I am particularly proud to give the Mildred Weisenfeld Lecture because she was truly a great lady. Mrs. Weisenfeld died in 1997 at the age of 76.1,2 She had lost her vision as a teenager to retinitis pigmentosa, but when she was only 25, she established the National Council to Combat Blindness, which soon became known as Fight for Sight. Its first research grants were provided in 1947 and, over the years, many of the young researchers became the leaders in ophthalmology in the United States and overseas. In 1949, Mildred Weisenfeld started working with others to have blindness added to the mandate of the National Institute of Neurologic Diseases and she continued pressing until the National Eye Institute was finally established.

Fight for Sight is a very important supporter of eye research, particularly focusing on young researchers and fellowship applications. ARVO took over the peer review of these applications in the mid 1980s, and this has continued under the leadership of Art Silverstein. In 1988, Fight for Sight became the research division of Prevent Blindness America.

I was very proud to receive the first Fight for Sight citation for achievement in clinical research at ARVO in 1980 as a very young researcher. I take this opportunity to recognize the great contribution of my colleagues and mentors, with whom I shared this award: Art Silverstein, Chan Dawson, and Bob Prendergast. I had the distinct privilege of winning this award a second time in 1987, this time in collaboration with our President, Sheila West, Beatrice Munoz, and other colleagues. It was during this time that I also had the pleasure of meeting Mrs. Weisenfeld.

Mrs. Weisenfeld enlisted many famous people to support her work, ranging from Bob Hope to Liza Minelli, and she continued to work full time until her death. Her enormous contribution was recognized by ARVO and the American Academy of Ophthalmology and also by President Harry S. Truman. Mildred Weisenfeld was passionate about the importance of ophthalmic research and the need to make a difference in people's lives.

PopulatiOn-Based Data

I have chosen to talk about eye care for the future, but before you can look at the future, you have to know where you are. The work that I present here draws on the experience of many studies, but particularly on the work that we have done in Melbourne. We are based at the Royal Victorian Eye and Ear Hospital, which is as much an "ivory tower" as you will find anywhere. However, we were concerned to find the status of eye care and eye disease in our community, and to do this we had to get out to where the people are, rather than wait and examine only those who came to see us at the clinic.

As with the other major population-based studies such as the Beaver Dam Eye Study, the Blue Mountains Eye Study, the Rotterdam Eye Study, the Salisbury Eye Study, and so forth, we first defined a particular area and then went door to door to do a private census to identify every resident older than 40 years.3 We set up a local examination site with all our equipment in a suitable local house or office. We collected detailed background information and medical histories from participants. We used standardized measurements of acuity, refraction, and so forth and standardized eye examinations with photographs of the lens, retina, and discs that were all later graded. For those who could not come to our examination site, we conducted examinations at home. We wanted to make sure that nobody who was in the sample escaped our net if we could help it.

Our initial work was done over several years and involved nine randomly selected sites in the Melbourne metropolitan area that gave us an urban sample of 3271.4 We then randomly sampled nursing homes in the areas around the field sites to get a sample of 403 people in aged care and nursing homes.5 Finally, we examined a rural sample of 1473.6 We then had a representative sample and could reconstruct the distribution of eye disease across the whole community. We had examined a total of 5147 people aged more than 40 years; the oldest participant was 103. Overall, we had a very good participation rate of 86%. Having gathered these data, it was just a "simple matter" of feeding them into the computer, turning the handle three times, and out comes all the information. Basically, there are only three things you need to know.

1. Poor Vision Is Bad for You

The first thing to recognize is that poor vision is bad for you, and now data are available to quantify this. Data from the Salisbury Eye Study and the Blue Mountains Eye Study show that even a moderate level of visual impairment—that is, less than 6/12 (20/40)—has a significant impact on the ability of people to enjoy healthy aging (Table 1). Difficulties in daily living, social functioning, and religious participation, all are altered twofold by just this very modest reduction in acuity.7 The use of community services increases 12% for each line of vision lost (Wang JJ, Mitchell P, Smith W, Cumming RG. ARVO Abstract 3077, 1998).

Not only is there an impact on social isolation, but this level of moderate visual impairment has a significant impact on morbidity. The Beaver Dam Eye Study and others have shown an increased risk of falls and hip fractures8,9 and an increase in mortality attributable to this moderate visual loss, even after adjusting for the other factors that affect morbidity that can be measured in a population-based study.10-13
At this stage we are not able to fully assess the cost of vision loss to the individual, the family, and the community; this information is urgently needed. However, the costs to government can be ascertained, and in Australia, for example, blindness and the five major causes of vision loss cost the Australian Government $AUD 2 billion per year.

2. Poor Vision Is Much More Common Than We Recognize

Most people consider vision loss or blindness to be something rare, something that is not likely to happen to them. However, the reality is quite the opposite. Our data show that after the age of 40, the amount of eye disease, visual impairment, or blindness increases threefold with each decade. By their 90s, almost half of all people have visual impairment and almost one person in six is legally blind (Fig. 1).

The life expectancy in our communities has changed dramatically over the past century. A hundred years ago, the life expectancy in Australia, North America, and Western Europe was approximately 40 or 45 years, now it is approximately 80 years (Fig. 2). A hundred years ago, only 1 person in 10 would reach his or her 80th birthday; today, 50% of people born will reach the age of 80, and once you have had your 40th birthday, you have two chances in three of having a 90th birthday. This changing life expectancy has caused a significant change in the demographics of the community. In Australia, the population as a whole will increase only 20% by the year 2020, but the number of people more than 65 years of age will double (Fig. 3). These are the infant boomers growing up at last; this is us.

These people are those who are alive and aging. Similar changes will occur in the United States and elsewhere.

If we put these two things together, the exponential increase of eye disease with increasing age and the doubling of the number of people older than 50, we will have a doubling in the number of people with visual impairment and with eye disease in our community in the next 20 years. This will occur just by the demographic change. There will be twice as much work for us to do in 20 years.

3. There Are Lots of Simple Things That Can Be Done about Poor Vision

Australia has a reasonably good health care system; I know of none better. It has a universal health insurance program set up by the government called Medicare; there is a good distribution of services throughout the country, except for the most remote rural areas; there is a fairly uniform and high standard of care across the country; there is a mix of public and private systems; and the system is cost effective. Health care costs approximately 8.5% of gross national product. There are approximately 650 ophthalmologists in private or public practice, and approximately 3000 optometrists. Medicare covers optometric examinations and there are also low-cost or free spectacle services for the poor. However, despite Australia’s good health care services, half of visual impairment is correctable, and much is preventable (Fig. 4).

**Undercorrected Refractive Error.** One could ask, how on earth could undercorrected refractive error be a problem? This occurs when people either do not have the spectacles they require, or they are wearing spectacles that no longer suit

## Blindness and Visual Impairment

![Blindness and Visual Impairment](image)

**Figure 1.** Age-specific rates of visual impairment (<6/12) and blindness (<6/60) from the Melbourne VIP show that the amount of visual impairment and blindness increases threefold with each decade of age. Reprinted from Taylor HR. Eye Care for the Community (revised 2001). East Melbourne, Australia: Centre for Eye Research Australia, University of Melbourne; 2000; available at http://cera.unimelb.edu.au/eyecarecommunity/menu.html/.

## Life Expectancy

![Life Expectancy](image)

**Figure 2.** Life expectancy has increased nearly 40 years during the last century. Reprinted from the Australian Bureau of Statistics. Canberra, Australia; available at http://www.abs.gov.au/.
them. The number of people with poor vision due to undercorrected refractive error increases markedly in the older age groups (Fig. 5). Our data show that more than a third of elderly people having an aged-care assessment have poor vision.

Undercorrected refractive error could simply be remedied with a pair of spectacles. We do not need a new gene, we do not need a new laser, we do not need any new breakthroughs in technology. This is technology that has been around for 400 years and is cheap and readily available.

The solution we see for this in Australia is to have all people older than 50 have their eyes tested at least once every 5 years and more frequently for those in high-risk groups such as those with a change in vision, with diabetes, or with a family history of glaucoma. In particular, we should make sure that the elderly have regular vision tests. We should establish the appropriate referral pathways for refraction or for further ophthalmic examination. For those whose vision cannot be improved, we should make sure that they are referred to specialist low-vision services to make maximum use of their remaining vision. Associate Professor Jill Keeffe has developed a range of different materials including simple vision tests and instructional videos that can be used in different settings to at least start this process, including the assessment of the elderly.

Cataract. The prevalence of cataract increases so that by their 90s, everybody will have cataract, and half the people will have already had cataract surgery (Fig. 6). In Australia, we perform approximately 120,000 cataract operations a year, approximately 6,500 cataract operations per 1 million people per year. The figure in the United States is approximately 6,000 per 1 million people. In Australia, there are approximately 36,000 people with visual impairment due to cataract. This is a relatively small number of people and represents only approximately 3 months of operating volume. We appear to be coping quite well with the current need.

Possibly two thirds of cataract is due to genetic factors, but the specific genes have not been identified. However, there are two risk factors that are well defined and that can be altered. One is cigarette smoking, and the other is ocular exposure to UVB. We must promote protective behavior, to encourage people to stop smoking because of the risk of cataract and to reduce ocular UV exposure. To increase awareness of the harmful effects of UV exposure on vision, a prize-winning community service announcement entitled “Don’t Fry Your
Eyes’ has been produced and broadcast on Australian television and radio.

Although we cannot prevent most cataract at present, we know that cataract surgery is highly effective. We must make sure that we have in place systems to detect those with non-surgically treated cataracts that cause vision loss. However, if everything else stays the same, the need for cataract surgery will double in the next 20 years, just with the aging population. We have to plan how to handle this doubling of cataract surgery in the next 20 years, probably without additional resources.

Diabetes. People with diabetes are 25 times more likely to have visual impairment than those without diabetes. In Australia, there are 450,000 people with diagnosed diabetes and an almost equal number with undiagnosed disease. The rates are similar in the United States and other developed countries. All those people with diabetes are at risk of development of diabetic eye disease, but early diagnosis and appropriate treatment should prevent up to 98% of vision loss.

There is a real lack of awareness and a breakdown in communicating the message that all patients with diabetes must have regular eye examinations. In Australia, a careful review of the national data and the level of eye care has led to the recommendation that people with diabetes should have an eye examination every 2 years. In the United States the recommendation is for an annual examination. However, in Australia only half of those with diabetes have had an eye examination in the past 2 years, and of more concern is that one third have never had their eyes checked (Fig. 7). This clearly is a huge systems failure.

We must promote awareness among all those with diabetes about the importance of regular eye examinations. We should involve everybody in the chain, everyone in the team of people who look after or manage patients with diabetes. This includes the family physicians, pharmacists, diabetic nurse educators, internists, endocrinologists, optometrists, and ophthalmologists. They should make sure that every person with diabetes has a regular eye examination. We also must make sure that we and our colleagues who treat diabetic eye disease know well the clinical practice guidelines and continue to follow them. Data from a national audit in the United Kingdom, for example, show that many patients who receive laser treatment receive only a portion of the treatment needed.

Glaucoma. Many more of us are at risk of the development of glaucoma than one would expect. The prevalence of glaucoma may be 1.7% in those more than 40 years of age, but actually 9% of people in their 80s and 90s will have glaucoma (Fig. 8). What is extraordinary is the amount of undiagnosed glaucoma in the community. In Australia, there are approximately 200,000 people with glaucoma, but in half of them the disease has not been diagnosed. If it is not diagnosed, it is clearly not being treated.

We know that a positive family history increases the risk of glaucoma approximately four times. Although some glaucoma genes have been identified, they account for only a small percentage of people with glaucoma. We must develop community awareness about the family risk of glaucoma. Everyone with glaucoma must know that glaucoma is a family disease and they must be encouraged to alert their brothers and sisters and sons and daughters that glaucoma is in their family. We have to make sure those people who have a family history of glaucoma get regular eye examinations.

We also must develop and promote effective community-based screening to detect those with glaucoma who do not

**Prevalence of Glaucoma**

![Figure 8](https://example.com/figure8.png)
Macular Degeneration

![Figure 9](image-url) Age-specific prevalence of macular degeneration shows that two out of three persons will develop macular degeneration and one in four will suffer a significant loss of vision. Reprinted from Taylor HR. Eye Care for the Community (revised 2001). East Melbourne, Australia: Centre for Eye Research Australia, University of Melbourne; 2000; available at http://cera.unimelb.edu.au/eyecarecommunity/menu.html/

have a family history. The Lions Sight First Program has sponsored Lions Eye Health Programs in several countries including Australia. These LEHP programs promote community awareness of the need for regular eye examination for people with diabetes and glaucoma. A wide variety of material has been developed for use by Lions Clubs at a local level to increase awareness.

If we can detect glaucoma early, treatment is effective and the risk of vision loss can be reduced or prevented. Of course, we would like better ways to treat glaucoma, but we also should develop better clinical practice guidelines based on pharmacoeconomic criteria to sort out the confusing maze of high-priced, new pharmaceuticals.

### Macular Degeneration

Macular degeneration is a disease with a risk that increases tremendously with age. It is no surprise that macular degeneration was unusual 100 years ago when life expectancy was approximately 40 years, or even 50 years ago, when life expectancy was approximately 60 years. Now many people live into their 80s and 90s, and the number of people with AMD has increased extraordinarily. We have found that two of three people in their 90s will have early AMD and one person in four will have vision loss due to AMD (Fig. 9). There is still no effective prevention or treatment for most cases of macular degeneration, although there are exciting advances that we should watch and evaluate carefully. We know that family history of AMD increases the risk fourfold and that there clearly is a need to identify this genetic component further.

However, one third of AMD is due to cigarette smoking, and cigarette smoking stands out as the one known risk factor for this disease that is modifiable. People with early AMD who continue to smoke are at increased risk of losing vision compared with those who stop smoking. Health promotion messages related to AMD should focus on cessation of smoking. To this end, a collaborative effort with the Australian National Tobacco Council produced a television advertisement in 2000 that emphasized the link between cigarette smoking and AMD.

There is one thing that is very important for us not to forget and that is to make sure that every patient of ours who has macular degeneration has optimal rehabilitation for visual loss.

In Australia, we have excellent low-vision services, but even so, only one person in three who is legally blind is accessing these services. Many people and their doctors think that if patients can still see something, they are not blind, and if they are not blind, they do not need rehabilitation services.

Although there is much more eye disease and vision loss than previously recognized—and the amount will double in the next 20 years—there are many simple measures that can be taken to address this. We have set out much of this information in a simple booklet entitled *Eye Care for the Community*.26

### The Global Situation and Vision 2020

A few years ago, the World Health Organization (WHO) reassessed the amount of blindness around the world and estimated that there were approximately 45 million people who were blind and an additional 135 million people with visual impairment. They also determined that by the year 2020, these numbers would double. WHO and the International Agency for the Prevention of Blindness (IAPB) launched a major new global initiative that is intended to reduce the number of blind persons to less than half the present number by eliminating avoidable blindness. This new program, The Global Initiative to Eliminate Avoidable Blindness by the year 2020, also called Vision 2020: the Right to Sight, was launched in February 1999.

This global initiative includes disease control, the development of human resources, and the provision of appropriate technology and infrastructure. It is reasoned that by focusing on priority areas, coordinating activities, using advocacy, and increasing fundraising, it will be possible to give everyone “The Right to Sight” by 2020.

To achieve this, Vision 2020 has brought together a broad range of people from the WHO, IAPB, national government bodies, nongovernment organizations, philanthropic institutions, and the health professionals and the organizations to address the problem of global blindness. The basic building blocks are National Vision 2020 Action plans. To develop these plans, countries must determine what services would be required in their country for everyone to have the right to sight by the year 2020. This will allow the countries to identify the gaps between their existing services and those needed by 2020. The National Vision 2020 action plans can set out a series of steps to close the gap over this time.

To us, Vision 2020 means the right to sight for everyone, not everyone except Australians. How could we apply these lofty goals to Australia? We established Vision 2020: the Right to Sight Australia in September 1999, and it was formally launched in October 2000. Vision 2020 Australia adopted the same goal as the Global Initiative—that is, to eliminate avoidable blindness by the year 2020. It also seeks to be the national representative body for all groups involved in vision in Australia and to put vision on the national agenda. Vision 2020 Australia currently has 45 partners that include non-government organizations, university departments, research organizations, rehabilitation groups, special interest and support groups, eye care professional groups and other interested parties.

Vision 2020 Australia will focus on three major areas. It will address the global problem of vision loss by raising public awareness of the importance of vision as a basic human right and so increase government and community support of bilateral aid and funding for overseas activities. It will focus on the Australian community, to increase awareness of eye care and to emphasize the need for regular eye examinations and for professional best practice. Finally, it will particularly address the problem of vision loss in Australia’s Aboriginal and Torres Strait...
Islander communities. Indigenous Australians have 10 times the amount of blindness as do other Australians, and there are still many problems that must be resolved about the delivery of eye care services to these communities. Vision 2020 Australia has prepared a document that sets out the National Eye Health Strategy that has been presented to the government. It is obvious that Vision 2020 Australia is an ambitious undertaking that will take a lot of people, time, work, and effort, but this is what is necessary to address the problems of blindness and visual loss identified both globally and in Australia.

However, just as Vision 2020 does not mean the “Right to Sight for all except Australians,” it does not mean “… for all except Americans” or “… all except those in developed countries.” Each of us has a responsibility to strive in partnership with others to make sure that the aspirations of Vision 2020 are applied in our own communities and countries, as well as in the developing world.

I have tried to show that vision loss presents a large and growing problem, in that it is both bad for you and is also much more common than generally realized. However, there is much that can be done to prevent or correct most of this vision loss. Although much more eye research is clearly needed, there is also much we can do easily by fully applying what we already know. Vision 2020 gives us a splendid vehicle to do this. This must surely resonate with Mrs. Weisenfeld’s passion for both eye research and the need to make a difference.

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