41].

Changes in the epidemiology of allergic disease and allergy/immunology practice need to be recognised. With increasing numbers of children being evaluated for food allergy comes the need to undertake deliberate food challenges to determine whether the child has grown out of a sensitivity, or in other cases, to prove or disprove clinical allergy in the patient with a positive allergy test. Deliberate challenges with medication are also required under a number of other circumstances, including the evaluation of patients with possible drug sensitivity, and also in the management of patients with the aspirin triad, characterised by asthma, nasal polyps and aspirin allergy. Such patients have frequent sinus infections, require repeat sinus surgery to remove nasal polyps and are high-level consumers of antibiotics. If these patients are shown to be sensitive to aspirin, desensitisation procedures can improve quality of life, reduce the need for antibiotics, improve asthma control with less medication and reduce the need for further surgery.

Rush desensitisation is a procedure most commonly used to treat patients with insect venom allergy. Instead of weekly injections over many months (with the need for time off work, and multiple medical visits and waiting periods after an injection), the patient can reach maintenance within two half day sessions as an inpatient or hospital clinic. While this procedure is resource intensive in terms of staff time and the need for inpatient facilities, it is likely to be cost effective long term as patients require less time off work, with fewer injections in the first few months of treatment, fewer outpatient visits to doctors (with the cost involved), and patients reach a protective dose quickly. Further cost effectiveness analysis would be desirable to validate this in an Australian context. Similar protocols may have a role to play in the future in the management of patients with allergic rhinitis and asthma,

[41] R Mullins personal communication 15 October.

treated with aeroallergen extracts. Since such procedures are of their nature potentially risky, they need to be undertaken within hospital-based institutions in most cases.

Access to care would be enhanced by the following initiatives.

- **Guarantees of specific funding for current and additional specialist allergy/immunology training places:** It is important to note that one FTE specialist is required per training position for registrars, according to the criteria of the College of Physicians and pathologist criteria. The ability to undertake training (whether it be for specialist registrar trainees, other specialties or general practitioners), is therefore entirely dependent on infrastructure which includes institutional-based allergy specialists.
- **Support for hospital-based allergy/immunology units to provide both inpatient and outpatient services:** Funding of additional academic chairs in allergy/immunology is one option to consider, as such institutions attract those interested in clinical disease as well as research, and would be a focus for the introduction of novel treatments (such as immunotherapy for food allergy).
- **Specific funding for specialist outreach services for rural and remote areas**.
- **Development of funding models (through Medicare Australia) for item numbers** to support:
  - teleconferencing so that non-allergy specialists can access specialist advice, similar to current item numbers (353, 355, 356, 357 and 358) to support teleconsultation for psychiatric patients in remote areas;
  - telephone consultations between specialists and patients in remote areas where clinically appropriate; and
  - changing allergy practice that includes drug and food challenges within a hospital environment, and 'rush immunotherapy' procedures

Ideally, training positions should be increased proportionately more in the comparatively less well endowed State of Queensland, as well as in South Australia and Victoria, to allow for outreach services or rotations through the Northern Territory and Tasmania respectively. In the short term it is likely that expanded services in allergy/immunology in under serviced areas such as Tasmania, the Northern Territory and Queensland will require recruitment of specialists from other areas to establish units and train future specialists. This may initially require outreach programs and specialist and trainee rotations to be negotiated across State borders. Given recent changes in epidemiology, particular emphasis should be given to increasing the number of paediatric allergy/immunology trainees.

8.2 ACCURATE AND EARLY DIAGNOSIS

Access to accurate allergy and immunology testing is required to identify avoidable allergens, to identify targets for specific immunotherapy, and (at times) to exclude allergy as a potential contributor to symptoms. Much of allergy assessment involves correcting misinformation. Access to accurate testing allows patients and their carers to undertake measures of proven effectiveness, and reduces the risk that the vacuum will be filled by unproven tests and procedures and ineffective treatments that are commonly promoted in the community.

Accurate and early allergy diagnosis requires the registration of reagents for SPT, including the availability of positive control solutions such as histamine or codeine, some of which are currently not available or remain unregistered.

Methods of allergy testing are currently hampered by the financial bias towards measuring total IgE (a test of limited clinical usefulness) compared to measurement of allergen specific IgE. Currently, Medicare rebates to pathology laboratories are structured so that measurements of more than four allergens during any single episode are not rebated to the requesting laboratory. This encourages inappropriate test ordering by doctors to minimise the out of pocket cost to patients. Unfortunately, this approach often provides confusing, irrelevant and sometimes misleading results. It also impairs the care of patients who may have co-existent food and aeroallergen sensitivity.

Patients with allergic disease often have more than one coexistent problem, and appropriate clinical care involves assessment of all conditions simultaneously. A patient with allergic respiratory disease may have eczema, food allergy, or contact allergic dermatitis. Contact allergic dermatitis is more common in patients with IgE mediated hypersensitivity, and may sometimes be confused by some general practitioners with angioedema/food allergy. The current Medicare schedule does not provide for patient rebates for SPT for measurement of allergen specific IgE (relevant to immediate hypersensitivity to food, aeroallergens or sting or drug allergy), and patch testing (used to assessed contact allergic dermatitis) on the same occasion. The current Medicare structure does not encourage the assessment of coexistent allergy related conditions, and has the potential to reduce efficiency by encouraging separate visits to assess and test for separate conditions. This is of particular importance when assessing patients from remote areas, where access to specialist medical care is often more difficult.

The specialty of allergy and clinical immunology deals with a relatively large number of rare and orphan diseases for which some genetic testing is available. Because these conditions are rare, some tests are performed only occasionally, usually in the setting of hospital/university laboratories with specialised expertise. Many of these low volume tests are labour intensive, cannot be automated, and economies from high volume turnover cannot be achieved.

Access to accurate and clinically useful diagnostic tests would be enhanced by the following.

- **Access to diagnostic reagents for SPT and immunotherapy**. This would require a collaborative approach between manufacturers, the Therapeutic Goods Administration and the ASCIA to identify key allergens to which access is required.
- **Revision of the Medicare schedule to:**
  - facilitate measurement of a single allergen specific IgE to more than four allergens at a time (where clinically relevant relevance to the underlying clinical condition) would facilitate patient assessment; and
  - allow for simultaneous assessment of immediate (IgE-mediated) hypersensitivity and delayed hypersensitivity/contact allergic dermatitis; and
  - provide for 'orphan tests' for rare diseases and novel therapeutic agents.
- **Consider PBS subsidy for reagents such as penicillin minor determinants** which are not affordable for some patients, in the context of diagnostic procedures such as intradermal testing for drug sensitivity.

8.3 AFFORDABLE AND COST-EFFECTIVE MEDICAL THERAPY

Allergic disease is not only common, but many patients have multiple coexistent disorders, each requiring specific interventions including prescribed or non-prescribed medication or treatments. The genetic clustering of allergic disease often results in multiple individuals within the same family being similarly affected. The costs of symptomatic treatments are

significant in patients who require them on a daily basis for substantial proportions of the year, and may be less cost effective long term than interventions such as immunotherapy, the only form of treatment shown to alter the natural history of disease. The financial burden may also fall more heavily on those with lower incomes. Further research is required in this area in relation to the equity impacts and incremental cost effectiveness of alternatives. This would require a bottom-up cost analysis as previously described.

The costs involved in care of allergic patients are not collected in official government statistics. With the shift of some lower cost prescription medications to over the counter status, they are now outside of the PBS and Medicare safety nets. Medications such as long term antihistamines or nasal steroids are thus available to Veterans Affairs patients, but not to other patients with identical conditions who have not served in the military. Out of pocket costs have been shown to influence not only compliance but also the likelihood of complications of untreated disease - see Australian Centre for Asthma Monitoring (2007).

Access to some therapeutic agents is hampered by the current registration process required for some biological agents (such as allergen specific immunotherapy) or the lack of Medicare funded subsidies for novel therapies for rare diseases. To some extent this is because conventional measures of reliable evidence supporting treatments and diagnostic tests can only be obtained for common diseases. The same level of evidence is more difficult to obtain for rare diseases unless the therapeutic effect is very substantial.

Patient care would be enhanced if consideration were given to the following options, with safeguards to minimise the risk of abuse or cost blowouts.

- Availability of higher potency nasal steroid sprays on authority prescription for people
  - with relapsing nasal polyps; and
  - with chronic allergic rhinitis requiring therapy for more than six months per year.
- Availability of relatively nonsedating antihistamines on authority prescription for those requiring symptomatic treatment for chronic urticaria for more than three months.
- Funding of anti-leukotriene therapy on authority prescription (initial three month approval) restricted to initial prescription by allergy/immunology specialists or respiratory physicians, in patients with the ‘aspirin triad’ in whom aspirin desensitisation is contraindicated or not tolerated.
- Availability of specific allergen immunotherapy on authority prescription (initial six month approval), restricted to initial prescription by allergy/immunology specialists. This would require the development of costing models that recognise the difference between patient co-contributions for medication purchased on a monthly basis, from immunotherapy where allergen is manufactured for a specific patient and provided in treatment kits that are used for 6-12 months at a time.
  - The model used to fund allergen immunotherapy for honey-bee and wasp venom immunotherapy in patients with anaphylaxis (where the patient contribution is once for each 6-month supply) is an appropriate one to consider in this context.
- Ability to add non-prescription items used for the treatment of allergic disorders to the Medicare safety net would make them more affordable.
- Recognition of allergy as a chronic disease, with development of a model of care that incorporates recognition of costs of management, and proposes how the cost burden can be lessened for those on multiple medications, including those currently not on prescription.

- Support for trials of novel therapies (such as newer immunomodulatory agents and receptor antagonists) in patients with autoimmune and auto-inflammatory diseases where there is a rationale for therapy, and where alternative agents are poorly tolerated or toxic.
- Development of mechanisms to extend the range of approved medications for novel indications, and then to make them more affordable for patients who require access. Medications with orphan indications, will find it difficult to obtain sufficient evidence of efficacy from large-scale placebo-controlled trials when the underlying condition itself is rare. There are a number of examples of this including:
  - fluticasone for the treatment of eosinophilic oesophagitis which has been proven to be effective, but is currently only approved for the treatment of asthma; and
  - Mycophenolate has been approved for treatment of lupus nephritis, but not for the management of other related conditions.

8.4 COMMUNITY AND MEDICAL EDUCATION OUTSIDE THE CURRENT PARADIGM

Allergic disease is so common that even a substantial increase in the number of specialised allergy services in the community is unlikely to meet demand without increasing the skills base in primary care to deal with more straightforward cases. The importance of quality evidence base training is paramount. Poor training results in poorer quality care, undesirable outcomes, and increased uptake of unproven, ineffective and sometimes dangerous or expensive, alternative medical practices. Unfortunately, there are a number of factors that have contributed to an erosion to the skills base in primary care and exacerbated the relative shortage of specialised services available compared to increasing demand, including:

- the relative paucity of allergy-related content in current medical courses;
- the absence of allergy services in some hospitals and the privatisation of others, resulting in fewer opportunities for undergraduate and postgraduate education; and
- the current model of postgraduate medical education in general practice in Australia is built around the provision of sponsored meetings by pharmaceutical companies, resulting in a drug rather than disease-centred focus. The educational opportunities available may be limited by some sponsors having less interest in funding activities for across-the-counter medication (most allergy medications) compared to those requiring a doctor's prescription. This model of postgraduate education is outmoded and does not serve the medical or wider community well.

The care of patients with allergic disease would be enhanced by:

- working with universities and medical schools to enhance immunology/allergy education, one of the most common disorders that doctors will encounter in general practice; and
- increasing the diagnostic and management skills of general practitioners as well as related specialties (eg, paediatrics and respiratory physicians) to deal with relatively straightforward cases.

These goals could be achieved (in part) by the following initiatives.

- Undertake an audit of undergraduate medical curricula, audit the basic knowledge of trainees emerging from that curricula, identify deficits, and design educational content to rectify deficits.

- Reversing the trend in the last 15 years of privatisation of allergy /immunology clinics. Such clinics are the incubators of future trainees, and are the centres for undergraduate and postgraduate education in allergic disorders.
- We need to reform the current model of postgraduate education, which is outdated and does not serve our patients or our community well. This involves ensuring that a component of allergy/immunology is involved in the curricular of training of paediatricians, other related specialist, general practitioners and medical students. This may involve liaising with specialist advisory committees the Royal Australasian College of Physicians and other postgraduate bodies involved in training such as the Royal College of General Practitioners or Divisions of General Practice.
- Funding specific educational initiatives, along the lines of the National Asthma Campaign, to enhance the skills needed to manage allergic disorders in general practice. This may involve one or more of funding of educational seminars (perhaps through ASCIA or the Divisions of General Practice). Such activities should concentrate on regional areas that are currently underserviced, including rural areas, where educational activities are more difficult to access. Teleconferencing and video conferencing may form a useful method of service delivery.
- The preparation and distribution of printed evidence-based educational materials, such as the '*Is it Allergy?*' program initiated by the European Academy of Allergy Asthma and Immunology (with a similar program currently under development by ASCIA) is an important facet of education. Materials on allergy prevention (already developed by ASCIA) require a more widespread distribution to baby health centres, obstetric services and maternity hospitals.
- Upskilling of medical practitioners (GPs as well as selected specialties) can also be achieved by establishment of teaching clinics within public hospitals, as is currently being trialled at the Royal Children's Hospital in Melbourne. Teaching clinics require restructuring of currently operating service clinics for clinical service purposes rather than for teaching purposes. Expansion of current clinics and restructuring to meet a service as well as teaching role would require a rollback of privatisation of public hospital clinics, and funding of new clinics where none exist.
- Development of partnerships between specialty services and GPs, nursing, community health centres, other specialties, midwives and pharmacists to increase the general evidence-based knowledge of these health professionals, and counter widespread disinformation about allergic disorders in the community.

8.5 LOCAL RESEARCH

There is a need for locally based research on the epidemiology and identification of risk factors for development of allergic disease, to assist in the development of intervention studies that have proven successful in other disorders such as cardiovascular disease and Sudden Infant Death Syndrome.

Public health care planning and workforce planning is also underpinned by an accurate estimate of the prevalence of some disorders in Australia, and changing prevalence, as noted most recently for food allergy in young children. Furthermore, development of collaborative research programs within major hospital and university centres of excellence may facilitate the introduction of novel therapies (such as immunotherapy for food allergy) that may one day alter the natural history of disease and reduce burden of chronic disease. Support for uniquely Australian problems (such as Jack Jumper ant anaphylaxis research programs and studies of the aerobiology and clinical significance of potential native

Australian triggers of respiratory allergic disease) should be made a priority, as such problems will not be addressed by private funding or overseas interests.

Special consideration might be given to commissioning the AIHW or a similar organisation to undertake a top-down study of the health system costs of allergic disease in Australia.

8.6 DEVELOPMENT OF A MODEL OF ALLERGY AS A CHRONIC DISEASE

Organ based specialties are poorly equipped and trained to handle disorders lying outside their particular specialty. This can result in inappropriate review by multiple organ specific specialties, a practice that is time and cost-inefficient and may result in suboptimal care. By contrast, management of allergic disorders by allergy specialists has been shown to be cost effective and reduce hospitalisation and cost of care in patients with asthma, chronic sinusitis and food allergy/anaphylaxis. Education of patients to self-manage their condition has shown similar results.

The cost effective management of patients with allergic disorders would be enhanced by:

- Recognition of allergy as a chronic disease. This will facilitate development of a model of care that incorporates the management of coexistent disorders in the same individual in a cost-effective manner.
- Development of models of care that incorporates service provision by specialists, GPs, pharmacists and other health professionals to provide care and evidence-based information in a timely manner. This model will be underpinned by an educational model as outlined above.
- An examination of how the cost burden can be lessened for those on multiple medications, including those currently not on prescription. This may require a re-examination of provisions of the current Medicare safety net and Pharmaceutical Benefit Scheme.

APPENDIX A – RESOURCES REQUIRED FOR ALLERGY SERVICES

An overlap exists between clinical immunology and allergy, and other organ specialties. Most Australian and New Zealand Allergy and Clinical Immunology specialists have been trained in allergy and clinical immunology, and involved in the assessment and management of a variety of common disorders (eg. allergic respiratory disease, eczema, hives/urticaria, food, sting or drug allergy) as well as less common conditions (eg. vasculitis, immune deficiency, some autoimmune disorders).

The role of hospital-based Allergy and Clinical Immunology services

While many patients are managed in the community by general practitioners or allergy/immunology specialists in private practice, hospital based units are required not only to provide consultative services for hospital inpatients, but provide an essential infrastructure for services that cannot always be delivered in the community, including:

- testing for some drug allergies;
- drug or food challenges where reactions may be serious. The role of hospital-based tertiary referral units will be increasingly more important given the increasing number of children evaluated for possible food allergy;
- provide “rush” desensitisation protocols to switch off serious allergic reactions to venomous insects (like bee or wasp) that either cannot be delivered in the community setting, are performed because routine immunotherapy is poorly tolerated, or for rural patients for logistic and safety reasons;
- provision of ancillary services such as dietetic advice;
- multi-disciplinary services and teams that may be required in some cases for example:
  - young children who may require the services of allergy specialists, paediatricians, dietitians and psychological services;
  - children and adults with primary immunodeficiency and multi-organ system disease;
- the care of patients with rare diseases;
- serve as a focus for research; and
- are the locations where novel therapies (such as desensitisation to food) will first be trialled.

Hospital-based services also play an important role in training of:

- New specialists;
- Medical students;
- Hospital residents (some of whom will ultimately work in primary care/general practice);
- Related speciality trainees (such as paediatricians, dermatologists, respiratory physicians, Ear Nose Throat surgeons) who may also assess patients with allergy-related disorders; and
- The general medical and paramedical community (eg. GP’s, nurses, dietitians)

Given the epidemiology, age distribution and nature of allergic disease in the community, provision for inpatient and outpatient facilities for the assessment and management of adults and children is required, as well as appropriately trained staff.

Medical staff

Most units will require the services of at least two specialists in Clinical immunology and Allergy. Since the natural history and prognosis of some allergies in children differs from that in adults (eg. food and insect venom allergy), expertise in paediatrics relevant to the problems under evaluation is essential. This may be provided by one or more of specialist paediatric Allergy and Clinical Immunology specialists, the input of paediatricians with an interest and expertise in Allergy and Clinical Immunology, or adult-trained Allergy and Clinical Immunology specialists with experience in assessing and managing children. Many patients present with complex and multisystem problems, and may need to be assessed and managed within the context of a multi-disciplinary team.

Units will require at least one registrar (either vocationally training in the speciality or rotating from another service in internal medicine), and one resident medical officer for training and for supervision of inpatients (including food or drug challenges).

Nursing staff

The support of a specialist allergy clinic nurse is mandatory. Nurses have an important role in:

- undertaking some allergy testing (skin prick testing, spirometry);
- administering immunotherapy;
- education of patients and the parents of young children in allergen avoidance, spirometry and inhaler technique and EpiPen training;
- supervising of some challenge procedures; and
- in community outreach programmes (eg. school anaphylaxis training programmes).

Ancillary services

Qualified adult and paediatric dietitians are required to give detailed advice to patients (and their care-givers) with food allergy, to assess the nutritional status of patients who have restricted their diets (either with medical advice or at their own instigation), to advise on how best to manage patients with multiple documented food allergy, and to advise patients with "food intolerance" how best to manage their diets to minimise symptoms without compromising nutrition. This is particularly important when managing young children, where restricted diets are more likely to impact on nutrition and growth. Physiotherapists have an important role to play in patients with immunodeficiency. As in any patients with chronic disease impacting on physical, psychological health and finances, access to social workers and psychology/psychiatric services is also important.

Outpatient facilities

Facilities should be available for:

- skin allergy testing (skin prick and intradermal);
- measurement of lung function (including supervising a patient's inhaler technique);
- fibreoptic rhinoscopy of the upper airways (desirable);

- patch testing for contact allergic dermatitis (or performed in association with dermatology services);
- providing patient and parent education (including instructing on self administration of adrenaline);
- administering allergen immunotherapy (desensitisation) with an appropriate observation area;
- challenge facilities (eg. medication) for lower risk procedures; and
- should have access to resuscitative facilities in case of adverse reaction to a challenge or an immunotherapy injection. Staff should be trained in resuscitative techniques.

Inpatient facilities

Inpatient facilities will be required for the investigation and management of patients with some disorders (eg. immune deficiency and systemic autoimmune disorders) and to provide challenge facilities in patients considered at higher risk of an adverse reaction. This may require facilities for day-stay and overnight stay for patients with suspected food allergy to prove or disprove sensitivity and allow liberalisation of diet if negative. These facilities cannot be easily provided in community-based allergy/immunology services. Facilities should be available for open as well as double blind, placebo controlled tests to identify or disprove food intolerance by giving suspected foods in disguised forms. For this purpose some pharmacies at specialist centres stock foodstuffs contained in special capsules, with placebo controls of similar appearance.

APPENDIX B – ALLERGY QUESTIONS IN THE NHS

The next few questions are about other long term conditions, that is, conditions that have lasted, or are expected to last, for 6 months or more. Apart from the conditions you have already told me about?

(LTC_Q01)

Do you have any of these conditions?

(Prompt card 21)

1 Yes

5 No *(go to LTC_Q05)*

(LTC_Q02)

Which of these do you have?

(Multiple response)

10 Hayfever

11 Sinusitis or sinus allergy

12 Emphysema

13 Anaemia

14 Bronchitis

15 Other allergy

16 Epilepsy

17 Fluid problems/fluid retention/oedema (Exclude those due to heart or circulatory problem)

18 Hernias

19 Kidney stones

20 Migraine

21 Psoriasis

22 Stomach ulcer or other gastrointestinal ulcers

23 Thyroid trouble/goitre

24 Tuberculosis

25 Back - slipped disc or other disc problems

26 Back pain or back problems *(go to LTC_Q04)*

Population: All persons

I would now like to ask you about asthma

(ASTH_Q01)

Have you ever been told by a doctor or nurse you have asthma?

1 Yes

5 No *(go to next module)*

6 Don't know *(go to next module)*

(ASTH_Q02)

Do you still get asthma?

1 Yes

5 No *(go to next module)*

(ASTH_Q03)

Do you have a written asthma action plan?

1 Yes

5 No *(go to ASTH_Q08)*

6 Never heard of one *(go to ASTH_Q08)*

7 Don't know *(go to ASTH_Q08)*

(ASTH_Q04)

Did you get the asthma action plan from a doctor?

1 Yes *(go to ASTH_Q07)*

5 No

(ASTH_Q05)

(Did you get the asthma action plan from) a nurse?

1 Yes *(go to ASTH_Q07)*

5 No

(ASTH_Q06)

(Did you get the asthma action plan from) a chemist?

1 Yes

5 No

(ASTH_Q07)

Is your action plan similar to this?

(Prompt card 11)

1 Yes

5 No

The next questions are about medication that you may have used or taken for your asthma in the last 2 weeks. Please do not include vitamin and mineral supplements, as well as any natural or herbal medicines, in your answer.

(ASTH_Q08)

Have you taken any medication for asthma in the last 2 weeks?

1 Yes *(go to ASTH_Q09)*

5 No *(go to ASTH_Q10)*

6 Don't know *(go to ASTH_Q10)*

(ASTH_Q09)

Sequence Guide:

If NHS/NHSI go to ASTH_Q11

If NATSIHS/IHS go to SG_ASTH_Q12

(ASTH_Q10)

Sequence Guide:

If NHS/NHSI and ASTH_Q08=5 or 6 go to ASTH_Q18

If NATSIHS/IHS go to next module

(It might be easier to answer these questions if you have the medication in front of you)

(ASTH_Q11)

What are the names or brands of all the asthma medications you have used in the last 2 weeks?

Test entry : up to 3 names/brands

Mark 4 if more than 3 medications stated

(ASTH_Q12)

Sequence Guide:

If NATSIHS/IHS/NHSI and ASTH_Q08=1 go to ASTH_Q13

If NHS go to ASTH_Q14

(ASTH_Q13)

Was your asthma medication used for prevention, relief or both?

1 Prevention

2 Relief

3 Both

4 Neither

5 Don't know

Sequence Guide:

If NHSI go to ASTH_Q14

If NATSIHS/IHS go to ASTH_Q18

(ASTH_Q14)

How often did you use [name of medication] in the last 2 weeks?

(Loop for each name/brand)

1 Every day and/or night

2 More than 3 days and/or nights a week

3 1 to 3 days and/or nights a week

4 Less than once a week

5 Varies/as required

(ASTH_Q17)

During the last 2 weeks, have you used a nebuliser to administer any of these medications for your asthma?

1 Yes

5 No

6 Don't know

(ASTH_Q18)

Sequence Guide:

If NHS/NHSI go to ASTH_Q19

if NATSIHS/IHS go to next module

(ASTH_Q19)

Have you taken any of these actions for your asthma in the last 2 weeks?

(Prompt card 12)

1 Yes

5 No *(go to next module)*

(ASTH_Q20)

Which ones?

10 Admitted to hospital as an inpatient *(go to next module)*

11 Visited outpatient clinic *(go to next module)*

12 Visited emergency/casualty *(go to next module)*

13 Visited day clinic *(go to next module)*

14 Consulted a doctor (General Practitoner or Specialist)

15 Consulted other health professional *(go to next module)*

16 Had days away from work/study *(go to next module)*

17 Had other days of reduced activities *(go to next module)*

18 Taken vitamin or mineral supplements *(go to next module)*

19 Used natural/herbal medicines *(go to next module)*

(ASTH_Q22)

Did you consult a General Practitioner or a Specialist?

1 General Practitioner

2 Specialist

End module

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