ACTING POSITIVELY: STRATEGIC IMPLICATIONS OF THE ECONOMIC COSTS OF MULTIPLE SCLEROSIS IN AUSTRALIA

REPORT BY
ACCESS ECONOMICS PTY LIMITED

FOR

MULTIPLE SCLEROSIS AUSTRALIA

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GLOSSARY OF COMMON ABBREVIATIONS

ABS	Australian Bureau of Statistics
AIHW	Australian Institute for Health and Welfare
AMSLS	Australian Multiple Sclerosis Longitudinal Study
BEACH	Bettering the Evaluation and Care of Health
DALY	disability adjusted life year
DCIS	Disease Costs and Impact Study
AMSLS EIS	Economic Impact Study (a sub-study of the AMSLS)
GP	general practitioner
IFN	Interferon
MRI	magnetic resonance imaging
MS	multiple sclerosis
NOHSC	National Occupational Health and Safety Commission
PBS	Pharmaceutical Benefits Scheme
PPMS	primary progressive multiple sclerosis
QALY	quality adjusted life year
RRMS	relapsing remitting multiple sclerosis
SPMS	secondary progressive multiple sclerosis
VSL	value of a statistical life
YLD	years of healthy life lost due to disability
YLL	years of healthy life lost due to premature death

EXECUTIVE SUMMARY

Australia needs to move towards more positive public awareness of MS to enable improved community participation by people with MS, encouraging the health and general community to better understand the challenges of this disabling condition – both to reduce the levels of discrimination and disadvantage and to provide appropriate solutions.

- In 2005**, over 16,000 Australians** have MS, a chronic progressive and incurable neurological disease causing disability and premature death.
- MS has an onset in early adulthood and a lifelong impact. It is most frequently diagnosed in people between the ages of 20-40, a time of career building, relationship building and the early stages of family life.
- The constellation of long term disabling symptoms caused by MS, including extreme fatigue, immobility, vision disturbance, muscle weakness, chronic pain and executive cognitive impairment have a life changing effect on individuals, families and employers.
- People with MS, like others with a lifelong chronic illness, experience lower income levels than the general community.
  - 74% are women, and **87% are of working age**, since peak incidence is in the mid-twenties. 21% experience severe disability, 46% moderate disability and 33% mild disability, with life expectancy reduced by 6-7 years.
  - **MS has higher one-year prevalence than breast cancer, bowel cancer, sports injuries or poisoning**.
  - Prevalence is expected to grow 6.7% in the next 5 years, faster than population growth due to demographic ageing.

The total financial costs of MS in 2005 are estimated as over $600m (0.07% of GDP) and $37,333 per person with MS, or $30 per Australian, each year. Lost productive capacity and the replacement valuation of informal community care are the two largest cost components.

- **Informal care** for people with MS in the community from families and others, represents 43% of total costs (replacement costs are valued at $257.7m), with an average of 12.3 hours per week of informal care required per person with MS, based on data from the Australian MS Longitudinal Study (AMSLS).
- **Production losses**, which derived from reduced work hours, temporary absences, early retirement and premature death, are around 26.4% ($158.6m).
  - 3,195 people with MS will not work in 2005 due to the illness.
  - Of those who are employed, more will work part-time and far fewer full time, on a standardised basis, than in the general population.
- **Pharmaceuticals** for people with MS, mainly new generation interferons, are estimated to cost $84.1m in 2005 (14% of total costs).
  - These therapies have a strong evidence basis showing cost effectiveness in slowing progression and enhancing wellbeing and productivity for people with MS.
- **Nursing home** accommodation is around $25.8m (4.3%) in 2005.

- There are an estimated 730 people with MS in (high care) nursing homes in 2005, of whom 268 (37%) are younger people aged under 65.

- **Other health costs** – including hospitalisations, specialist and primary care and allied health, are $26.2m (4.4%).
  - Research is 1.9% of health expenditure, below the average of 2.4%.
- **Aids and modifications** for people with MS include walking aids, special kitchen and hygiene items, wheelchairs, ramps, car and home adaptations.
  - These were estimated to cost $27.8 (4.6% of total financial costs).
- **Formal community care services** cost $432 per person with MS according to early data from the AMSLS Economic Impact Study (EIS) – $7.0m (1.2%) overall.
- **Deadweight losses** arising from **taxation revenue foregone** and **welfare payment transfers** are estimated as $13.5m or 2.3% of total costs in 2005.

In addition, the burden of disease – the suffering and premature death experienced by people with MS – is estimated to cost an additional 8,968 DALYs (years of healthy life lost), with two thirds due to disability and one third due to premature death.

- **MS causes more disability and loss of life than all chronic back pain, slipped disks, machinery accidents, rheumatic heart disease or mental retardation**.
  - The disability weight for progressive MS is higher than for moderate dementia, AIDS, rheumatoid arthritis or severe hearing loss.
  - For relapsing-remitting MS, the disability weight is similar to that of a major depressive episode and over four times higher than that of chronic back pain.
- The **net disease burden in 2005 is equivalent to $1.34 billion** ($1.08-$1.59 billion), **over twice the financial costs**.[1]
  - **Altogether the financial and disease burden of MS is estimated to cost nearly $2 billion per annum**.

Challenges exist to reduce the costs of MS and enhance the quality and options for care. The age of onset of MS is generally in early adulthood and means that a significant number of people with MS are working, studying, starting families, or financially committed (eg, buying their first home).

- The first best solution from an economic and equity perspective involves policies that enable people with MS to **retain employment** where possible, while recognising the need to have a solid welfare response for those that cannot maintain employment due to health and mobility restrictions.
- Given the profile of financial costs, **support for informal carers** will be a key issue. In this study, the costs of residential care for people with MS have been found to be some 60% higher than for the replacement value of informal care, aids and modifications and support services from the formal sector, for people with MS residing in the community.

[1] This estimate is based on the value of a statistical life of $3.7m and a discount rate of 3.3%.

- **Young people in nursing homes** has become an endemic problem. Aged care is inappropriate for younger people for a variety of reasons and addressing the unmet need for appropriate accommodation must be a priority.
- **Timely and cost-effective health interventions** have the potential to retard growth in future direct and indirect costs of MS and enhance the quality of life of people with MS in Australia over the longer term. These include pharmacotherapies, psychosocial interventions (especially those provided without Federal funding through MS Australia), achieving better linkages between health and disability programs, developing care pathways across jurisdictional boundaries, health promotion programs, enhancing collaboration, meeting the special needs of disadvantaged groups (MS is over-represented in rural areas), and adopting innovative financing solutions.
- **Investment in research** is an important way of bringing about improvements in the overall understanding of the disease, treatments and ultimately a cure. A major challenge is the development of a critical mass in ethical MS research to increase new lines of investigation, opportunities for collaboration and commercialisation of new treatments and products in Australia – particularly in the areas of genetics, remyelination and nerve regeneration.
- **Improving community understanding and reducing discrimination** through formal sector education and training, targeted training and support for employers of people with MS or their carers as well as general community awareness. MS still carries stigma and mythology in the community, and the invisibility of symptoms contribute to poor acceptance in many settings.

To this end, this report makes the following recommendations.

1. Employment support: It is recommended that:

- a discrete policy focus is created within DEWR (covering Disability Open Employment sector and the Job Network) to develop programs aimed at retention and adaptation of existing jobs for people with MS and other chronic illnesses;
  - such programs should involve innovative strategies such as workplace environment adaptation, job restructuring or tailoring, part-time and flexible work-from-home options, and transport assistance, as appropriate;
  - rehabilitation and workers compensation models should be considered for integration into job retention policy and programs;
  - existing employer incentive schemes could be extended to include employers supporting workers with MS and other disabilities in job retention programs; and
- education and awareness strategies are developed to counter workplace misperceptions and discrimination against people with disabilities (including MS) and encourage employers and employees to identify and implement positive long term solutions.

2. Early intervention and health promotion: It is recommended that the range of specific health, wellness and self management programs for people with MS and their carers is extended to improve health and lifestyle outcomes for both groups, including:

- early access to cost-effective pharmacological and other therapies that will improve health outcomes and workforce participation; and

- a change in community perceptions and attitudes to MS so that the potential for positive strategies and outcomes is realised by employers, policy makers and the community.

3. Pharmaceuticals: It is recommended that the Federal Government fast track the process for expanding the PBS-listed indications for anti-fatigue and anti-convulsant therapies for people with MS that have strong clinical evidence. Access to these medications can improve the management of some of the most debilitating symptoms of the disease that prevent participation in employment and other forms of community life.

4. Community and residential care: It is recommended that:

- to improve efficiency and efficacy of community care programs, alternative and better coordinated models of care are established across the Commonwealth and State jurisdictions to result in more seamless, flexible and multidisciplinary care that is able to follow the course of the disease;
- to this end, formal protocols and transfer agreements need to be struck between Commonwealth/State disability and aged care programs to formalise service access and continuity for people with MS and similar progressive conditions with the aim of supporting people in the community and delaying residential placement for as long as appropriate;
- where residential accommodation is required, it is age-appropriate and incorporates specific care for disease related symptoms as well as disability support;
- the Council of Australian Governments (COAG) Health Working Group delivers a detailed plan for the move of younger people with disabilities out of aged care, incorporating the recommendations of the National Alliance of Young People in Nursing Homes for a national taskforce to undertake the initiative, in particular to:
  - develop services in every State and Territory to provide alternative housing and support options for a targeted number of younger people wishing to move out of nursing homes;
  - reduce further admission of younger people into nursing homes through the timely provision of flexible community service packages to ensure they are able to access choices about where they live;
  - build measures and resource allocation into the Commonwealth State Disability Agreement to specify funding responsibilities and ensure sustainable service delivery for the existing target group and those others at risk of inappropriate placement in aged care; and
  - make CSTDA services available to younger people with MS and other disabilities living in nursing homes.

5. Support and respite for informal carers: It is recommended that:

- additional recurrent funding is provided for design and delivery of support, education and respite services for informal carers of people with MS;
- the recent budget initiative for respite care to assist employed carers is expanded to target the carers of people with MS to ensure that respite services are introduced in a dignified and relevant manner, and will offer greater employment continuity to carers;

- the Commonwealth National Respite for Carers program and State disability programs fund shared care and respite services for carers and people with MS (and other young people with disabilities) that:
  - are lifestyle friendly, flexible and age-appropriate;
  - are available over the long term course of the disease; and that
  - offer improved case management input to ensure good planning and packaging of services.

6. Research: It is recommended that:

- the scope to address the relative under-funding of MS is reviewed with a view to bring research spending on MS up to the national average with investments directed through MS Research Australia; and
- a National MS Register is established from 2005 to bring together accurate ongoing data about MS incidence, prevalence, impacts and services into a national framework for data collection, with appropriate linkages to other existing MS databases and as a framework for research.

7. Collaborative Partnerships: It is recommended that the National Neuroscience Consultative Taskforce establish a Brain and Mind Research Alliance in line with the recommendations of the Prime Minister's Science, Engineering and Innovation Council Report from 2003 to, as a priority, implement strategies through a national action agenda to prevent, reduce or contain the chronic and debilitating consequences of neurological disorders. This could be facilitated by a national network of neurological associations.

8. Service capacity of MS Australia: It is recommended that the scope for Federal and State funding of the MS Societies be reviewed with a view to improving national infrastructure and service delivery capacity for Australians with MS, through the introduction of new services and improvement of existing responses in the following areas:

- carer education and support programs
- rural and remote outreach programs for people with MS and their families;
- employment support, job in jeopardy programs and employer education about particular methodologies around MS in the workplace;
- community education; and
- health promotion and self management programs.

9. Disadvantaged groups: It is recommended that MS services reflect the different needs of different groups of people, with equal and improved access for people with MS and their families and carers, in particular people who live in rural and remote regions of Australia and/or who are from culturally and linguistically diverse backgrounds, through:

- better and more appropriate use of smarter new technologies in diagnosis, treatment and referral; and
- specific attention to workforce development in outer metropolitan and rural locations for allied health workers capable of working with people with MS and similar progressive neurological conditions.

10. Financing issues: It is recommended that:

- Government consider less onerous and more consistent access to preserved superannuation lump sums for younger people with MS and other chronic illnesses, potentially from age 45 or 50 years, based on individual capacity assessments; and
- longer term intergenerational financing makes adequate provision to appropriately fund the growing community needs for health, ageing and disability services, in view of the demographic ageing and the projected expansion in prevalence of people with chronic disease and disability.

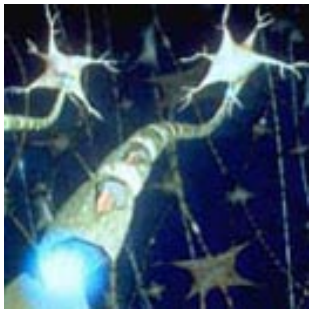
1. PREVALENCE AND SOCIOECONOMIC IMPACTS

1.1 EPIDEMIOLOGY AND AETIOLOGY[2]

1.1.1 WHAT IS MS?

Multiple Sclerosis (MS) is a chronic, relatively common and incurable disease that randomly attacks the central nervous system (brain and spinal cord).

MS is an inflammatory demyelinating condition. Myelin is a fatty material that insulates nerves, acting much like the covering of an electric wire and allowing the nerve to transmit its impulses rapidly. It is the speed and efficiency with which these impulses are conducted that permits smooth, rapid and coordinated movements to be performed with little conscious effort. In MS, the inflammation, breakdown and loss of myelin (demyelination) is accompanied by a disruption in the ability of the nerves to conduct electrical impulses to and from the brain and this produces the various symptoms of MS. The sites where myelin is lost (plaques or lesions) appear as hardened ('sclerotic' or scarred) areas: in people with MS these scars appear at different times and in different areas of the brain and spinal cord. The term 'multiple sclerosis' means, literally, **many scars**.



Symptoms of MS are unpredictable and vary greatly from person to person and from time to time in the same person. They may include: extreme tiredness (fatigue), tingling, numbness, impaired vision, loss of balance and muscle coordination, slurred speech, tremors, stiffness, bladder and bowel problems, difficulty walking, problems with memory and concentration, mood swings and, in severe cases, partial or complete paralysis.

Onset: 70% of cases begin between 20 and 40, with the average age being 30 and the peak incidence occurring in the mid-twenties, although rare individuals as young as 2 and as old as 75 have developed it.

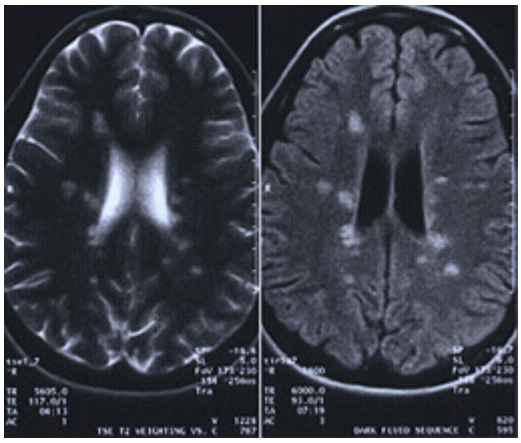
Progression: There are two distinct patterns of prognosis (Patwardhan et al, 2005):

- **Relapsing/remitting (RRMS):** About 80% of people with MS have a form in which neurological symptoms and signs typically evolve over a period of several days, stabilise, and then often improve spontaneously within weeks.
  - However, over time, signs and symptoms of central nervous system dysfunction persist after relapses, or progression occurs between relapses; this pattern is called **secondary progressive (SPMS)**.
- **Primary progressive (PPMS)**: In about 20% of patients, a progressive course is apparent from onset.

The progress, severity and specific symptoms of the disease cannot be predicted.

[2] Picture and epidemiological descriptions in this section are from the Multiple Sclerosis International Foundation, www.msif.org/en/ ms_the_disease/what_is_ms.html , unless alternatively sourced.

Diagnosis: The peculiar nature of MS makes the diagnostic process complex, requiring a combination of neurological exams, medical and laboratory tests and imaging to eliminate other possible disorders and confirm MS. Elusive symptoms that come and go might indicate any number of possible disorders and can be very difficult for general practitioners (GPs) to interpret. MS diagnosis should thus be made by a physician experienced in identification, and on objective evidence from two or more neurologic signs that occur in different parts of the central nervous system, last at least 24 hours, and are at least three months apart. As well as symptoms that indicate injury to more than one part of the central nervous system, laboratory tests can be helpful in showing abnormal findings consistent with a diagnosis of MS. **Magnetic resonance imaging** (MRI) with gadolinium contrast, especially during or following a first attack, can be helpful in providing evidence of lesions in the brain and spinal cord. A second MRI scan may be useful at least three months after the initial attack to identify new lesions and provide evidence of dissemination over time (Calabresi, 2004). Newer MRI technologies have added greatly to diagnostic capacity (see below).



MS diagnosis with advanced Open MR system, image courtesy of Siemens Medical Systems
T2 image on the left and new Turbo-FLAIR image on the right.[3]

Differential diagnosis: Other diseases that can mimic MS must be excluded, including vascular disease, spinal cord compression, vitamin B12 deficiency, central nervous system infection (eg, Lyme disease, syphilis), and other inflammatory conditions (eg, sarcoidosis, systemic lupus erythematosus, Sjögren's syndrome) (Calabresi, 2004).

Because of the frequent difficulty of diagnosing MS, in 2001 the International Panel on Diagnosis of MS formalised the inclusion of MRI and made other refinements to formulate what are now called the 'McDonald criteria' for diagnosis (McDonald et al, 2001). Since that time, the McDonald criteria have been widely used and tested in a variety of research settings.

1.1.2 AETIOLOGY

The overall cause of MS is still unknown. The body's immune system normally defends the body from attack by viruses or bacteria. However, in the case of MS, the body's immune system attacks its own myelin, causing disruption to nerve transmission. It is thought that genetic and environmental factors are involved – but

[3] Description and picture reproduced from www.imaginis.com/ multiple-sclerosis/mri-and-ms.asp

the actual trigger to the disease has not yet been discovered. Interestingly, some studies report a lower risk for MS in people with asthma and allergies, suggesting that the immune imbalances causing these conditions may protect against the immunological processes leading to MS.

Risk factors for MS include:

Gender: In Australia, about three times as many women as men have MS. This gender bias may be related to variation in a gene that controls a powerful immune messenger chemical called *interferon (IFN) gamma*.[4] There are also many demonstrated links between MS and the sex hormones – testosterone and oestrogen (eg, helping to explain why pregnant women with MS do not have relapses).

Genetic factors: Studies indicate that genetic factors may make certain individuals more susceptible to the disease, but there is no evidence that MS is directly inherited. New research continues to uncover genes involved in MS (Zhang et al, 2005). The risk for someone inheriting all the genetic factors contributing to MS is only about 2% to 4%. Nevertheless, when siblings have the disease, they are more likely to have the same degree of severity. Among identical twins the risk is about 25% to 30%.

Ethnicity: MS occurs more commonly among Caucasians, especially those of northern European ancestry, but people of African, Asian and Hispanic backgrounds are also affected.

Geography: MS prevalence increases with distance from the equator in both hemispheres. Specifically, prevalence is highest in northern and central Europe (except northern Scandinavia), Italy, southern Australia, and northern regions of North America. Middle-risk areas are southern Europe (except Italy), southern US, northern Australia, northern Scandinavia, the Caucasian sections of South Africa, and possibly Central America. Low-risk areas include tropical parts of Africa and Asia, the Caribbean, Mexico, and possibly northern South America. It is unclear whether this pattern is attributable to environmental factors – **sunlight (vitamin D, UV radiation)** – genetics, or both.

Smoking: A single new research study suggests that smoking may increase the risk of MS for those who do not yet have it, and increase the risk of converting to secondary progressive, versus a non-smoker with RRMS (Hernan et al, 2005).

Cow's milk during early infancy: Breast milk contains factors that may help regulate immune responses; there is some evidence that infants fed only on cow's milk may have higher risk for either MS or diabetes type 1 later in life. Studies on national differences in diabetes indicate risk may vary with different milk proteins, suggesting that not all cow's milk is identical and some proteins carry higher risks than others.

A large amount of research has been directed towards whether the geographical distribution of MS is due to environmental or genetic factors. Poser (1994) suggested

[4] Unlike interferon betas, which are used to treat MS, IFN gamma has been linked to immune attacks in MS, and preliminary findings suggest this variant may be more frequent or more active in women than men. IFN gamma appears to be a new key variable – perhaps one piece in a puzzle – in understanding who gets MS. People who have a gene that produces high levels of IFN gamma may be predisposed. This finding provides a possible target for further investigation (Jan. 27 online publication of *Genes and Immunity*).

that the geographic hypothesis is explained by the migration of ethnic groups with a particular susceptibility to MS. Migration studies have found that groups who migrate from a high prevalence area to one of low prevalence often exhibit higher rates of MS prevalence than the indigenous population (Compston and Robertson, 1998). In 1981 the prevalence of MS in English-born residents of Perth and Hobart was considerably higher than Australian-born residents (Hammond et al, 1988b) but not in Queensland (Hammond et al, 1987). However, this can depend on the age of migration. MS among people who migrated as children is usually much closer to that of the native-born population, suggesting that environmental factors can moderate the impact of a genetic susceptibility to MS. Australian studies into the difference in prevalence among Australian-born and overseas-born residents suggest these modifying factors may even extend well into adulthood (Hammond et al, 1987; Hammond et al, 1988b).

Miller et al (1990) found that while prevalence and mortality rates of MS in Australia and New Zealand were strongly correlated with latitude there was no statistically significant correlation of proportion of Mc/Macs in the phone book (a crude proxy for Scottish ancestry) or frequency of DL2 (an antigen most closely associated with MS) with latitude. They concluded that environmental factors were more likely to explain variations in MS prevalence across Australia.

Other authors commenting on the "place or race" debate conclude that both factors have a role to play in explaining MS prevalence (Sawcer et al, 1997).

The cause(s) of MS remains a mystery. Genetic factors play a role but no single gene is likely to be responsible for causing MS. Rather, the most popular current theory is that the disease occurs in people with a genetic susceptibility who are exposed to some environmental assault (a virus or a toxin) that disrupts the blood-brain barrier. Immune factors converge in the nerve cells and trigger inflammation and an autoimmune attack on myelin and axons. A number of disease patterns have been observed in MS patients leading some experts to believe that MS may represent several diseases with different causes.

Genetic factors probably play a role in making a person susceptible to the disease process leading to MS. But the risk for someone inheriting all the genetic factors contributing to MS is less than 5%. Advanced techniques called microarray technologies are now making it feasible to scan hundreds of genes and identify those most likely to be contributors to MS.

Infectious Agents, likely viruses, are the top suspects for triggering the autoimmune response in people genetically susceptible to MS. There are a number of reasons for this belief including clusters of historical MS outbreaks and the fact that some viruses are very similar to the myelin protein and may thus cause confusion in the immune system.

Infectious Agents Under Suspicion. Micro-organisms at the top of the suspect list are, or have been: herpes virus 6, Chlamydia Pneumoniae, Epstein-Barr virus, measles virus, adenovirus, polyomavirus, and the retroviruses (including HIV). Research has ruled out a link between vaccinations and relapses of MS.

Adapted from the University of Maryland Medical Centre site: "What causes MS?" **www.umm.edu/patiented/articles/what_causes_multiple_sclerosis_000017_4.htm**

1.1.3 MORTALITY AND CO-MORBIDITY

With modern medicine and technology, people with MS can be expected to live 90-95% of the normal life span (six or seven years less than average). However, in about half of MS cases, patients die from complications of the disease. MS also has significant negative emotional and physical consequences, and suicide rates are much higher than in the general population.

Women tend to have a better outlook than men. Factors that determine a higher risk for a severe condition include:

- being over 40 years old at the time of onset of symptoms;
- initial symptoms affecting either motor control, mental functioning, urinary control or multiple regions;
- frequent attacks in the first years or a short interval between the first two attacks; and
- remissions not complete; rapid progression of disability; or progressive MS from the beginning or shortly after onset.

MS mortality rates are higher in countries with a greater prevalence of MS (Kurtze 1997, p95). Several studies have looked at mortality rates associated with MS patients in Australia. Hammond et al (1989) showed that mortality rates also reflect the geographical prevalence of MS. Two methods are commonly used:

- the **indirect** method: based on ABS mortality figures, the method captures only those deaths where the main underlying cause of death was MS; and
- the **direct** method: based on recorded deaths from survey records (such as neurologists' records), the method captures all deaths of people with MS, whether due to MS or another co-morbidity.

The 1981 Queensland study (Hammond et al, 1987) found that mortality rates constructed using the indirect method were higher than those using the direct method, probably due to less comprehensive data collections for the latter. They also found a similar geographic pattern in mortality rates to those found in prevalence data, with higher mortality rates in the more southern areas of the State. Moreover, the study found a fall in ABS mortality rates from 1950-59 to 1971-80, which suggested that an increase in the survival rates from MS contributed to some of the increase in prevalence.

TABLE 1-1: MS MORTALITY RATES, QUEENSLAND 1981 (PER 100,000)

	Indirect	Direct
Above tropics	0.21	0.05 (0.06)
Below tropics	0.41	0.36 (0.35)
All of Queensland	0.34	0.29 (0.28)

Source: Hammond et al (1987), p.197, Table 12. Rates in parentheses are age-standardised to the 1981 Australian population.

Another study looked at patterns of co-morbidity in hospitalised patients with MS over the age of 65. Discharge diagnoses for urinary tract infection, pneumonia, septicaemia and cellulitus were more common for MS patients than an age and sex matched control group. MS patients were less likely to have discharge diagnoses of acute myocardial infarction, heart failure, hypertension, angina pectoris, cerebrovascular disease, diabetes mellitus and chronic obstructive pulmonary disease. Possible explanations given for this included under-reporting of certain co-morbid conditions, a protective effect of MS or its treatment, reduced prevalence of risk factors, disproportionate mortality in younger MS patients with co morbidity and the benefits of medical surveillance (Fleming and Blake, 1994).

Depression: Between 40% and 60% of MS patients suffer from depression at some point over the course of the illness, and studies have reported risks for suicide ranging from 3% to 15%. There is some evidence that depression in MS is not only due to the social and psychological impact of MS but to the disease process itself. Furthermore, in one study, depression had biological effects (increasing production of inflammatory cytokines) that could exacerbate MS. Treating depression thus may help reduce the disease process and suicide risk. People at highest risk for suicide are those who live alone, those with a history of an emotional disorder (e.g., depression, anxiety, alcohol abuse), a family history of mental illness, and people with high social stress (Fleming et al, 1994).

1.2 TREATMENT AND MANAGEMENT

1.2.1 PREVENTION AND EARLY INTERVENTION

Advances in understanding and treating MS are occurring and research to find a cure is encouraging. For example, Australian research (from the Menzies Centre for Population Health Research) suggests that sun exposure during childhood and early adolescence (particularly during winter) may reduce risk of MS, consistent with the recognised observation that MS is more common at latitudes with lower levels of ultraviolet radiation, vitamin D or both (Van der Mei et al, 2003). The study suggested that an additional one hour of winter sun may confer risk reduction for children aged six to 15 years, while noting issues related to skin cancer.[5] Vitamin D supplementation is also under investigation; Hayes (2000) recommends providing supplemental vitamin D to individuals who are at risk for MS.

Evidence now strongly suggests that the most destructive changes from MS in the brain occur very early on in the disease process and may cause considerable damage even before symptoms begin. Earlier diagnosis with new MRI technology, together with access to evolving treatments, offers the promise of more effective early intervention strategies for MS (Frohman et al, 2003). Many experts are now urging treatment after a first episode of relapsing MS (a clinically isolated syndrome) using disease-modifying agents, particularly where specific findings from advanced MRI techniques can help determine which patients are at highest risk for progression. Quality primary and specialist (neurologist) care are very important to comprehensive and effective management of MS. Many therapeutic and technological advances are helping people with MS lead more productive lives by modifying the underlying disease course as well as by providing learning strategies to help them cope with the many changes brought on by the disease. As such, treating patients early on can save money over time by preventing severe disability.

[5] Higher sun exposure for children aged 6-15 years in *summer* (average 2-3 hours or more a day during weekends and holidays) was also associated with a decreased risk of MS (adjusted odds ratio 0.31, 95% confidence interval 0.16 to 0.59), although not apparently as important as higher exposure in winter. Greater actinic (radiant) skin damage was also independently associated with a decreased risk of MS (0.32, 0.11 to 0.88).

1.2.2 PHARMACOLOGICAL MANAGEMENT

Maintenance Treatment for Relapsing-Remitting Multiple Sclerosis (RRMS)

Since 1996 four medications (Betaferon, Copaxone, Rebif and Avonex) have been approved in Australia and are available under the Pharmaceutical Benefit Scheme for relapsing forms of MS. They can help to lessen the frequency and severity of MS attacks, reduce the accumulation of lesions in the brain, and have also been shown to slow the progression of disability.

Interferons and other disease-modifying agents can have side effects and are expensive. Also, many patients have a mild course that can be managed with less toxic agents. However, strong evidence suggests that delaying treatment in most MS patients increases the risk for severe disability.

Corticosteroids may be used to treat an acute relapse and hasten recovery. Some research has reported benefits from the use of pulsed administration of intravenous methylprednisolone or intravenous immunoglobulin. Sometimes this is followed by oral prednisolone. Another agent showing promise is azathioprine, an immunosuppressant.

Treating Secondary Progressive Multiple Sclerosis (SPMS)

It is not clear if interferons and other standard treatments for RRMS help those whose condition has become continuously progressive. Mitoxantrone, an immunosuppressant, may delay relapse and progression in SPMS although side effects may sometimes be serious. Other immunosuppressants, such as cyclophosphamide, methotrexate and cladribine, may help some patients with SPMS. They can have toxic side effects, however, so there must be clear treatment indications.

Treating Primary Progressive Multiple Sclerosis (PPMS)

No treatments have been proven yet to slow primary progressive MS. Studies using interferons and glatiramer are underway.

In addition to the medications above, there is a wide range of therapies available to treat symptoms of MS such as spasticity, pain, fatigue and weakness, bladder dysfunction and depression.

Experimental Agents: Other agents under investigation for MS include monoclonal antibodies, aminopyridines, cannabinoids, oestrogen and statins.

1.2.3 PSYCHOSOCIAL AND OTHER HEALTH INTERVENTIONS

Psycho-social interventions: Diagnosis of MS can provoke a range of feelings – such as disbelief, anger, fear, depression, grief, loss and guilt. Appropriate counselling can be very helpful for the individual and the family to come to terms with emotions and to learn how to adjust and cope, retaining dignity and self-esteem. Psycho-education can help the person and their family learn to manage certain symptoms and can help prevent secondary morbidity such as depression or anxiety. Participation in support groups can also be very helpful, organised in each State and Territory by community organisations such as Multiple Sclerosis Australia. Peak community bodies meet a wide range of needs, including information and resources, support and education programs, referral services, family carer training and support (eg, through courses, seminars and respite) and advocacy.

Other health professionals: Physiotherapists, occupational therapists, speech therapists, mental health workers (eg, psychiatrists and psychologist), social workers, dieticians, continence advisers and urologists can all form part of a comprehensive case treatment plan for a person with MS, including for co-morbid conditions such as depression.

1.2.4 OTHER AND ALTERNATIVE INTERVENTIONS

Non-pharmacological experimental agents include:

Plasmapheresis: a procedure in which blood is removed from the body, blood cells are separated from plasma and mixed with replacement plasma, which is then returned to the body. The replacement plasma is thought to dilute antibodies and other immunologically active substances that may trigger MS.

Oligodendrocyte implants: a new minimally invasive method to transplant modified oligodendrocyte cells, which stimulate nerve and axon growth, directly into the brain.

Stem cell transplantation: stem cells are produced in the bone marrow and are the early forms for all blood cells in the body; adult stem cell transplantation may possibly slow progression.

Non-traditional treatments

Nearly 60% of MS patients try some form of alternative remedies[6] such as:

- relaxation and meditation such as music therapy and massage therapy;
- electromagnetic stimulation;
- the "Codi-Loder regimen" of vitamin B12, lofepramine (a tricyclic antidepressant), and L-phenylalanine (an amino acid available in health stores);
- linoleic acid (evening primrose oil), a polyunsaturated fatty acid; and
- oral enzymes (including bromelain, trypsin, papain and rutin) appear to reduce inflammation.

Research on any benefits is slim and there may be some danger with many remedies commonly used by MS patients:

- antioxidant vitamins or supplements (eg, A, E, C, Q10, pycnogenol, grape seed extract) can trigger T-cells and inflammatory components of the immune system;
- gingko – low but increased risk for bleeding and convulsion at high doses and interaction with other agents;
- bee venom – contains many chemicals, some of which can cause severe and sometimes deadly allergic reactions in some people; and
- other herbal or natural remedies (echinacea, ginseng, garlic, zinc, melatonin, borage seed oil, chaparral and comfrey) may exacerbate MS.

[6] For greater detail see **http://www.morehead.org/wellconnected/000017_9.htm**. 60% relates to lifetime 'prevalence' and is an American figure, in the absence of a current Australian alternative.

1.3 PREVALENCE

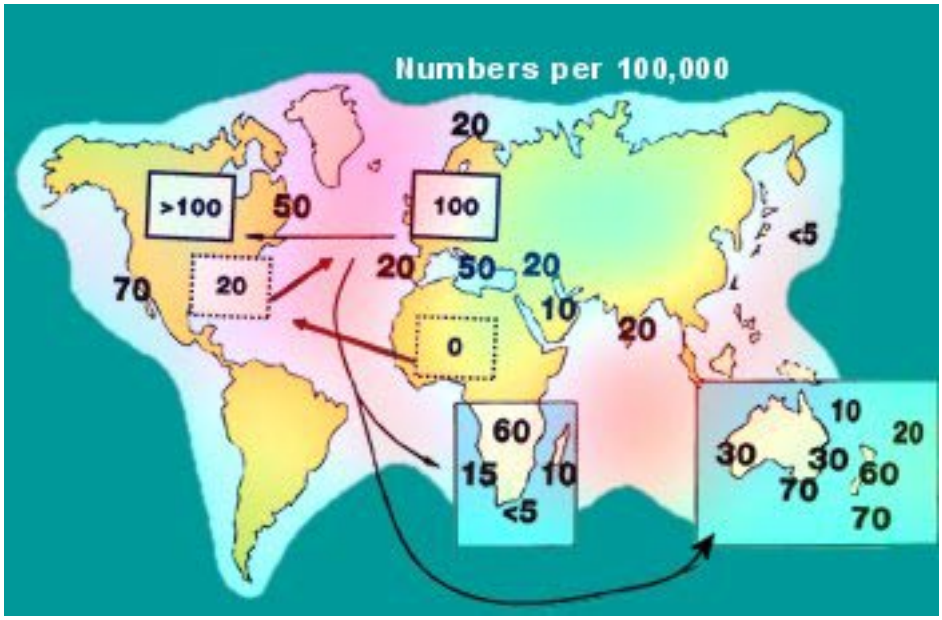
1.3.1 PREVALENCE RATES

An estimated 2.5 million people in the world have MS. There have been a large number of studies of the prevalence of MS around the world. Despite this, obtaining reliable and detailed estimates of the total number of people with MS in Australia today is very difficult. There are several reasons for this.

- MS is a low prevalence condition, so survey samples are often very small and hence more susceptible to sample error.
- There is no simple diagnostic test for MS, so even multiple case ascertainment methods may not fully capture all cases of MS in the study population.
- The increased prevalence of MS at latitudes further from the equator makes it difficult to extrapolate prevalence estimates for one region of Australia to other areas.
- In areas which have been repeatedly surveyed over the last 50 years, prevalence appears to be increasing, but the most recent published studies of prevalence in Australia are almost ten years old.

As Figure 1-1 shows, there is a general tendency for greater prevalence of MS at locations further from the equator. The possible explanations for this latitudinal gradient were discussed in Section 1.1.2 above.

FIGURE 1-1: WORLDWIDE PREVALENCE OF MS



Source: The Multiple Sclerosis Research Initiative world map, downloaded 18 April 2005 from **www.thisisfolkestone.co.uk/ms/maps/map.htm**

Throughout the world, the prevalence of MS also appears to be increasing over time. It appears that the observed increase in prevalence of MS may reflect a real increase in the incidence of the disease, as well as the impact of other factors such as better diagnostic testing (including MRI) and case ascertainment or increased survival rates. Studies in North America, Scandinavia and Sardinia have concluded that observed

increases in incidence are real, and not the result of methodological issues, but others in the UK rejected this hypothesis (Riise, 1997, p5-7). Noonan et al (2002) observed a particularly significant trend increase in incidence of MS for women.

Australian Studies

There has never been a nation-wide census of MS prevalence in Australia. However two large-scale prevalence studies have been undertaken in Australia. The first was in 1961, and the second 20 years later in 1981 (Hammond et al, 1987; Hammond et al, 1988b; McLeod et al, 1994). No published study appears to have been undertaken to coincide with the 2001 census date. Both of these studies looked at localised prevalence in various Australian towns and cities, with the primary aim to see if prevalence varied according to latitude and/or the ethnic background of the community. The surveys used a number of methods of case ascertainment, including the records of hospitals, specialists and general practitioners and the MS Society in each region.

More recent localised surveys were undertaken in August 1996 for the Australian Capital Territory (Simmons et al, 2001) and Newcastle (Barnett et al, 2003). Previous studies had suggested that prevalence in Newcastle could be used as a reliable proxy for prevalence throughout New South Wales, without the expense of a more comprehensive survey (McLeod et al, 1994). A longitudinal study of MS in Southern Tasmania was also commenced in 2002, although no results have yet been published.

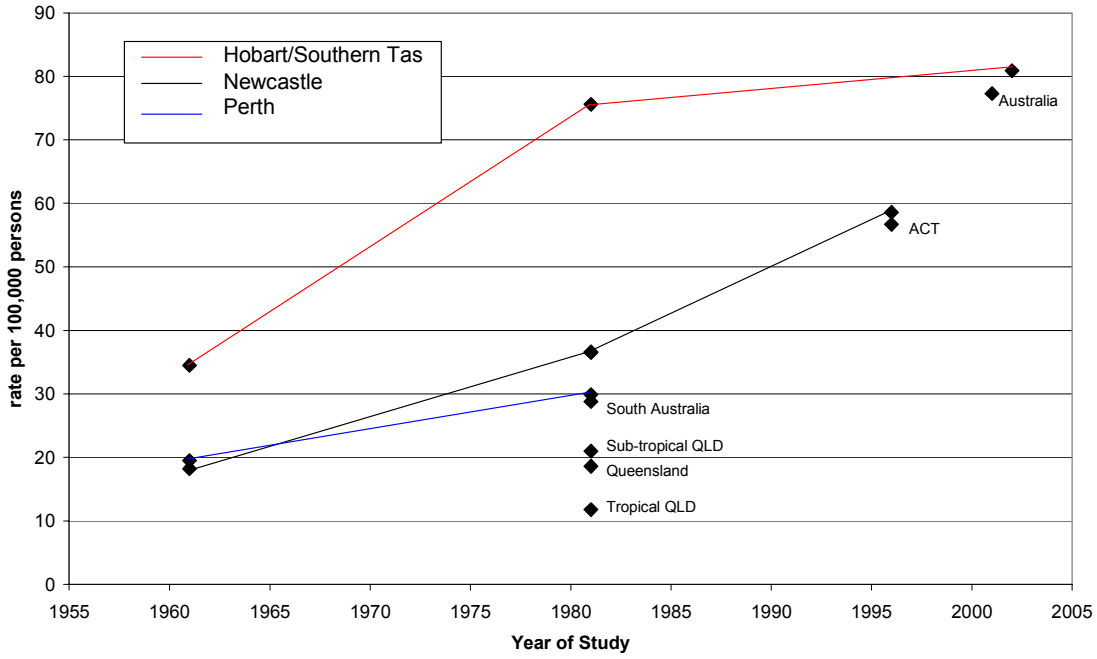
The 2001 ABS National Health Survey, a community based survey of self-reported prevalence, estimated there to be around 14,900 Australians with MS, equivalent to 0.08% of the Australian population in 2001, or 77.3 cases per 100,000 people. However, due to the very small sample size (n=23) it is not possible to disaggregate this total figure into age, gender or location specific prevalence rates.

Summarised results from the Australian studies are presented in Table 1-2 and Figure 1-2.

TABLE 1-2: MS PREVALENCE RATES FROM SELECTED AUSTRALIAN STUDIES

per 100,000 pop	Newcastle			Perth	Hobart	ACT	Australia	Southern Tasmania
	1961	1981	1996	1981	1981	1996	2001	2002
Males	16.5	24.6	33.1	16.0	52.6	29.6		
Females	19.9	48.1	83.4	43.6	96.4	72.1		
Persons	**18.2**	**36.5**	**58.6**	**29.9**	**75.6**	**51.1**	**77.3**	**80.9**

FIGURE 1-2: MS PREVALENCE RATES, AUSTRALIA, 1961 – 2002



These Australian studies have demonstrated the following trends.

- A latitudinal gradient with higher frequency of MS in southern areas. Populations located at latitudes greater than 40°S report prevalence rates more than twice those for people living in northern States (Miller et al, 1990).
- A significant increase in prevalence over time, although it is not clear the extent to which this reflects better case ascertainment or differential migration of people from high risk populations (Hammond et al, 1987; Hammond et al, 1988b).
  - Prevalence in Newcastle has risen by 272% for females and 74% for men from 1961 to 1996 (Barnett et al, 2003). The rise was attributed to increased incidence, particularly among females, and to increased survival rates.
  - The 1996 study of prevalence in the ACT found unexpectedly high levels of MS, compared to results then available (1981) of prevalence in Newcastle, a city of similar latitude. Subsequent publication of MS prevalence in Newcastle (Barnett et al, 2003) during 1996 in fact shows very similar results between the two cities at the later date.

Age-specific prevalence rates from the two 1996 surveys are set out in Table 1-3 below.

TABLE 1-3: AGE-SPECIFIC PREVALENCE RATES, 1996

	Newcastle, 1996						ACT, 1996					
	Male		Female		Person		Male		Female		Person	
	pht	n	pht	n	pht	n	pht	n	pht	n	pht	n
10-19		0		0		0	0	0	4.3	1	2.1	1
20-29	17	2	26	3	21.4	5	21.9	6	25.7	7	23.8	13
30-39	69.5	7	92.5	9	80.8	16	51.9	13	134.7	35	92.1	47
40-49	34.3	3	165.8	14	98.9	17	71	17	184.2	46	128.8	63
50-59	49	5	221.5	14	150.2	19	60.3	9	194.6	28	119.4	37
60-69	55.9	3	161.3	10	112.4	13	61	5	72.2	6	66.7	11
70+	31.3	2	71.9	7	55.8	9	0	0	34.3	3	28.2	3
Total	**33.7**	**22**	**83.7**	**57**	**59.1**	**79**	**32.2**	**50**	**82.5**	**126**	**57.1**	**176**
AS Total	***33.1***		***83.4***		***58.6***		***32.8***		***79.9***		***56.7***	
95% CI	20.6-50.2		62.9-108.4		46.3-73.2		22.7-46.2		63.4-99.2		43.1-74.1	

Source: Barnett et al (2003), Simmons et al (2001). 'AS Total'= age-standardised. 'pht' = per 100,000.

Taking a simple average of these two most recent detailed studies suggests a prevalence rate of 33.0 per 100,000 for men and 83.1 per 100,000 for women. Applying these average rates to the Australian population in 2001 would suggest around 11,480 people had MS – somewhat less than the number reported in the 2001 National Health Survey.

Because of the strong latitudinal gradient present in previous Australian studies, using the average from the 1996 studies may overstate prevalence in the northern States and understate prevalence in the more southern States. One possible way to induce differential prevalence rates for different States is to scale the 1996 Newcastle prevalence rates up or down in proportion to observed differences in prevalence in the 1981 studies. However it is not at all clear that these proportions would accurately represent differences in prevalence in 1996. Comparisons of the differentials in the 1961 and 1981 surveys are quite different, as shown in the table below. There are also missing data points. It is not clear whether Victoria, which is situated between 35°S and 40°S and accounts for around 24% of the total Australian population, should have an imputed prevalence rate closer to that of Perth and Newcastle (30°S to 35°S) or of Hobart (40°S to 45°S).

TABLE 1-4: GEOGRAPHIC VARIATIONS IN MS PREVALENCE, AUSTRALIA, INDEX RELATIVE TO NEWCASTLE

Location	1961	1981
Newcastle	1.00	1.00
Perth	1.01	0.82
Hobart	1.63	2.07
Queensland	0.44	0.51
NSW	-	1.00
SA*	1.85	0.79

For this study, Access Economics has generated imputed age-specific prevalence rates for the Australian population as a whole for the year 2001 (see Table 1-5). These prevalence rates are based on the two 1996 studies which surveyed Australians living in the middle latitude areas but several adjustments have been made.

- The first adjustment was to remove the fluctuating pattern in prevalence among middle aged males (20-29 to 40-49 cohorts). This was necessary to remove the fluctuations present in the 1996 Newcastle prevalence estimates which are most likely a result of small sample size. In this study prevalence for men peaks in the 30-39 age group, and then falls over 50% among 40-49 year olds. This would suggest that men are dying or recovering from MS in middle age, which is not likely to represent a true approximation of disease progression.
- Secondly, prevalence rates for each age-gender cohort were scaled up by a factor of 1.312 so that, when applied to the 2001 Australian population, the total number of Australians with MS equalled that reported in the 2001 National Health Survey (14,900). The implicit assumption being made here is that between 1996 and 2001 the prevalence of MS has increased due to some combination of increased incidence, better diagnostic techniques and longer survival rates for people with MS. This scaling also accounts for the greater concentration of Australia's population in urban areas south of Newcastle, where prevalence is likely to be higher following the North-South gradient.

TABLE 1-5: PREVALENCE RATES FOR COSTING PURPOSES

Age Group	Male per 100,000 pop	Female per 100,000 pop
10-19	0.0	5.6
20-29	25.5	33.9
30-39	68.1	149.0
40-49	69.1	229.6
50-59	71.7	273.0
60-69	76.7	153.2
70+	20.5	69.7

The difference between prevalence rates in the original 1996 studies and Access Economics' imputed rates for 2001 can be seen in Figure 1-3 (females) and Figure 1-4 (males), taking into account the increased prevalence trends over time.

FIGURE 1-3: COMPARISON OF AGE-SPECIFIC PREVALENCE RATES, FEMALES

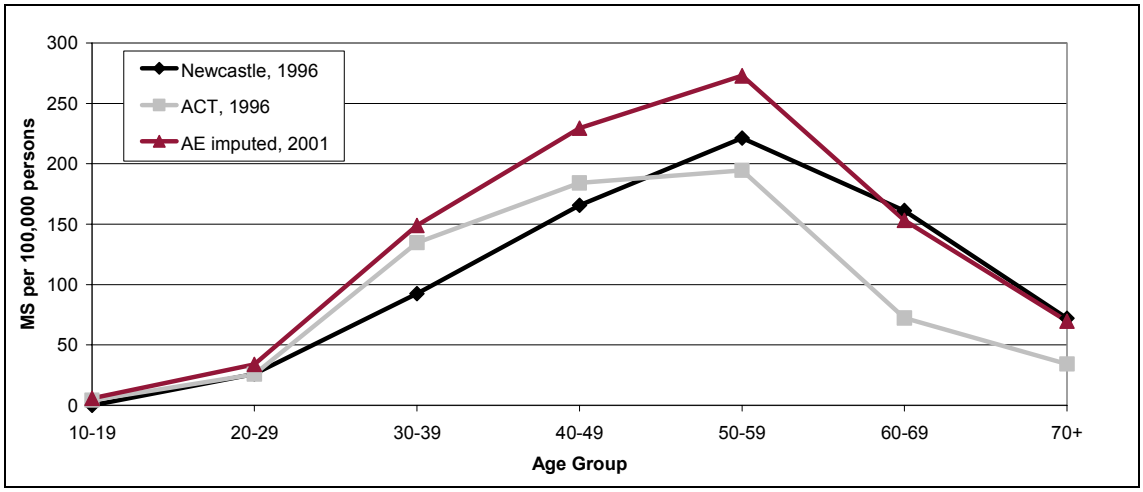
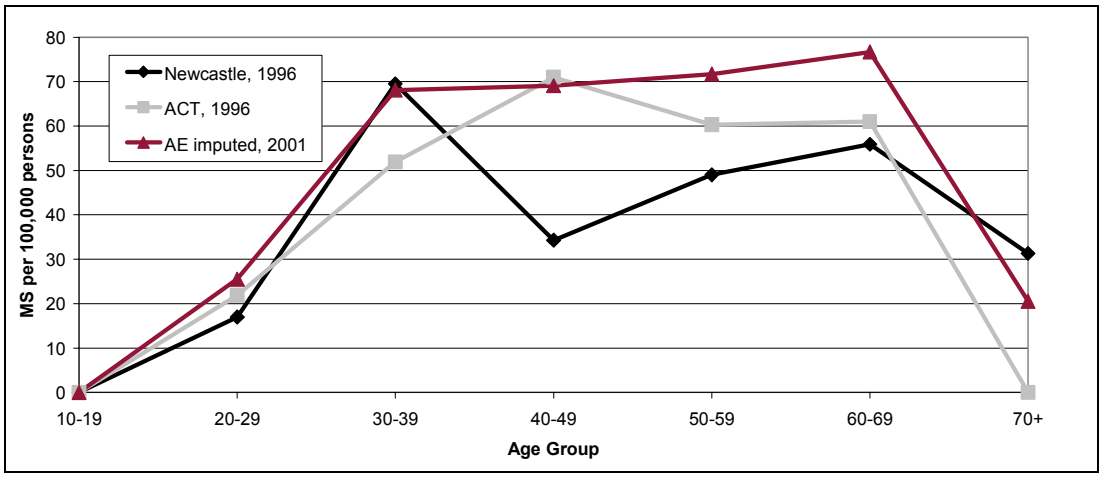


FIGURE 1-4: COMPARISON OF AGE-SPECIFIC PREVALENCE RATES, MALES



1.3.2 PREVALENCE ESTIMATES AND PROJECTIONS

Estimates of MS prevalence in 2005 and projected prevalence in 2010 and 2020 are made on the basis of the imputed age-specific prevalence rates set out in Table 1-5 above and presented in Table 1-6.

TABLE 1-6: MS PREVALENCE BY AGE AND GENDER, AUSTRALIA, 2005, 2010, 2020

	2005	2010	2020
Male			
0-19	-	-	-
20-29	359	377	391
30-39	1,009	1,010	1,072
40-49	1,029	1,050	1,069
50-59	925	989	1,087
60-69	660	822	1,021
70+	167	193	285
Total	**4,150**	**4,441**	**4,925**
per 100,000	***41.14***	***41.94***	***42.76***
Female			
0-19	147	145	140
20-29	469	491	505
30-39	2,246	2,236	2,345
40-49	3,462	3,524	3,574
50-59	3,539	3,840	4,197
60-69	1,316	1,651	2,122
70+	752	833	1,143
Total	**11,931**	**12,721**	**14,026**
per 100,000	***116.52***	***118.43***	***120.17***
Persons			
0-19	147	145	140
20-29	829	868	896
30-39	3,256	3,247	3,417
40-49	4,491	4,574	4,643
50-59	4,464	4,828	5,284
60-69	1,976	2,474	3,143
70+	919	1,026	1,428
Total	**16,081**	**17,162**	**18,952**
per 100,000	***79.12***	***80.45***	***81.72***

- **There are estimated to be 16,081 people with MS in 2005, increasing to 17,162 people (up 6.7%) by 2010 and to 18,952 people (up 10.4% from today) by 2020**.
- **74% of all Australians with MS are female**.
- **87% of Australians with MS are of working age** (15-64 years), which is projected to decline a little to 84% by 2020.
  - Over half of Australians with MS are aged 40-59 (56% now falling to 52% by 2020).
  - Senior Australians (aged 60 and over) with MS will increase from 18% to 24% of the total in the next 15 years, while the share of younger people (under 40) with MS will decline from 26% to 24%.

It should be noted that these estimates only allow for changes in the demographic makeup of the Australian population over the next 15 years; the imputed age-gender prevalence rates from 2001 are thus assumed to remain constant thereafter.

The age-gender distribution in 2005 is illustrated in Figure 1-5, while the change in the age distribution is highlighted in Figure 1-6.

- There will be more than 50% growth in the number of people with MS aged over 60, over the next 15 years.
- In contrast, the number of people aged 0-19 is projected to fall over the forecast horizon.

FIGURE 1-5: MS PREVALENCE BY AGE AND GENDER, 2005

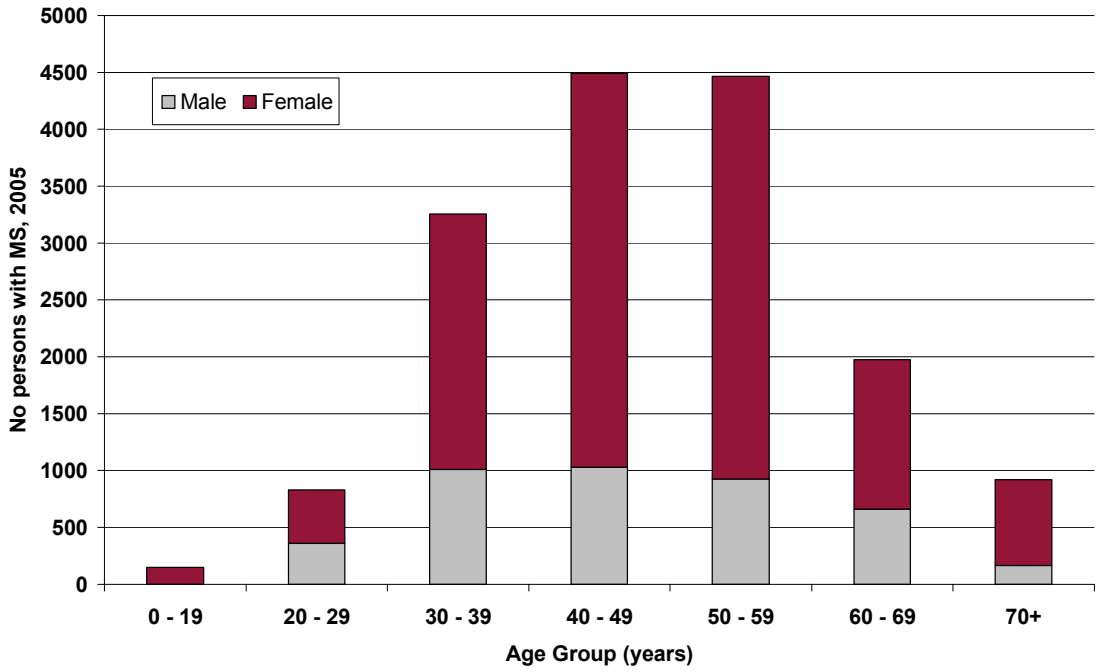
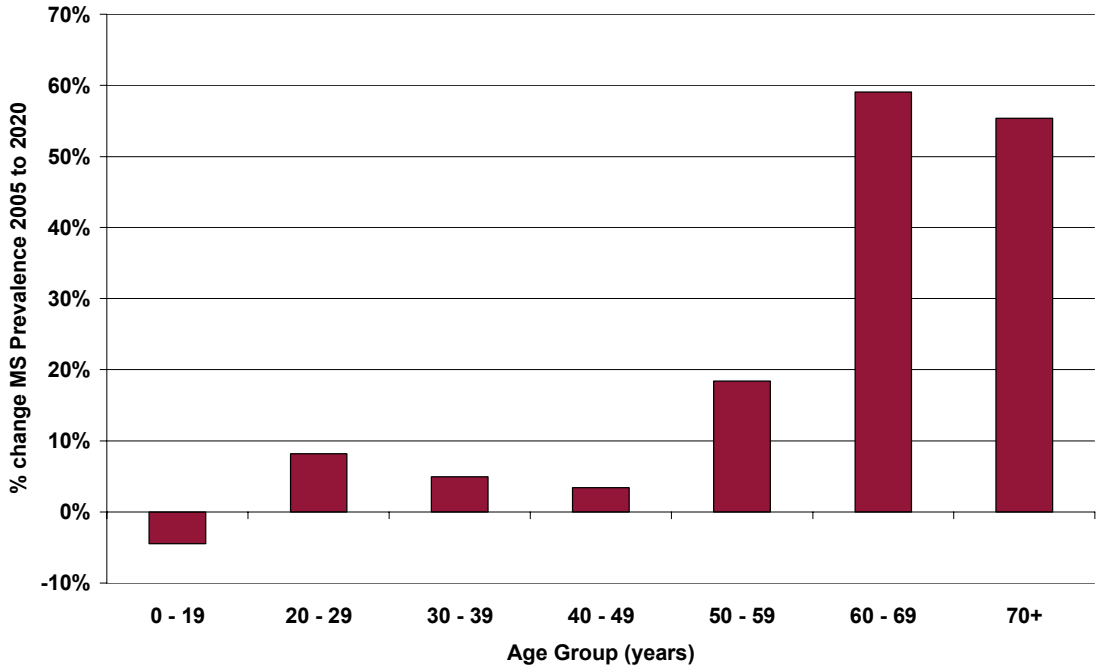
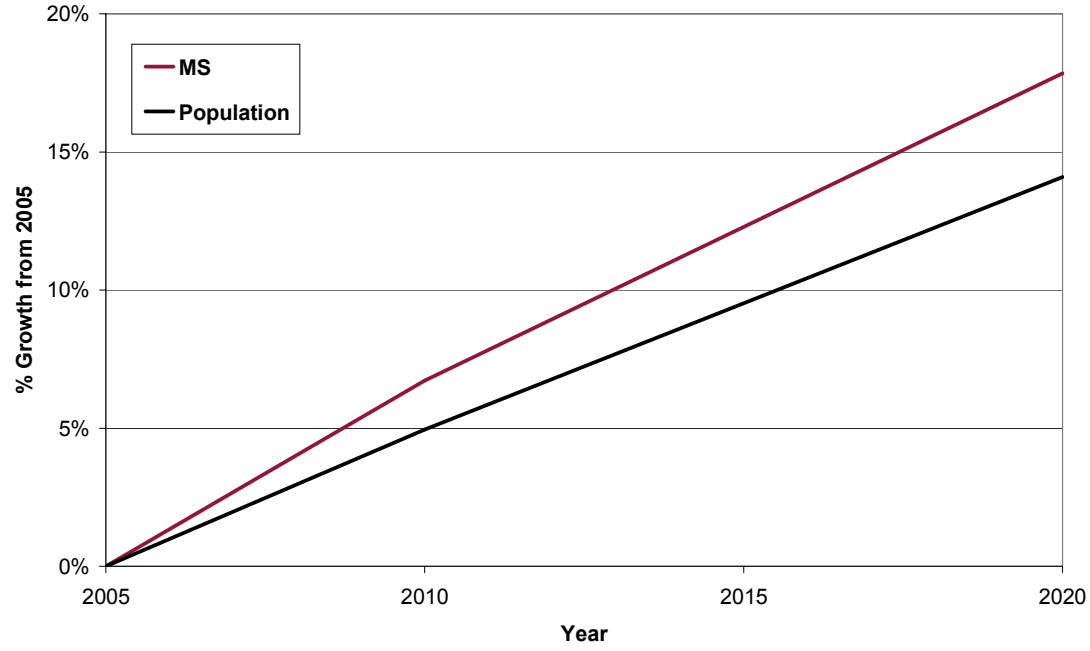


FIGURE 1-6: MS PREVALENCE, % CHANGE BY AGE GROUP, 2005 TO 2020



The growth in MS prevalence relative to (slower) population growth is illustrated in Figure 1-7.

FIGURE 1-7: GROWTH IN MS PREVALENCE RELATIVE TO POPULATION, 2005-2020



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