



**Alzheimer's Disease
International**

The global voice on dementia

World Alzheimer Report 2023

Reducing dementia risk: never too early, never too late





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Cover photo: A couple catches waves at a surfing school for seniors in Santos, Brazil in March 2019. (Alex Kornhuber)

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Domenico Pugliese is a freelance photographer based in London whose work has appeared in many national and international magazines and newspapers. He has travelled widely around the globe and speaks different languages. This has helped him to understand the situation and allowed him to create an image that reflects a deeper meaning. The underlying message in his work is the hope of progress and development within the bounds of the human spirit, and a celebration of the human essence and its capability to survive.



Wendy Weidner is head of research and publications at Alzheimer's Disease International, where she is the focal point for ADI's research portfolio in partnership with academic institutions and Alzheimer associations across a wide range of projects. As well as leading publications, Wendy works alongside ADI's Medical and Scientific Advisory Panel and ADI's newly developed Expert by Experience Advisory Panel of people living with dementia and their care partners.



Luca Zanetti was taken by his photographer mother Pia Zanetti to troubled Nicaragua in the mid-1980s. There, he observed how to approach, provoke, tease, praise, and care for a human photo subject. In 1991, he joined photographers' agency Lookat, and attended classes at the Photography Department of the Zurich School of Art and Design for four years. Recently, Zanetti has been working on stories in Nicaragua, Colombia, Brazil, Peru, and the Central African Republic. He lives in Colombia and Zurich, Switzerland.

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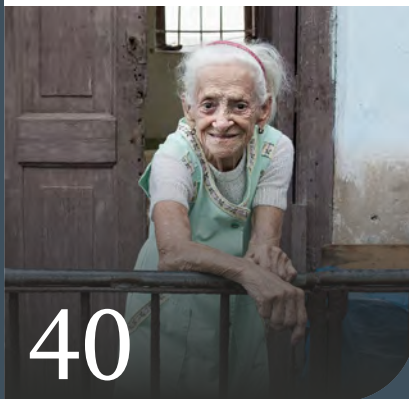
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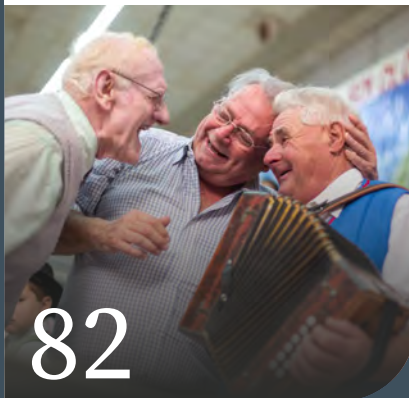
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Foreword



Paola Barbarino,
Chief Executive Officer, Alzheimer's
Disease International

“The people who have a purpose in life, or ikigai [in Japanese], do not present a worry.”

Yuko Taira, an official in Ogimi, known as the “village of longevity”, in Japan (page 78)

As I read the quote above, I thought: With the enormous sense of purpose that ADI gives me, there's no retiring for me anytime soon, is there?

I am so proud of how this report has turned out. Easy to read, packed with useful facts, succinct, impactful, and – I hope – helpful to people living with dementia, their families, the general public, and policymakers.

The origins of this report can be traced back to two reflections that have played in my mind in the last few years.

The first came during a conversation with Gill Livingstone, Miia Kivipelto, and Martin Knapp about three years ago. With three of the world's foremost experts on dementia risk reduction on the phone, the gist of the call was: Given how much we know about risk reduction and how it can benefit people, how do we convince governments to start promoting risk reduction-friendly lifestyles? Thanks to researchers' extensive findings, we had data on the topic – so how come no one was using it?

The second has been my recurring conversations with London cab drivers. As soon as they ask me about my job, they often mention knowing someone who had or has dementia (dementia is the leading cause of death in the UK⁴). The first thing they want to know is if there is anything they can do to avoid getting the condition, while simultaneously offering their own ideas for how to stave off dementia, which they have by and large garnered from the tabloid press and received with varying degrees of scepticism. So, this posits the question: Given the high levels of awareness of and interest in dementia in countries like England, why are people not given wider access to real, science-based information on how to lower their risk by their governments?

As it would save governments money in the long run and make more people feel more in control of their lives, you would think this would be a no-brainer (no pun intended), but alas! Nothing could be further from the truth.

Hence this report, which investigates a lot of issues connected with what I would call a global dereliction of duty, including:

“This report [...] investigates a lot of issues connected with what I would call a global dereliction of duty.”

Paola Barbarino, CEO of Alzheimer's Disease International

- The lack of sympathy for and downright stigma against dementia at the international level (Read about why dementia risk reduction is not included in other non-communicable disease public health campaigns on page 46).
- The chronic lack of research funding, including on how to adapt diet guidelines in lower-income countries (Read page 24 to learn more about efforts to adapt the Mediterranean diet to South Africa).
- The overarching issue of it being easier to prescribe beneficial lifestyle changes than to make them, and how to address the reluctance many people have in following government advice, regardless of how good it is for their health – for example, COVID-19 vaccination.
- The reality that some of the most important risk factors are not modifiable by an individual on their own, despite their best efforts, but come from society, the environment, genetics, and so on. This, I hope, will give some solace to the people living with dementia who ask me whether they could have done something earlier to prevent the onset of the condition.

That said, the report does offer a lot of hope to those who want to take action. Wearing hearing aids really works, as do dancing, physical, and mental exercise... many things can be helpful at a presymptomatic stage, and even after a diagnosis. Some amazing genetic research, such as the work of Francesco Lopera in Colombia, really allows us to see that the solution is not far from reach and may well lie in our own bodies.

I also learnt new things, for example, that younger generations may be more likely to understand the concept of brain health because they are more familiar with conditions such as autism or ADHD (but is it the same in lower- and middle-income countries?).

By reading this report, you will realise the mammoth task faced by researchers looking into hypotheses that seem wholly obvious, but still need scientific evidence for any action to be taken, such as the impact on the brain of sports like boxing. This report also gives us a glimpse into the abyss of what we still don't know, and the work of thousands of researchers who are dedicating their lives to ensure that one day we will have answers. It also gives us an insight into the work of thousands of people living with dementia and carers who speak up so that other people will not have to go through what they are going through. Chapeau. I salute you. You are amazing!

You who are reading this have the biggest task of all: to continue helping us spread the message, to do your best to raise awareness, influence policy, make the world a better place for all of those who live with dementia and their care partners. Risk reduction strategies do not have to be complex, most of them just need to be better known.

And in the spirit of *mens sana in corpore sano*, I will shut down my computer and go for a walk instead...

Paola Barbarino

London, September 2023



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Introduction



Ageing women in rural Ghana, pictured here in October 2022, are sometimes banished to 'witch camps' after showing signs of mental health issues, menopausal symptoms, or dementia – which are sometimes misinterpreted as evidence of witchcraft. (Lee-Ann Olwage)

Between misleading articles overstating the miraculous powers of a single food item and scientific papers written in inaccessible jargon, the average person may find the vast universe of information available on the topic of dementia risk reduction intimidating – and understandably so.

Yet making this information digestible is crucial, now more than ever. The World Health Organization (WHO) estimates that 1 billion people were over the age of 60 in 2020, and that this age category will double to 2.1 billion people by 2050, two-thirds of whom will be living in lower- and middle-income countries. The number of people aged 80 years or older is meanwhile expected to triple during the same time frame to reach 426 million¹. It is essential to act now to ensure that these people can live as healthily as possible, for as long as possible.

As our societies age, the number of people living with dementia across the world is expected to rise from 55 million in 2019 to 139 million in 2050, according to the WHO². The costs associated with dementia are also expected to more than double from US\$1.3 trillion per year in 2019 to \$2.8 trillion dollars by 2030.

These numbers, which Alzheimer's Disease International (ADI) mentions often, bear repeating. While we have witnessed remarkable advances in recent years in the diagnosis and treatment of dementia, we are still far from finding a cure, and even further away from having

healthcare systems capable of disseminating a future remedy to all who need it, wherever they are in the world.

In this context, the phrase “prevention is better than cure” is not just a trite saying, but a call to action. While the incorrect belief that dementia is the inescapable fate of old age may be a deeply ingrained view for some, we now know that up to 40% of dementia cases could be prevented or delayed by addressing 12 risk factors identified in the 2020 Lancet report on dementia prevention³. Given the current astronomical cost projections for dementia in coming decades, governments should seize this opportunity for risk reduction policies with real impact, both in terms of healthcare costs and wellbeing.

“Research increasingly shows that dementia can be delayed or even prevented by targeting our lifestyle choices such as exercise, diet, and social connections; also, it is never too late to correct hearing loss,” Dame Louise Robinson, professor of primary care and ageing at Newcastle University and co-chair of ADI's Medical and Scientific Advisory Panel, tells ADI. “‘Healthy hearts, healthy bodies, healthy brains’ should be our mantra.”

“Healthy hearts, healthy bodies, healthy brains’ should be our mantra.”

Dame Louise Robinson, professor of primary care and ageing at Newcastle University

Dementia risk reduction is not a binary path between developing the condition later in life or never at all.

The sheer scope of options to pursue when seeking to lower one's risk of developing dementia later in life can feel intimidating, especially as not all are based on solid evidence. Research is still ongoing to understand the causation and/or correlation between various factors and dementia risk. But the amount of knowledge on the topic should be cause for optimism. There might not be a one-size-fits-all, surefire way to prevent dementia, but there are plenty of changes, big and small, that are within reach to change the odds, one step at a time.

Dementia risk reduction is not a binary path between developing the condition later in life or never at all. Delaying the onset of dementia or slowing down its progression after having been diagnosed are equally essential goals when it comes to managing the burden of disease at the societal and individual levels – not to mention the immeasurable worth of a few more years of life in good health for individuals and their loved ones.

Risk reduction is a core component of ADI's global advocacy work for people living with dementia and their families, particularly around raising awareness and increasing

understanding. This is why we chose to approach this World Alzheimer Report differently than in previous years. We believe the latest research and innovative approaches carried out by researchers and healthcare practitioners worldwide deserve to be accessible to as broad an audience as possible. For this reason, we chose to collaborate with Simon Long, editor-at-large at The Economist, to help us break down important scientific and medical discoveries and recommendations into a compelling and approachable report. We also asked journalists from all over the globe to show concrete examples of how the different factors discussed in this report can be applied in real life, wherever one lives in the world.

Risk reduction, we believe, is a practice, not a theory. We hope this report will empower its readers to make changes in their lives where they can, and to advocate for local, national, and international powers to provide the best possible environments for people to take their health into their own hands.



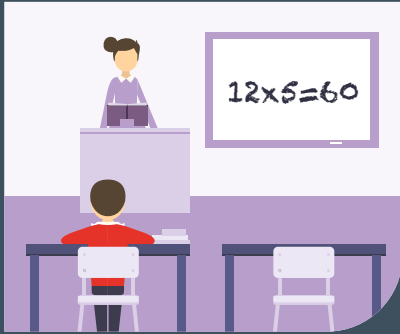
Two friends laugh in Ofunato, Japan in June 2019. (Alex Kornhuber)

Risk reduction is a core component of ADI's global advocacy work for people living with dementia and their families, particularly around raising awareness and increasing understanding.

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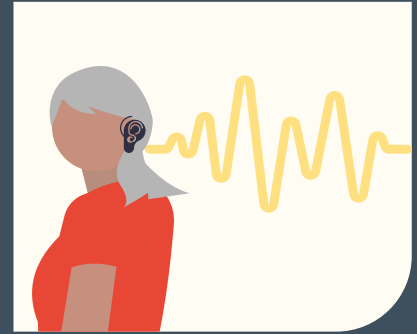
The 12 modifiable risk factors for dementia according to The Lancet



Less education



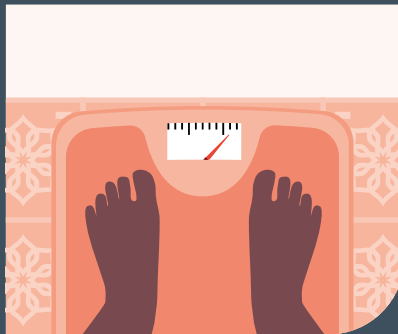
Hypertension



Hearing loss



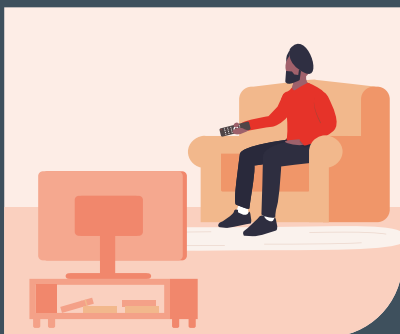
Smoking



Obesity



Depression



Physical inactivity



Diabetes



Social isolation



Excessive alcohol consumption



Head injury



Air pollution

Chapter 1:

Physical health risks

How the body impacts the brain



The university of São Paulo in Brazil offers a range of exercise classes exclusively for seniors, pictured here on April 1, 2019. (Alex Kornhuber)

BY SIMON LONG

Dementia has long been seen as a force of nature, as immutable as the weather. Even when it became widely accepted that it was not an inevitable part of the ageing process, there was a sense that developing the condition was the luck of the draw: there was nothing you could do about it. In his book, “Unaging: The Four Factors that Impact How You Age,” Dr Robert Friedland, a neurologist at the University of Louisville, recalls addressing a press conference after a meeting of the United States’ Alzheimer’s Association in the 1990s. Drawing on his own work and that of others’, he suggested that to lower the risk of Alzheimer’s, people should keep physically and mentally active, avoid smoking, eat well, and so on. When he finished, somebody from the Alzheimer’s Association intervened to warn the assembled journalists: “Wait! Dr Friedland’s suggestions have not been verified in a placebo-controlled, double-blind, randomised trial, and are premature.”¹

The intervention reflected both the widespread prejudice at the time about dementia, and the lack of available scientific proof, which was in part the consequence of the mind-boggling difficulty of conducting randomised control trials for risk and protective factors that may take decades to show their effects, and in which so many other considerations have to be controlled for. Take for example: to what extent does learning a second language protect against dementia in later life? Thomas Bak, a cognitive neuroscientist at the University of Edinburgh who has spent much of his career working on the question, responds: “Give me tens of millions of dollars and six or seven decades, and maybe I can tell you.”

But gradually, more randomised control trials looking at different risk and protective factors have been completed, and more and more data from lifelong “longitudinal” studies have become available. Hardly anybody doubts anymore that some risk factors are modifiable; few would quibble with Friedland’s 30-year-old recommendations for mitigating some of them.

Indeed, the pendulum has swung the other way. A small dementia prevention industry has sprung up. Friedland’s book is part of a growing library on how to keep the brain healthy in old age, with titles such as “The Alzheimer’s Prevention Program: Keep your Brain Healthy for the Rest of your Life”²; “The Alzheimer’s Prevention Plan: 10 Proven Ways

to Prevent Memory Decline and Reduce the Risk of Alzheimer’s”³; or “The Alzheimer’s Revolution: An Evidence-based Lifestyle Program to Build Cognitive Resilience and Reduce the Risk of Alzheimer’s Disease”⁴.

Anyone reading no further than the title of these books and failing to explore the content might come away with the impression that Alzheimer’s, the most common cause of dementia, is entirely preventable. But that is to overlook two important points: that some of the most important risk factors are not modifiable by an individual on their own, since they come from society, their environment, or their genetic inheritance; and that it is far easier to prescribe beneficial lifestyle changes than to make them. That smoking tobacco is dangerous has been well known for decades, yet a survey in 2023 found that 11% of adults in the United States still smoke cigarettes⁵.

To argue dementia is preventable also suggests the issue is a simple binary between either full cognitive health or dementia, ignoring the continuum through mild cognitive impairment and the early stages of dementia. More useful than thinking about “dementia prevention” may be to think about “risk reduction” and “brain health”. “Dementia prevention programmes” cannot live up to the promise of the name. As people age, their risk of developing dementia grows inexorably. But the way they live can reduce it. And they can delay the onset of dementia. For the individuals concerned, their families and carers, and for society as a whole, that in itself is an enormous benefit.

Most of these programmes start with the body. After all, *mens sana in corpore sano*. When Juvenal, a Roman poet, coined his famous maxim nearly 2,000 years ago – “a healthy mind in a healthy body” – he was stating the obvious even then. Although the precise nature of the links between mental and physical health remains complicated, mysterious, and subject to intensive scientific research, much has been learned about how physical factors influence cognitive decline. In 2020, the Lancet Commission on Dementia Prevention Intervention and Care listed 12 established “modifiable” risk factors that contribute to the development of dementia⁶. Nine affect the brain through the body: hearing loss; smoking; hypertension; obesity; physical inactivity;



Etsuko Taira prepares dinner at home in Ogimi, Japan in June 2023. (Reina Ogawa Clarke)

diabetes; excessive alcohol consumption; air pollution; and traumatic brain injury. (The others are a lack of education in youth; depression; and social isolation.)

Many of these factors overlap and reinforce each other. Physical inactivity is a risk factor for weight gain, which in turn increases the risk of diabetes. All three are dementia risk factors. So the basic message is one that is often trotted out as a bromide: what's good for the heart is good for the brain. The best way to look after both is to pursue what has for decades been recognised as a "healthy lifestyle" – eating a diet rich in fibre, unprocessed foods, vegetables, and fruit, and avoiding too much meat and fat; taking plenty of physical exercise; sleeping well and enough; not smoking and not drinking too much; staying free of infectious diseases; avoiding sports that involve repeated blows to the head.

You are what you eat

It is almost impossible to scientifically prove a causal relationship between changing behaviour patterns, physical health, and reduced rates of dementia. But some evidence

makes the connections seem more likely. Why else might the incidence of dementia be going up in some countries, but coming down in others?

A study published in 2020 in the journal *Neurology* reported on the results of following nearly 50,000 people in North America and Europe between 1988 and 2015. It found that 8.6% developed dementia. But the risk of being among them had, remarkably, fallen by an average of about 13% a decade, from about a one-in-four chance for a 75-year-old in 1995 to less than one in five by 2015⁷. Speaking in June 2023, Gill Livingston, a professor in the psychiatry of older people at University College London who leads the Lancet Commission, summed up the latest evidence of progress in North America and Europe in reducing the incidence of dementia: "There has been a 25% decrease in the past 20 years."

In China and Japan, however, the risks of developing dementia have been rising. In Japan, the overall age-adjusted prevalence rate nearly doubled from 4.9% in 1985 to 9.6% in 2014⁸. And according to the *China Alzheimer Report* of 2022, the incidence,

morbidity, and mortality of Alzheimer's in China "have steadily increased to make it presently the fifth-leading cause of death among urban and rural residents."⁹

It probably does not help that Asia is still experiencing an epidemic of tobacco smoking¹⁰, at a time when the West's has been receding. Remarkably, for a long time, it was possible to find arguments that smoking helps protect against dementia¹¹. This resulted from two distortions: money from the tobacco industry to promote disinformation; and the statistical confusion caused by the shortage of very old people who smoke (smoking does not protect against dementia, but it does make people less likely to live long enough to develop the condition). The Lancet Commission ranks smoking third among modifiable risk factors, behind only lack of education and hearing loss¹².

Drinking too much ranks lower as a risk, but the damage it does to the brain can actually be seen in MRI scans (right-sided hippocampal atrophy). It is, however, difficult to isolate the extent of the risk borne out of heavy drinking from other risky behaviours linked to it. A study in France of 31.6 million people admitted to hospital between 2008 and 2013¹³ found that alcohol use disorders were a big risk factor for all types of dementia, especially for early onset dementia.

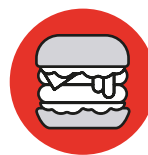
In China and Japan, rising rates of dementia are also accompanied by rising rates of coronary heart disease¹⁴. This may suggest that the national diets are becoming less healthy (See article page 78). Friedland argues that diet influences brain health, not just as a factor in many diseases that heighten the risk of dementia, but directly through intestinal bacteria (microbiota), which have a strong influence on cells in the brain involved in learning and memory, and which are regulated by what we feed them – i.e., what we eat. A project led by Paul O'Toole at the University of Cork from 2007–13 investigated 500 people aged over 65 and showed how diet modulated their microbiota and how a narrow diet caused low-diversity microbiota, which correlated with frailty and lower scores for cognition¹⁵.

A 2022 study also found a strong link between the consumption of ultra-processed food (UPF) and cognitive decline¹⁶. UPF, defined as "industrial formulations of food products, typically mass-produced, that contain few natural ingredients" – i.e., full of additives, emulsifiers, sweeteners, preservatives, artificial colours and flavours, etc. – carries so many risks it is hard to disentangle dementia from the others. But the study suggested that a high intake of ultra-processed meat, oils, and spreads was linked with faster cognitive decline in older individuals with Type 2 diabetes. Another study of 72,083 people aged 55 or older who weren't diagnosed with dementia when the study started, and who provided data on their diets to the UK Biobank, found that the high consumption of UPF was associated with a higher risk of all-cause dementia¹⁷. One striking finding was that replacing 10% of UPF weight in one's diet with an equivalent proportion of unprocessed or minimally processed foods was estimated to be associated with a 19% lower risk of dementia.

Another study, undertaken in Brazil from 2008 to 2017, of an ethnically diverse sample of nearly 11,000 people¹⁸ found that people whose consumption of UPF was in the top quartile had a 28% faster rate of cognitive decline and a 25% faster rate of executive function decline (i.e., of the brain's ability to control thoughts, emotions, and behaviour). The reasons for this are not entirely clear. In conversation with ADI, Christoffer van Tulleken, a doctor of infectious diseases and author of "Ultra-Processed People: Why Do We All Eat Stuff That Isn't Food ... and Why Can't We Stop?", suggested it might be because of "a lot of different mechanisms... a leaky biome: bacteria leaking into the bloodstream... We are building our bodies from products that are not really food." UPF foods, he says, are "engineered to drive excessive consumption, with ingredients that have addictive or quasi-addictive properties."

But, he went on: "Why UPF causes dementia is less interesting than the fact that it is causal." And he says, arguing from first principles, it would be "really weird" if it were not. It is shown to lead to weight gain, a risk factor for diabetes and cardiovascular disease, "so it would be really strange if it did not cause cognitive decline". He thinks we should be "thinking of UPF as we think of tobacco". After all, he says: "Poor diet has overtaken smoking as a leading cause of death." That is indeed what a global study published in *The Lancet* in 2019 showed¹⁹.

If some foods seem bad for the brain, the belief that others are good for it has a long pedigree. P.G. Wodehouse, a British comic novelist, made much of the idea in his books over a century ago, about a very brainy valet, Jeeves, whose employer attributed his acumen to a diet of fish. The idea is persistent. After all, fish is rich in Omega-3 fatty acids, which have been shown to improve blood flow in the brain and cognitive wellbeing²⁰.



"Poor diet has overtaken smoking as a leading cause of death."

Christoffer van Tulleken, an infectious diseases doctor

The search for a miracle brain food has an undeniable appeal. A deficiency of vitamin B12, found in food of animal origin²¹, can lead to a mental decline easily mistaken for Alzheimer's²². Pomegranate juice has been shown to help maintain memory

in people over 50²³. Beetroot juice, which is rich in natural chemicals called nitrates, has also been shown to enhance cognitive function²⁴. A number of studies have suggested that flavonols such as myricetin, a common phenolic compound found in vegetables, berries, teas, and wine, help protect against diseases such as Parkinson's and Alzheimer's²⁵.

But newspaper headlines capturing the results of such studies tend towards misleading and excessive optimism, missing out important data on quantities, period of consumption, etc. For example, a medical journal pointed out that a study claiming that “eating a handful of blueberries a day can strengthen cardiovascular and cognitive health”²⁶ would in fact require eating 75–80 blueberries a day, which is a rather big handful²⁷. Some interpretations even seem designed to cheer the reader up. “Drinking three glasses of champagne a week can stave off dementia!”²⁸ turned out to be based on a study that used rats (apparently, they like the bubbly stuff so much they are good at remembering where they drank it). A study showing that consuming dark chocolate reduces the risk of dementia was financed by Mars, a confectionary behemoth²⁹, which does not necessarily invalidate its findings but does suggest some non-scientific reasons for its being undertaken. Thankfully, some reputable resources exist, such as the Alzheimer's Drug Discovery Foundation (ADDF) Cognitive Vitality reports³⁰, in which neuroscientists break down the effectiveness of certain foods, drinks, and drugs when it comes to brain health.

Scientists like Friedland meanwhile stress diet diversity over a hyperfocus on certain foods: “It is important to eat different things,” he tells ADI. The US government also promotes a varied diet, dubbed MIND (Mediterranean-DASH Intervention for Neurodegenerative Delay, i.e., incorporating DASH, or Dietary Approaches to Stop Hypertension)³¹. It entails lots of vegetables (especially leafy greens, which are rich in nitrates), berries and nuts, olive oil, a bit of fish and poultry, some beans and whole grains – and, perhaps less predictably, a glass of wine a day.

It is a diet that is, of course, easier to follow for those who live around the Mediterranean, where many of these ingredients are locally grown, cheap, and accessible, which may not be the case everywhere. Dr Vanessa De la Cruz-Góngora, a researcher focused on nutrition in population at the National Institute of Public Health in Mexico, says that the MIND diet is either unobtainable or unaffordable for many Mexicans, in a country where olive oil, for example, is expensive. Mexico has high rates of diabetes and cardiovascular disease³², but little research has been done on what a locally sourced equivalent of the MIND diet would look like. Diet recommendations for dementia risk reduction should be adapted to the local context in order to be practical and effective (See article page 24).

Dr Oliver Shannon, a lecturer in nutrition and ageing at Newcastle University, also advocates “moving away from looking at individual compounds, to whole-diet approaches”. But he

acknowledges the difficulty of persuading people to change their diets radically for the rest of their lives. So he highlights the benefits that even relatively modest changes can have – using more olive oil, swapping beer for a glass of wine. He also says there is mounting evidence that nutrition works differently for different people, and diets should be personalised.

Losing senses

Some things that are not bad for the heart are nevertheless bad for the brain. Most significant is the loss of hearing. The Lancet Commission's 2020 report concluded that this was the biggest of its 12 risk factors for dementia. Livingston sums up the finding as follows: “People with hearing loss are about twice as likely to develop dementia.”

A study published in *Lancet Public Health* in 2023³³ was among several to find that people with hearing loss who do not use hearing aids have an increased risk for all types of dementia. The good news, however, was that it found no increased risk in people with hearing loss who use hearing aids compared with people without impaired hearing. The study suggested that “up to 8.2% of dementia cases could be prevented with proper hearing loss management”. In fact, that may even understate the benefits, as those taking part in the study who reported not experiencing hearing difficulties were not asked if that was because they used hearing aids until 2009. As Livingston puts it, there is “considerable evidence that using hearing aids reduces the risk of dementia”.

Why does impaired hearing increase the risk of dementia so sharply? David Loughrey, a neuroscience researcher at the Global Brain Health Institute, says that one theory is that hearing loss and dementia might have a common cause. That hearing aids seem so effective in protecting against dementia, however, argues against that theory. Another is that people straining to understand what is said to them suffer increased “cognitive load”, which hearing aids alleviate.

The *Lancet Public Health* study notes the “biological plausibility that better hearing might reduce cognitive load and alleviate sensory deprivation”. It also points out that hearing aids might also make it easier to understand what people are saying, enhancing social interaction, relieving loneliness, and, potentially, depressive symptoms, both of which are risk factors for dementia. Another study, known as ACHIEVE, conducted among some 3,000 people aged 70–84 in the United States, concluded in July 2023 that “hearing loss might be a particularly important global public health target for dementia prevention efforts given that hearing loss is highly prevalent among older adults and is treatable with an established intervention (i.e., hearing aids and related support services). Such interventions are underused around the world, confer essentially no medical risk, and have been shown to reduce cognitive decline within three years when implemented in later life for at-risk older adults.”



Melody Ndjitaviua, who works as a carer at the Alzheimer's Dementia Namibia care facility in Swakopmund, helps to wash and dress Ndjinna Ngombe in August 2021. (Lee-Ann Olwage)

Eyes and shut-eye

Not yet included in the Lancet Commission's 2020 list of risk factors is impaired vision, but several studies have identified a link between vision loss and cognitive decline and posited it as a risk for dementia³⁴. As with hearing loss, it is not clear why this may be the case, with similar plausible explanations – increased “cognitive load”, sensory deprivation, and worsening isolation and psychological health. People are however more likely to have their eyes tested than their hearing, so problems should be picked up earlier, which may also help delay cognitive decline.

Less certain are the conclusions to be drawn from evidence linking tooth loss and dementia. A 2021 study in the Journal of the American Medical Directors Association³⁵ found the loss of a tooth was associated with a 1.4% increase in the risk of cognitive impairment and a 1.1% increase in the risk of dementia. Of those studied, people who had lost at least 20 teeth had a 31% higher risk of cognitive impairment. For those who had lost them all, the risk was 54% higher. Dentures – like hearing aids – seem to help. For those who used them, the risk of dementia was not significantly higher than for people with all their own teeth.

As with impaired hearing and vision, the reasons for the apparent linkage between tooth loss and higher rates of cognitive decline are not clear. It may simply be that people with mild cognitive impairment are more likely to skimp on oral hygiene – so that tooth loss is an early symptom of dementia, not a cause; or that bad teeth are an indicator of lower socioeconomic status and educational level; or, conceivably, that increased bacteria in the mouth and gum disease cause inflammation and raise the risk of beta-amyloid plaques in the brain. Tooth loss can also be associated with diabetes, a significant risk factor for dementia³⁶.

Another risk factor not included so far in the Lancet Commission's list is sleep. Studies on the matter are especially complicated because of the ethical difficulty of arranging randomised control trials, which would involve leaving some people with sleeping disorders untreated. The studies that have been done have had mixed results, yet suggest that poor sleep patterns in middle age may contribute to a higher risk of dementia in later life³⁷. Sandra Giménez, a clinical neurophysiologist at the Global Brain Health Institute, says that treating “obstructive sleep apnoea” (a relatively common disorder) with a “CPAP” mask (Continuous Positive Airway Pressure) seems to reduce the risk of Alzheimer's.

A 2021 study published in *Nature Communications* found that sleeping less than six hours a night between the ages of 50 and 60 was associated with a higher risk of dementia³⁸ (the model was adjusted to take account of other factors that might affect sleep patterns or dementia risk). Another study in Chinese Taipei in 2015 found that people suffering from sleep-related movement disorders had a nearly four times higher risk of developing dementia than people without the condition³⁹. A study of nearly 180,000 male army veterans in the United States⁴⁰ found that those with insomnia had a 26% increased risk of developing Alzheimer's over the next eight years. A 2023 study in the *American Journal of Preventive Medicine*⁴¹ also found that people who find it hard to get to sleep have a higher dementia risk. "Sleep-maintenance insomnia" (i.e., waking up in the night), however, is actually associated with a decreased dementia risk, a finding replicated in a study conducted in Norway⁴².

Sporting chances

Just as most people would assume, from their own experience, that sleep is good for the brain, so they would also think that repeated pummeling of the head is bad for it. Yet many sports positively encourage it, and efforts to regulate them are controversial because of the large number of people who play them and the even larger numbers who watch and follow them as fans. When boxer Muhammad Ali – known as "The Greatest" of all time – was examined and tested by a leading neurologist

in 1984, he had his own common-sense explanation of what might be wrong: "I've been in the boxing ring for 30 years, and I've taken a lot of punches."⁴³

But providing scientific proof for what looks like a statement of the obvious is not easy. A study of the subject published in 2017⁴⁴ noted that, as long ago as 1928, "punch-drunk syndrome" was identified as an occupational hazard for boxers. In 1937, it was given the more scientific-sounding name of "dementia pugilistica". In 1954, two German scientists published the results of the autopsy of a 51-year-old man who had been a boxer from the age of 18 to 29 and was Germany's middleweight champion for six years. By the time he was 39, personality changes began to appear, accompanied by insomnia, memory loss, impaired speech, along with the physical symptoms of Parkinson's disease and dementia.

The autopsy found extensive Alzheimer's pathology – beta-amyloid plaques and neurofibrillary tangles. It indicated, in other words, early onset Alzheimer's. The 2017 study concluded that uncertainty persists about how directly the damage done by boxing is linked to dementia: "If one is rigorous with the human data, it remains unclear how, and indeed whether, traumatic brain injury from boxing crosses the threshold from structural damage to a progressive neurodegenerative cascade." Of course, "structural damage" might be deemed too much of a danger in itself.

Swiss photographer Pia Zanetti, 80, cycling in South America. (Luca Zanetti)



A diagnosis of “chronic traumatic encephalopathy” (CTE) can only be made during an autopsy. Like Alzheimer's, CTE involves tau, a protein in nerve cells that is associated with dementia, but that builds up in CTE in a way that is different from other brain diseases, including Alzheimer's⁴⁵. It used to be thought that CTE resulted from concussions, or at least from being hit very hard. However, it is now known that it can result from repeated subconcussive impacts⁴⁶.

Boxing is far from the only sport offering the chance to acquire CTE for fun: lacrosse⁴⁷ and ice hockey also have high rates of concussion, and American football seems almost as dangerous as boxing. In 2017, a study by researchers at Boston University found that 99% of deceased American footballers who had played in the National Football League and had donated their brains to science suffered from it⁴⁸. (A follow-up study in 2023 found a slightly lower proportion with CTE: 92%⁴⁹.)

Unsurprisingly, research into former rugby players has found similarly high rates of neurodegenerative diseases. One study that followed 412 former international rugby players in Scotland⁵⁰ for several decades found that their risk of neurodegenerative disease was just over two-and-a-half times higher than a control group from the general population. In England, hundreds of former rugby players have joined a class-action lawsuit demanding compensation from the sporting authorities, whom they accuse of negligence regarding the risk of brain injuries⁵¹.

Football – also known as soccer in North America – players are also at higher risk of dementia than the general population. A study of male players in Sweden's top division published in 2023⁵² found that outfield players had a significantly increased risk of Alzheimer's and other dementias. That the finding did not apply to goalkeepers suggested the obvious explanation: that the risk comes from repeated heading of the ball. One of the most famous footballers to have developed dementia in Britain was Jeff Astle, a former England international who died aged 59 in 2002 of CTE⁵³. He was known for his prowess with his head in the days when football was still played with heavy leather balls that would soak up the water and mud. His family set up a foundation to raise awareness of sporting brain injuries and support those affected.

A study published in 2022 in *Frontiers in Neurology*⁵⁴ saw researchers in six countries look at data from around the world and across different sports and conclude that, although the evidence on the link between “repetitive head impact” (RHI) and CTE will always be imperfect, “we have the highest confidence in the conclusion that RHI causes CTE.”

These dangers have led to repeated calls for tighter regulation. In most countries and sports, professional sports are much more strictly governed than those played for fun by amateurs,



In most countries and sports, professional sports are much more strictly governed than those played for fun by amateurs, who may thus be at greater risk.

who may thus be at greater risk. Sports in schools have been a particular focus of controversy⁵⁵. In 2020, heading was banned in football practice in primary schools in England, Scotland, and Northern Ireland. A similar ban for under-12s has been in force in the United States since 2015⁵⁶. But repeated calls to ban tackling and scrums from school rugby have been resisted by the sport's administrators⁵⁷. In Australia, a position paper published in 2019 by Sport Australia⁵⁸ (now known as the Australian Sports Commission, a government body responsible for supporting and investing in sport) concluded that even “the link between sport-related concussion and CTE remains tenuous”.

The issues are familiar from countless public health campaigns: to what extent should people be allowed to do things they enjoy, even when these activities are known to be dangerous? Some, such as taking illegal drugs or dangerous driving, are outlawed in most countries. But for many – smoking, say, or drinking alcohol – society compromises by allowing them for adults, but barring sales to children. School sports are in a category almost of their own, where parents would have to take steps to exclude their children from them.

There is no single, surefire way to lower one's risk of dementia – but rather than being discouraged, readers should remember that there are plenty of changes that are within reach.

Dr Daisy Acosta, a researcher at the Universidad Nacional Pedro Henríquez Ureña in Santo Domingo, says she often summarises her advice to patients in the Dominican Republic with a simple phrase in Spanish: “poca cama, poco plato, y muchas horas de zapato” – roughly translated as “little bed” (stay active and engaged), “little plate” (eat healthy and not too much), and “many hours of shoe” (walk, walk, walk). All things that feel well within reach for a lot of us.

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The power of pilchards: Could a small fish make a difference in South Africa's dementia risk reduction efforts?



Amid economic hardship, researchers and health professionals are adapting international nutrition recommendations to the local context.

BY MARION EDMUNDS IN CAPE TOWN, SOUTH AFRICA

An animated conversation is taking place around a frying pan of baby marrows and onions flavoured with garlic, seasoning, and a touch of parmesan. The chefs sample what they believe to be delicious, but naysayers are warning that this side dish might not go down so well in the dining room. In their experience, it is very difficult to persuade the residents of the Woodstock branch of NOAH (Neighbourhood Old Age Homes) to eat their greens.



NOAH is a not-for profit old age residence in Cape Town, South Africa. Here, 66-year-old Velma Peters is the chef and catering manager responsible for feeding 15 elderly residents. Lunchtime is one of the few treats of the day for these men and women. The communal meal gives them something to look forward to and an opportunity to engage around a table. Mrs Peters says they are often seated in expectation an hour before the meal is served.

"They want childhood food. On Sundays, we look forward to roast chicken, potatoes, and yellow rice – which must have raisins in it because their parents cooked it like that – cabbage and the tomato *bredie* (stew), sweet potato with cinnamon and sugar," she said, listing some firm favourites.

While Peters aims to present a tasty meal that also provides a mental focus for the day, there is now a larger discussion about what should be on the plate of people aged 60 and older who may be at risk of cognitive decline.

Over the years, diet has been proven to be one of several lifestyle factors that can lessen the risk of developing dementia or delay its onset. But dementia is understudied in sub-Saharan Africa, which is of concern given the expectation that its incidence will rise dramatically in lower- and middle-income countries (LMICs) in decades to come as the population ages. Alzheimer's Disease

International estimates that, of the approximately 139 million people living with dementia globally in 2050, around two-thirds will be in LMICs. Yet many lower-income countries like South Africa are not prepared to manage this health crisis and its societal and economic consequences.

But research on the ground in South Africa is trying to find ways to adapt international dementia risk reduction recommendations to the local context – and one alternative may well be a small, silver fish.

Dementia, an 'invisible' condition in South Africa

While there is an ongoing global conversation about the link between nutrition and brain health, taking place as much in medical journals as the popular press, Peters has been unable so far to persuade her clients to listen to visiting dietitians or take part in any gastronomic adventures for the sake of their longevity or cognition. At NOAH, eating right can be an uphill battle.

"They hate kale and brinjals [aubergines] and lentils [...] They were upset, I was their worst nightmare, I was their enemy. I was in tears, really," says Peters, ruefully reflecting on her failed campaign to change the eating plan. "They don't like salads – the lettuce, the tomato – they just don't want those healthy things."

She eventually abandoned the recommended recipes and went back to old favourites familiar to many communities in Cape Town – dishes pleasantly flavoured with Malay spices, a culinary tradition brought to this continent from the East when the Dutch first colonised South Africa over three centuries ago.

Today, South Africa is one of the richest countries in Africa, with a population of 60.6 million people¹, of whom 9.2% are older than 60². Despite its relative wealth, South Africa grapples with a



Fish like pilchards and snoek, pictured here, are common dietary staples in South Africa. (Marion Edmunds)

heavy burden of disease. In 2018, tuberculosis was recorded as the leading cause of natural death here, followed by diabetes, cerebrovascular disease, heart disease, and HIV, according to the government's statistical services. With the healthcare sector focused on these challenges, dementia is not a national priority. South Africa doesn't have a national dementia policy, nor any official campaigns to reduce dementia risk – although healthy eating and regular exercise are advocated more and more as a way to generally improve the nation's health.

“There is a wide invisibility of dementia across cultures in South Africa, because it is not recorded,” says Associate Professor Marguerite Schneider of the University of Cape Town. Schneider says that most people in this country erroneously regard dementia as a normal sign of ageing, while health workers are not trained to diagnose it, and there is little in the way of a care pathway.

To address this gap, Schneider led the South African work for Strengthening Responses to Dementia in Developing Countries (STRiDE), an international project mapping the state of dementia in seven LMICs. The STRiDE study estimated that 450,000 people are living with dementia in South Africa, many undiagnosed.

Adapting to local habits

In the absence of state services, dementia care in South Africa is supported by an under-resourced and struggling non-governmental sector. The private sector caters for the needs of a small and relatively wealthy minority of South Africans with dementia through upmarket care homes and frail-care centres, but as South Africa is one of the world's most unequal societies, it is out of reach for most. In 2021³, less than a quarter of elderly people had a major form of health insurance in South Africa. And even here, the benefits for people living with dementia are limited.

Within this specific context, dietitian Dr Lizette Kühn wonders whether it may be possible to reduce cognitive decline through an eating plan.

“My interest has always been with elderly people, and especially those living with dementia. The lack of knowledge in South Africa and the missed opportunity of possible lifestyle-preventative interventions marked a gap in the research,” she says.

This investigation became her doctoral thesis⁴. Kühn had to look to high-income countries for a base diet on which to build her study. The MIND diet, an eating plan pioneered in the United

The Grandmothers Against Poverty and HIV Aids Health Club gathers regularly to share knowledge and a hearty meal. (Marion Edmunds)



States specifically to protect the brain from cognitive decline, has become a significant reference point in the discussion of the role of nutrition in brain protection in the elderly ever since it was published in 2015.

The MIND diet⁵ is a flexible and selective combination of the Mediterranean diet and the DASH (Dietary Approaches to Stop Hypertension) diet, which was devised by scientists rather than inherited from a healthy community.

But the foods recommended in the MIND diet are often inaccessible for South African state pensioners, who have a restricted income of 2,080 South African Rands (under USD\$120) for food each month⁶. Food inflation is steep in South Africa, which also has a high rate of unemployment and widespread poverty.

“We can’t use the diet as it is overseas and just put it in South Africa,” Kühn explains. “I tried to mimic the elements of the foods in the MIND diet in a more affordable way, in a way that was practically available and that the people would be prepared to eat.”

So Kühn’s study⁷ saw peanut butter replace expensive nuts, and canola oil⁸ substitute⁹ for olive oil, because both are especially rich in mono-unsaturated fatty acids (MUFA) that help to maintain a healthy fatty acid profile in the blood. Tinned baked beans were used to provide plant-based protein. And the focus food of the study – canned pilchards – was chosen because it is a relatively affordable South African staple.

Kühn decided to investigate whether eating pilchards, a small silver, oily fish related to sardines and rich in Omega-3 fatty acids, might contribute to protecting elderly South Africans from cognitive decline. Pilchards have been fished off the South African coast for generations, and tins of the fish are a common sight on grocery store shelves.

Promising preliminary results

Kühn surveyed 57 residents aged 59 and above living independently in a retirement village in the Johannesburg suburb of Kempton Park to see if the diet with pilchards might have an effect on cognitive decline. They were divided into two groups: a control group followed a MIND eating plan, while the other group added pilchards and fish paste to the same diet over a 12-week period, with cognitive assessments on either end.

In order to test the cognition of the participants in the study, Kühn used the cognitive ability screening instrument (CASI) administered by a psychologist, and blood tests to assess whether the group was actually consuming the pilchards.



The STRiDE study estimated that 450,000 people are living with dementia in South Africa, many undiagnosed.

“What the blood tests showed was that twelve weeks was enough for the Omega-3 to be incorporated into the cells. The red blood cells are representative of the other cells in the body, including the neurons in the brain,” Kühn explains.

There was also a concern that by interacting with the people in her study, Kühn would provide a source of stimulation that would lead to improved cognitive scores not necessarily attributed to a change of diet. So, she spent time interacting with them in advance of the study until the novelty of her presence wore off. By the end of the study, she had gotten so close to the participants that they were swapping pilchard recipes.

The study concluded that the cognitive ability of both groups had improved after following the MIND diet, but that the group that had consumed the pilchards saw slightly, yet noticeably, higher improvement compared to their peers in the control group.

While Kühn is excited about the results, she is realistic about the impact of the study, knowing that the sample size is too small to draw definite conclusions. She hopes it will be a foundation upon which other studies could be built, involving more people from diverse South African communities with more sophisticated testing performed by a qualified neuropsychologist. But for that, she would need more funds. Going forward, as an independent dietitian, she includes pilchards in diet plans for most of her clients.



Velma Peters cooks healthy meals for residents at a NOAH old age residence in the suburbs of Cape Town, but getting them to enjoy it can be a challenge. (Marion Edmunds)

While nutrition should not be viewed as a foolproof way of postponing dementia or avoiding the condition altogether, delaying the onset of Alzheimer's and related diseases by even a few years through a recommended diet plan and other activities including regular exercise could spare individuals, their carers, and communities some hardships, while significantly lessening the cost of care on the economy at large.

Raising awareness in a difficult context

The majority of older South Africans have very limited choices in what they choose to eat. Research done by the Samson Institute for Aging Research (SIFAR) suggests that in this climate of low economic growth and rising joblessness, every cent is carefully weighed before being spent. SIFAR's executive director, Dr Leon Geffen, who was named as one of the Healthy Ageing 50 by the WHO, says that in many cases, the Older Person's Grant is the only income in a multigenerational household.

"Probably about 70 to 80% of all the people living in South Africa live on social grants. Can someone have control over their lives when they're living on that sort of level of income?" he asks.

"That person has to make trade-offs – do I buy food, or do I get medication? [...] We know in studies that we've done through SIFAR that about 50 to 60% of older people are making trade-offs on a monthly basis."

According to the Pietermaritzburg Economic Justice and Dignity Group, a non-profit organisation that tracks the price of South African staples in a Household Affordability Index, even pilchards are becoming more expensive. Six tins cost more than R140 (USD\$7.94) in March 2023, up from R93,79 in 2019 – a 49% increase¹⁰.

Health advocates are conscious of the importance of balancing advice on a healthy, diversified diet with the pragmatic reality of a difficult economic context for most South Africans – and the challenges of introducing new eating habits later in life.

Leaders of Grandmothers Against Poverty and HIV-Aids (GAPA) – a network of self-help groups for the elderly in Khayelitsha, Cape Town, one of South Africa's largest townships – meet every Tuesday to support each other and gain knowledge to pass on to

“Probably about 70 to 80% of all the people living in South Africa live on social grants. Can someone have control over their lives when they’re living on that sort of level of income?”

Dr Leon Geffen, Samson Institute for Aging Research (SIFAR)

other elderly people in their networks. The 60 or so grandmothers are also treated to a healthy lunch, including homegrown greens from the vegetable garden cultivated behind the hall.

In the day’s meeting, the group discuss pilchards as a food source to help with brain function. They are enthusiastic when they hear about Kühn’s study, as they were unaware of the health benefits of the fish. Some of the elderly women say pilchards are already part of their diet, maybe cooked in pasta or even straight out of the tin. One or two announce that they do not like the fishy smell, so it’s off their shopping list – but many are interested and want to know more. However, they have a very limited knowledge of dementia itself, and are vague in conversation about what it is.

Occupational therapist Buhle Maseko-MacArthur facilitates the group. She says their primary health concerns include high blood pressure and diabetes, but that it is unlikely that elderly people would seek out diagnosis or treatment for dementia, let alone address risk factors directly.

“Challenges like forgetting things would have to be really, really, really bad before they go and have that attended to,” she says.

Buhle nonetheless hopes that the act of engaging in GAPA and coming to weekly meetings, sharing information, connecting with others, and learning crafts stimulate the grandmothers in a way that might slow down cognitive decline. They already understand the importance of a healthy diet to ageing successfully and are enthusiastic about eating vegetables as a result – as long as they are cooked.

Back at NOAH, Peters plays with the idea of persuading her elderly clients to eat pilchards, in order to keep their brains healthy.

They have rejected fish pie in the past, “But maybe as a *smoortjie*,” she says describing a popular local dish made up of fried onions, chilli, garlic, green pepper, spices, and protein. “Pilchards in a *smoortjie* with some rice, and a potato. Then they will eat it.”

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Chapter 2:

Brain health risks

Looking after the mind



Grandmother and granddaughter share a moment together in Huripiti, Ayacucho, Peru, in January 2021. (Alex Kornhuber)

BY SIMON LONG

Dementia awareness in some parts of the world received a publicity boost in 2022, thanks to society's obsession with the private lives of celebrities. A television documentary series about how to live better and longer came up with a compelling idea for a scene. In the fifth episode of "Limitless"¹, Chris Hemsworth, an Australian actor famous for playing a Norse god (a role for which he looks as if he was typecast), was to sit facing a "longevity doctor". The physician, Dr Peter Attia, would tell him on camera the results of an exhaustive examination of his blood. Hemsworth later revealed in an interview with *Vanity Fair* that Attia decided he could not spring the news on him live on camera. One finding was so devastating it required a private consultation: that analysis of Hemsworth's genetic makeup revealed him to be eight to ten times more likely than average to develop Alzheimer's disease.

In the edited episode that was aired, Hemsworth showed his acting chops by appearing to react to this news with appropriate shock and concern. After the diagnosis, Hemsworth, who turned 40 in 2023, is told that it is a blessing that he can take steps now that most people would not contemplate until well into their 40s or 50s. The programme then turns to a discussion of what these steps should be. He is given the sort of lifestyle advice that readers of the previous chapter are now familiar with – good sleep and nutrition, etc.

One immediate prescription, however, is less conventional. To help develop his hippocampus – the small, seahorse-shaped part of the brain with a central role in the formation and retrieval of memories – Hemsworth is sent off on a helicopter trip to drop him and a friend for an adventurous days-long hike across the Australian outback without a cell phone. Navigation, he is told, is one of the most complex of mental activities. Ditching the GPS is a therapeutic workout for the brain.

As therapy, the stunt is of course rather ludicrous. A one-off adventure is not going to do much for the long-term health of Hemsworth's brain. (It is, however, a smart choice for other reasons: most forms of mental gymnastics – learning a new language, say, or tackling complicated mathematical problems – would make much

less watchable television.) But the notion that exercising and stretching the brain is an important way of keeping it healthy is widely accepted.

Autopsies have shown that the brains of many people who showed no symptoms of dementia when they were alive are riddled with the pathology of Alzheimer's – beta-amyloid plaques and tau neurofibrillary tangles. One way neurologists explain this apparent anomaly is through the concept of "cognitive reserve". The brains of those who had died without cognitive impairment are heavier than average, containing more neurons and synapses². They had, as it were, grey matter to spare.

Reserves of strength

The greater this "cognitive reserve", the better protected a person is against dementia. But how can it be enhanced? The best way, it seems, is to get an education early in life (See story page 40). Broadly speaking, the higher the level of educational attainment, the lower the risk of dementia – although the Lancet Commission reports that cognitive ability reaches a plateau in late adolescence, when the brain is at its most plastic, and that education after the age of 20 has a smaller effect³ (but has probably been pursued by people who already have a higher cognitive function, explaining the correlation between additional years of schooling and lower dementia risk).

Of course, building cognitive reserve does not stop when a person leaves full-time education. So long as the brain is exercised, it can retain and add reserve. But what sort of brain exercise is best? Even more so than for other risk reduction efforts discussed in this report, measurement is hard. As Dr Gary Small, a psychiatrist at the University of California, LA, and co-author of "The Alzheimer's Prevention Program"⁴, jokes: "I have never seen a head-to-head comparison of knitting and crossword puzzles."

Analysis of this kind is especially plagued by the problem of "reverse causality" (do knitting, or solving crossword puzzles, or learning Tibetan, or playing the harpsichord improve cognition? Or are these activities favoured by those with high cognitive functions anyway?). More research is needed, but this kind of study is not as far-fetched

as Small suggests. One trial, run out of Columbia and Duke Universities in the United States in 2022, found that the use of computerised crossword puzzles was associated with improved cognition and function and less brain atrophy in participants who had mild cognitive impairment, compared with those who used computerised cognitive games involving memory, matching, spatial recognition, and processing speed tasks⁵.

Another problem is to decide which is best: to take on mental activities that you enjoy, and so are likely to persevere with? Or to challenge yourself with something new, even if the activity does not appeal? Should crossword enthusiasts, as it were, start knitting? Yes, implies Small, speaking in part from his own recent experience in taking up a new professional role: "There is something about challenging yourself that keeps you mentally crisp." Many people afraid of cognitive decline will seek to "train" their minds by doing daily puzzles – sudoku, crosswords, jigsaws, etc. – a natural and beneficial self-protective response, but not as effective as trying something new and, at first, more difficult.

One activity generally accepted as helping build cognitive reserve is speaking more than one language. A 2007 study of 184 patients living with dementia in Canada found that those who were bilingual began showing symptoms of dementia about four years later than their monolingual fellows⁶. Several other studies have since replicated these findings. Another Canadian

study in 2010 found an even bigger benefit: that bilinguals were on average 5.1 years older than monolinguals at the age of onset of the symptoms of dementia⁷.

Bilingualism seems to contribute to cognitive reserve for the reason one would expect: it entails a difficult mental feat. Someone who speaks two or more languages well is constantly having to resist interference from the languages not currently in use⁸. And that interference – when a second, unused language intrudes unbidden into the one being spoken – becomes more common as people age or develop dementia.

Which is best: to take on mental activities that you enjoy, and so are likely to persevere with? Or to challenge yourself with something new, even if the activity does not appeal?

Friends greet each other at the Mao Branca senior centre in São Paulo, Brazil on March 28, 2019. (Alex Kornhuber)



For those who speak only one language, it is of course never too late to learn. Or is it? Everybody knows that the older you get, the harder it is to learn a new language⁹. But that very difficulty makes it good for brain health. “The constant juggling between distinct sounds, new words, and unfamiliar concepts acts as an efficient brain workout,” according to LingoFlamingo, a language school based in Glasgow that ploughs surplus revenue from its classes into subsidised work with older adults, including in care homes and day centres for those living with dementia¹⁰.

Robbie Norval, the school's founder, was inspired by the experience of two grandparents with dementia for whom the activities on offer were dull and mundane. He says the social contact the language classes bring is as important as the mental stimulation. The school has been advised by Thomas Bak, the cognitive neuroscientist mentioned in the previous chapter. He says that language, like music, “stimulates a lot of cognitive functions” involving sounds, form, concepts, grammar – and social interaction. And, in terms of the cognitive benefits, “activities that are multilayered are much better than doing just one thing.”

Keep-fit classes for the brain

Also credited with providing protection against cognitive impairment is playing a musical instrument¹¹. Data from EPIC-Norfolk (European Prospective Investigation into Cancer in Norfolk), a study of 30,000 people aged 40–79 in the English county of Norfolk since 1993¹², found a close correlation between playing an instrument in middle age and cognitive performance in later life. Two earlier studies had found quite dramatic results: in one case, that musicians were 64% less likely to develop mild cognitive impairment or dementia; and in another, a meta-analysis of two cohort studies, a 59% reduction in the risk of developing dementia was observed within the study's follow-up period.

A groundbreaking study involving interventions in the lives of a group of 60- to 77-year-olds in Finland with higher risk factors for dementia, known as the FINGER¹³ trial (Finnish Geriatric Intervention Study to Prevent Cognitive Impairment and Disability) published results in 2015. It included “cognitive training” as one of its five “fingers” of risk reduction (the others are diet, physical exercise, social contact, and vascular and metabolic monitoring). It put people through computer-based mental gymnastics. Miia Kivipelto, who led the study, suggests that part of the benefit for some of the participants may actually have come from the stimulation of learning to use information technology for the first time.

The FINGER study was the first published randomised control trial to show that modifications of several lifestyle factors can slow cognitive decline in later life. It has since expanded into an international network involving research teams from over



A study of 30,000 people aged 40–79 in the English county of Norfolk since 1993, found a close correlation between playing an instrument in middle age and cognitive performance in later life.

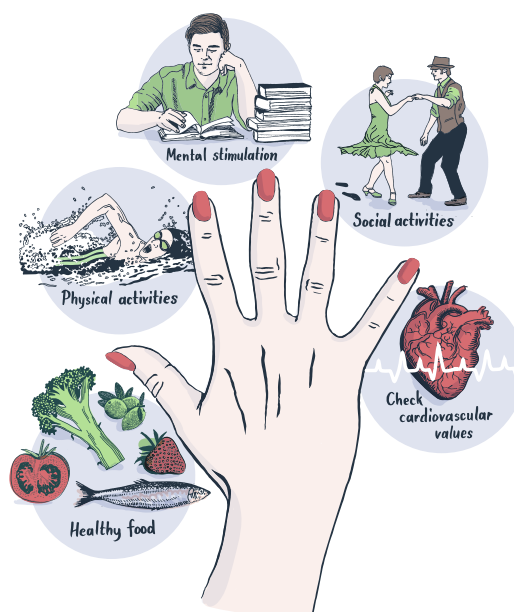


Illustration: Martina Krona, from the book “Brain Health” by Miia Kivipelto and Mai-Lis Hellénus (Holm&Holm Books)

40 countries¹⁴, from Burundi to the Philippines. Its intervention strategies are tailored to different geographical, cultural, and economic settings. Its study in Japan, for example, includes dietary advice determined by the Dietary Reference Intakes for Japanese, produced in 2020 by Japan's Ministry of Health, Labour and Welfare¹⁵.



Ngeno-Zacharias Nakamhela shows his wife, Ndikuhoole Johanna Nakamhela, who shows signs of dementia, old family photographs at their home in Kalkfeld, a small town just north of the Namibian capital, in August 2021. (Lee-Ann Olwage)

A remarkable smaller study, based in a Singapore shopping mall, has provided some interesting insights into which activities help keep brains healthy. Starting in 2011, it followed a cohort of just over 1,000 older people living around the Jurong Point Mall who were enrolled in randomised control trials covering different various psychosocial interventions: “mindfulness” (“learning to relax, maintaining stability and sustained attention or stillness of mind, and clarity”¹⁶), music reminiscence, choral singing, and gardening. After five years, the percentage of participants experiencing depression had fallen from 7.3% to 4.5%, and the percentage living with dementia had risen only modestly, from 1.9% to 2.9%.

The Jurong study ran out of funds after ten years, but a programme based on it, “Ageing Well Everyday” led by Professor Kua Ee Heok of the National University Hospital, has been taken up elsewhere in the island. Singapore’s largest Buddhist monastery, a huge complex at Kong Meng San, has provided facilities for 12-week courses for older people, mostly not showing symptoms of dementia, from all over the island, with similar content – mindfulness, exercise, horticulture, and music. ADI talked to “graduates” who had just completed one such course, enjoying an outing to Singapore’s national gallery in May, and heard great enthusiasm for the course. Demand outstrips supply, and participation was seen as a privilege and rather prestigious; it was an opportunity to make new friends.

“Social contact,” notes the Lancet Commission, “now an accepted protective factor, enhances cognitive reserve or encourages beneficial behaviours.” So activities that both stretch the brain and involve social interaction seem most effective in safeguarding brain health. Better still if they involve aerobic activity, helping keep the body healthy too.

If you were to design an activity from scratch to meet these criteria, you might come up with something resembling... dancing. A 2003 study in the Bronx in New York City looking into leisure activities and the risk of dementia in the elderly¹⁷ did indeed conclude that “dancing was the only physical activity associated with a lower risk of dementia”. A small study of a community dance programme in Singapore also had very positive results¹⁸.

Mens sana

Unsurprisingly, a healthy mind is more resilient to dementia than one with an illness. An analysis of data on New Zealand’s population, including everybody born in the country who lived there for any time between 1988 and 2018, found that people with mental health conditions were at greater risk than the general population both of developing dementia later in life, and of an onset of dementia at a younger age¹⁹.

The Lancet Commission lists depression as one of the 12 modifiable risk factors for dementia, though noting that, again, there is a “reverse causation” risk – the neuropathology of dementia may cause depression years before the symptoms of dementia manifest themselves²⁰. The New Zealand researchers classified nine broad categories of mental health conditions (substance use, psychotic, mood, neurotic – i.e., anxiety, physiological disturbance, personality, developmental, behavioural, and “unspecified disorders”). They also obtained data about self-harm. They found that people with a mental health condition were over three times more likely to be later diagnosed with dementia (6.1% of those with a mental health condition later developed dementia, compared with 1.8% of those without one).

That depression is a risk factor may help partially explain why women are at greater risk of dementia (See story on page 36). The vast majority of informal, unpaid care work in the world is carried out by women – providing the equivalent of an estimated 67 million full-time jobs in 2019²¹, often without social recognition. For many, this means diminished prospects for friendship and employment, and greater social isolation.

Another mental health risk factor for dementia is delirium (for which dementia is the single biggest risk factor²²). Both conditions can make a person easily distracted, unaware

of where they are, incoherent, hallucinate, or become very scared and paranoid. Even in hospital, delirium sometimes goes unnoticed and undiagnosed. Unlike dementia, however, delirium starts suddenly, within a matter of hours or days rather than over a period of years or decades. It is usually a brain's reaction to a particular medical problem, or set of problems, such as a surgical operation, or an infection.

Most people soon get back to “normal”. But Professor Daniel Davis, a geriatrician at University College Hospital in London, says that “an appreciable fraction” never do, with a lasting impairment of their cognitive functions. Studies, such as the one Davis himself leads in the London borough of Camden (the Delirium and Population Health Informatics Cohort, or DELPHIC)²³ have shown that experiencing delirium does make it more likely that someone will go on to develop dementia.

The coronavirus pandemic, meanwhile, worsened dementia risk for many – notably, in many countries, by imposing social isolation through lockdowns. Data also indicate that COVID-19 leaves people at a higher risk of long-term neurological complications – the COVID-related cognitive impairment that has become known as “brain fog”²⁴. The extent to which the pandemic may increase incidence of dementia is a question that will be examined for years to come.

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Addressing depression as a modifiable risk factor in rural Kenya



Mental health is taken increasingly seriously as a factor bearing consequences on overall health. In Kenya, the link between depression and dementia is being more closely examined than ever before.

BY MUTHOKI KITHANZE IN KWA KIVISI, KENYA

Josephat Nzyuko and Esther Kisilu are retired civil servants living out their sunset years in the expanse of their village, Kwa Kivisi, located in Makueni county in southeastern Kenya.



The couple's days revolve around tending to their livestock and a modest farm on the periphery of their compound. In the evenings, they sit outside to enjoy some tea – a longstanding habit for the couple.

Esther, 58, was an elementary schoolteacher for more than a decade, teaching science, agriculture, and Christian religious education at a nearby school. Even in retirement, her warm, pedagogical demeanour remains one of her most striking features.

"I liked teaching children very much, but slowly I became aware that I was struggling to pass information on to them. It was just difficult, and I could not explain it," Esther recounts, her words and movements measured and restrained.

Her distress grew, pushing her out of the classroom and between hospitals, seeking treatment for what she described as raging thoughts and bouts of insomnia.

Esther says her symptoms began in 2010, after Josephat, then a police officer, was imprisoned: "My husband was implicated in a crime and sentenced to four years of hard labour. Our children were still in school at the time."

Josephat's absence took an insidious toll on Esther, who spent her days and nights mulling over his fate all while having to care for her family. Her brothers soon picked up on her malaise and shuffled her to numerous hospitals.

Esther was eventually diagnosed with dementia in her late 40s, while her husband was still in prison.

"By the time I was acquitted in 2012 after my appeal was ruled in my favour, my wife's health had changed. Her mannerisms had changed; she stopped laughing and always sat pensively. She was not the same," says Josephat.

Esther's eyes dart to her chickens pecking in the distance during the interview – but for the most part her gaze is locked on her husband, who helps her retrieve some fading memories.

"She stopped going to school and church completely," Josephat explains. "Even attending her chama [an informal cooperative savings venture common in Kenya] ceased. She only stays in the house – coming out for a few hours before going back in."



Data from the Institute for Health Metrics and Evaluation (IHME) estimated that around 87,000 people were living with dementia in Kenya in 2019, a number projected to rise more than threefold to over 360,000 by 2050.



Dr Joseph Masila heads the Makueni Brain Health Centre, which provides mental and neurological health services to residents in southeastern Kenya. (Muthoki Kithanze)

Life stresses as risk factors

Data from the Institute for Health Metrics and Evaluation (IHME) estimated that around 87,000 people were living with dementia in Kenya in 2019, a number projected to rise more than threefold to over 360,000 by 2050.

But dementia remains largely misunderstood and stigmatised in Kenya, especially in rural areas. Low awareness of the condition among healthcare workers and the general public, in addition to a lack of access to disease-modifying drugs in the country, continue to make diagnosis and care for dementia a difficult task.

In this context, however, lowering the incidence of dementia by dealing with modifiable risk factors such as depression appears to be a practical opportunity.

In Esther's case, a history of depression precipitated the development of her Alzheimer's – which local health professionals say isn't uncommon.

"Up to 50% of the cases of dementia (in Makueni county) have depression," says Dr Joseph Masila, a Makueni county psychiatrist. "The variance is: When did the depression start and when did dementia start?"

"Although we may not confidently say (depression) is the prodrome of dementia, there is definitely a [...] link."

Dr Joseph Masila, a Makueni county psychiatrist

"Although we may not confidently say (depression) is the prodrome of dementia, there is definitely a [...] link," Masila goes on to explain.

While there isn't a proven direct cause-and-effect relationship between depression and dementia – being diagnosed with the former does not mean someone will inevitably develop the latter when they grow older – there is ample research¹ on depression as one of the potentially modifiable risk factors² for dementia.

According to Masila, addressing depression both psychosocially and psychotherapeutically could considerably lower the risk of dementia among the elderly – the population at greatest risk of developing the neurological condition.

Taking mental health seriously in Kenya

Depression and anxiety are the most common mental health conditions in Kenya. One in every four persons who seek health care in Kenya has a mental health condition, according to a 2020 report from the Ministry of Health³.

The report found out that common risk factors for mental health conditions include adverse childhood experiences, low levels of education, food insecurity, poor housing, unemployment, discrimination, climate change, and environmental degradation.

In 2022, then-President Uhuru Kenyatta declared that the National Health Insurance Fund (NHIF) would work to improve the state of mental healthcare in the country.

Efforts have included the creation of new mental health facilities, as well as the upgrading of existing units across various public hospital cadres. Despite being the largest specialised governmental hospital, Mathari National Teaching and Referral Hospital (MNTRH) was found to be seriously neglected and understaffed in a 2018 parliamentary report⁴. Efforts are underway to relocate the hospital at the cost of 5 billion Kenyan shillings (USD\$35 million) to improve the overall quality of services.

At a local level, Makueni became a trailblazer in recent years by being the first of Kenya's 47 counties to roll out a subsidised healthcare programme for its residents.

The Makueni Teaching and Referral Hospital deploys community health promoters, who visit homes in the area and can flag suspected cases of dementia, depression, and other ailments that may otherwise have gone undetected. Meanwhile, the hospital's counselling unit offers emotional, social, and mental support to members of the public since 2016.

Vulnerable senior citizens aged 65 and above in Makueni can also benefit from the Older Persons Cash Transfer (OPCT) programme. Those who qualify receive 2,000 Kenyan shillings (USD\$ 14.25) every two months to help them to buy food, clothing, or medicines – helping reduce some of their financial and overall stress.

In an effort to address increased rates of mental health and neurological conditions in the county, the Makueni Brain Health Centre, headed by Masila, was opened in 2022 to provide preventive, curative, and forensic services.

Esther Kisulu, right, first began showing signs of what would later be diagnosed as dementia while her husband Josephat, left, was imprisoned. (Muthoki Kithanze)



“Had mental healthcare been robust when my wife got sick, we may not be here, but there is hope for others.”

Josephat Nzyuko, carer

The facility has trained three clinical officers in psychiatry so far to assist in the diagnosis and treatment of psychological conditions such as depression – a significant feat in Kenya, which has around 100 psychiatrists⁵ for a population of 53 million.

The first of its kind in Makueni, the modern health facility is playing a crucial role in the management of dementia in the area, Masila claims.

“Before 2020, Makueni Teaching and Referral Hospital did not have a specialised mental health unit, let alone a psychiatrist,” he says. “[The Brain Health Centre’s] presence now has seen increased detection and screening of dementia cases.”

Josephat and Esther are beneficiaries of the facility, visiting the clinic periodically to keep track of Esther’s condition.

“Before the facility came up, we used to go to just any doctor, but now we are sure we are seeing the right doctors. Also, Esther can get her medication easily and conveniently,” Josephat says.

Masila observes that treatment at the Makueni brain health facility is highly subsidised, with patients paying only 50 shillings (USD\$0.36) for treatment. Medication is also free as long as it is available.

“Access to treatment for depression requires money,” he says. “It is much easier for people to come to the facility due to affordability.”

Masila adds that the centre’s awareness-raising efforts have also helped challenge some preconceived notions about dementia.

“During a sensitisation exercise, one man asked where we had been all these years when he thought *thing’ai* [dementia in the Kamba dialect] was normal ageing.”

Makueni county has become a pioneering location for the screening of around 2,400 people aged 60 and above for dementia since 2022, when the Africa Mental Health and Training Research Foundation (AMHTRF) and other partner organisations launched efforts to map out the prevalence of dementia.

The centre has also received at least six referrals for cases of suspected dementia from sub-county hospitals since its foundation.

In addition to being able to diagnose individuals with dementia and give them the help they need, the screenings also provide evidence of the probable number of individuals with dementia in Kenya, important data to inform policy and strategic action.

According to Professor David Ndeti, a psychiatrist and researcher at the University of Nairobi who works with the AMHTRF, Kenya is doing a commendable job to address mental health.

“There has been a peak in the training of psychiatrists in the country,” Ndeti says. “In fact, psychiatry is easily the most popular area of medical specialisation (today).”

Everyone in society has a role to play to bring down the burden of mental illness, from doctors, researchers, family members, to the state, he argues.

“There is a relationship [between depression and dementia], but to understand it better we need to establish the nature of the relationship,” he explains, adding that research is key. “We continue to conduct more studies.”

As momentum grows across the country to address mental health and dementia, Josephat and his family hope that this progress will help others in their situation.

“In hindsight, had mental healthcare been robust when my wife got sick, we may not be here,” he says. “But there is hope for others, because there is overwhelming focus on mental health right now.”

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'The best gift': Unlocking the power and long-term benefits of education in Pakistan



The link between schooling and the risk of developing dementia later in life is one of many arguments used by advocates calling for increased access to education in Pakistan, particularly for girls.

BY SAIMA JABBAR IN ISLAMABAD, PAKISTAN

It is the end of the academic year, and a schoolteacher in Islamabad informs Safia Bibi of the outstanding achievements of her younger daughters, aged 12, 10, and 6. The oldest of the three siblings has to translate the information for her mother, as Safia only speaks Pashto, a language predominantly spoken in northern Pakistan and Afghanistan, and cannot understand what the teacher is saying in Urdu, the official national language. But the woman in her 50s is happy to learn that her daughter will be moving on to the next grade – an opportunity she dreamed of having when she was younger.



"We used to live in a village near Noshera, in the Khyber Pakhtunkhwa province," Safia recalls. "My father didn't allow his daughters to step outside the home, let alone send us to school. He considered educating girls against our family traditions and religion. I spent my early years helping my parents with household chores and taking care of my younger siblings. I was only 15 years old when my father arranged my marriage to my cousin, who was also illiterate and worked in farming to support his parents."

Safia Bibi went on to have six daughters and three sons. Even though her three eldest daughters were also married at a young age, she pushed for her three youngest to be able to stay in school.

"Things changed when we moved to Islamabad, the capital. I fought with my husband to send our three younger daughters to school near our home," she recounts. "I hope that at least my three younger daughters can have better access to a quality life and education."

According to UNICEF¹, Pakistan currently has the world's second-highest number of out-of-school children, with an estimated 44% of children between the ages of 5 and 16 (around 22.8 million) not attending school.

Access to education is among the 12 modifiable dementia risk factors² identified by The Lancet.

According to the Institute of Health Metrics and Evaluation (IHME)³, approximately 374,000 people were living with dementia in Pakistan in 2019. This number is projected to rise to 1.35 million by 2050 if no preventive measures are taken.

While childhood education isn't often discussed through the lens of dementia in older age, medical professionals and education advocates argue that efforts to increase literacy and school enrolment rates in Pakistan are crucial at many levels to improve quality of life throughout citizens' lives.



While childhood education isn't often discussed through the lens of dementia in older age, medical professionals and education advocates argue that efforts to increase literacy and school enrolment rates in Pakistan are crucial to improve quality of life throughout citizens' lives.



Ayesha, 22, tutors children on different subjects at Mashal Association, a social welfare association dedicated to uplifting women and girls in Pakistan. (Saiyna Bashir)

Education, a gendered issue

While education is a broad issue in Pakistan, the problem particularly affects girls and women, with cultural and societal barriers restricting their access to formal schooling. The UN reports that some 10.7 million boys are enrolled at the primary school level, compared to 8.6 million girls. The 2022 World Gender Report⁴ highlights that boys were 15% more likely than girls to be enrolled in secondary school in the country.

The biggest factor preventing girls from attending school is poverty, along with gender discrimination, class, religious and ethnic divisions, as well as a lack of government schools. As children progress in their education, schools tend to become more segregated by gender, with fewer schools available for girls than boys.

Meanwhile, Pakistani Taliban (TTP) and other militant groups in the country who oppose girls' education have attacked hundreds of girls' schools, teachers, and students in the northwestern and northern parts of Pakistan since 2007, exacerbating the risks for the young students who are able to pursue their studies.

Ayesha, 22, was the first girl in her family to have been able to pursue her education up to the graduate level. She is currently teaching at the secondary school she once attended while pursuing her degree in education online at the Allama Iqbal Open University in Islamabad.

In the evening, children from a nearby impoverished area come to her for tutoring. Ayesha's father, Akhter, who works as a security guard at the school where Ayesha teaches, takes pride in calling his daughter "Madam Ayesha".

"I was over the moon when my father allowed me to become the first girl in the whole family to have the opportunity to pursue my education," she says. "My mother has diabetes and can't even read the medicine labels or the nutrition guide provided to her by a doctor. I am glad that I won't be as dependent on my children when I get older."

The long-term benefits of education on dementia

Low levels of education, especially in early life, have been proven to affect one's cognitive reserve and raise one's risk of developing dementia later in life. Women globally are almost twice as likely⁵ to develop Alzheimer's disease than men

– due to a number of factors including longer life expectancy, biological differences, the impact of traditional gender roles on their education, career, and lifestyle.

While the impact of education on dementia risk is well established in global research, the topic requires further exploration in Pakistan.

“Although traumatic brain injuries and depression are seen as primary risk factors for dementia in Pakistan, early childhood education could also contribute to reducing the risk,” says prominent neurologist Dr Maimoona Siddique.

Geriatrician Dr Majid Khan emphasises the connection between low levels of formal education and an increased risk of developing dementia later in life.

“Education helps to keep the brain stimulated by engaging in activities such as reading or writing, especially after the average retirement age of 60 years in Pakistan,” he states. “This practice can contribute to a decreased risk of dementia or delay its onset.”

However, research has shown that engaging in mentally stimulating activities throughout life can have a protective effect against dementia⁶, even for people who didn't get to pursue their education.

Waheeda, 46, didn't finish school, but now teaches sewing and embroidery to girls at a skill development centre. “I remember all the embroidery stitches I learned 15 years ago and enjoy teaching,” she says. “I would have forgotten all of it if I was not teaching this to girls.”

For psychiatrist Dr Mehboob Yaqub, increasing rates of literacy and education in Pakistan could not only affect individuals' risk of developing dementia – it could also improve the lives of people living with the condition.

“The existing stigma surrounding dementia in Pakistani society deters families from seeking medical assistance. Higher rates of education would help raise awareness about dementia, its symptoms, risk factors, and available treatments, in turn increasing [the rates of] early diagnosis and better managing the condition,” he affirms.

Moving towards a better future

Pakistan affirmed its commitment to the 2030 Agenda for Sustainable Development by adopting the Sustainable Development Goals⁷ (SDGs) in 2016. The fourth goal listed in the agenda calls for ensuring inclusive, equitable, and quality education and lifelong learning opportunities for all.

Khalida, centre, helps her 8-year-old daughter Sidrat-ul-Muntaha with her homework, as grandmother Liaqat watches on. (Saiyina Bashir)



According to the World Bank⁸, Pakistan spends 2.5% of its GDP on education, far below the 4.3% international average.

Mahgul Kureshi is an activist and vice president of the Mashal Association, which provides free education to underprivileged girls. For her, poverty, cultural and social barriers, and long commutes to school are a few reasons why girls are denied education in Pakistan.

She suggests that educational institutes should provide free pick-up and drop-off to girls coming to school, while implementing targeted scholarships, financial incentives, and promoting community awareness and engagement would help improve girls' education rates in Pakistan.

"I am grateful to my parents for allowing me to pursue my education up to the postgraduate level," Kureshi says. "Despite being 90 years old and experiencing partial hearing loss, I still have a deep passion for reading books. As a volunteer, I continue to visit Mashal Association regularly, actively participating in its various activities. This engagement helps to keep my mind sharp and active."

Empowering women through education not only benefits their personal and professional lives but also has broader societal implications, including improved healthcare access and reduced dementia risk.

"Educated girls are more likely to be aware of health risks, preventive measures, and reproductive health. They are more likely to delay marriage and make informed decisions on childbirth, adopting a healthy lifestyle, reducing health risks, and seeking timely medical attention," says Waqas Bajwa, deputy director for civil society organisation Idara-e-Taleem-o-Aagahi (Centre of Education and Consciousness). "By providing girls with quality education, we promote a comprehensive process for human and social transformation. We invest in their brain health and set the stage for healthier ageing, thus reducing the onset of dementia as well as other major health risks later in life."

Liaqat, 65, remembers witnessing girls from higher-income households going to school while her parents couldn't afford education for her and her siblings. As an adult, she has toiled as a domestic worker to support herself and her



Liaqat, who works as a kitchen helper at Mashal Association, wasn't able to study past the fourth grade. She now makes sure her granddaughter has access to the opportunities she was deprived of. (Saiyina Bashir)

seven children. "People have taken advantage of my illiteracy throughout my life, such as shopkeepers charging me higher prices knowing that I couldn't read the receipts or double-check the amounts," she says.

Despite the challenges, Liaqat is determined to provide a better life to her children and grandchildren. While her daughter Khalida could not afford to continue her education and got married young, Liaqat and Khalida are working hard to send the latter's 8-year-old daughter, Sidrat-ul-Muntaha, to private school.

One of Liaqat's daughters died in childbirth six years ago, leaving her even more determined to help her grandchildren break the cycle and get an education that could help them throughout their lives.

"I am shouldering the living and educational expenses [of my deceased daughter's children] because I want them to have a better quality of life. This would be the best gift I can give to them, and I hope that they will always remember me in a positive light after my death," she says.

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Chapter 3:

Environmental and population-level risk reduction



The bigger picture



A woman stands outside of her apartment in the Cuban capital, Havana, in 2014. (Domenico Pugliese)

BY SIMON LONG

The lesson Chris Hemsworth draws from what he is told by the experts on “Limitless” is resolutely upbeat: “So much of this is in my own hands: eat and sleep well. Challenge my mind and body with new experiences and immerse myself in nature, away from the distractions and stress of modern life. And, crucially, share all of this with the people I love.”

It sounds an unduly optimistic message. But it is true that there is so much that he – and any individual – can do to reduce the risk of dementia and delay its onset, and that many of the risks are “modifiable”. On the other hand, it has to be admitted that, although Hemsworth’s is a brave voice, it is also one of extreme privilege. The changes he talks of are far easier for well-off people in high-income countries. And in the coming decades, most new cases of dementia will be in lower- and middle-income countries (LMICs), where the capacity of many individuals to change their lives is constrained. In high-income countries, too, widening inequality means risks are very unevenly distributed.

The Lancet Commission argues that as many as two-fifths of cases of dementia are avoidable, noting: “Together the 12 modifiable risk factors account for around 40% of worldwide dementias which consequently could theoretically be prevented or delayed.”¹ But that word “theoretically” is doing quite a lot of work. It is far easier to list desirable changes to one’s lifestyle than to make them. They may involve countless choices over the course of a single day, many of them involving picking the less immediately appealing, healthier option – going to the gym rather than the pub; walking or cycling rather than driving; turning down cigarettes, drinks, or French fries.

Other risk factors that are, “theoretically”, in an individual’s control may in fact be almost impossible to change singlehandedly, especially if they do not belong to the tiny percentage of the world’s population who are financially well off. One person cannot do much on their own to improve the air quality in the city where they live, and it may not be feasible to stop burning polluting fuels at home. If a girl is not allowed to go to school, it is often beyond her power to acquire the years of education that would protect her from dementia later in life (See story page 40). Many other potential risk factors that may affect people living in LMICs more than others have been little studied because so much of the research to date has been conducted in the Global North: malnutrition in pregnancy and early life; the prevalence of diseases such as malaria and dengue; the role of HIV, and so on. Most are, from the perspective of the individual, unavoidable.

Even personal habits are not entirely a matter of self-discipline. Tobacco and opiates are extremely addictive. Giving up is a real struggle. And if all the food in the nearby shops is full of salt and sugar, it may be hard to cut down. Physical exercise is good for you; but if you have nowhere to do it, it is beyond reach.

For all these reasons, it has long been widely accepted that governments have some role in setting regulations to conserve public health, and hence, with regard specifically to dementia, to take measures at the population level to reduce the risks. In Britain, this idea was formalised in 2014 as the “Blackfriars Consensus”², reached at a meeting of public health officials, experts, and organisations working in dementia and non-communicable diseases (NCDs). It agreed that efforts to prevent NCDs should include those to improve brain health and that “there is a growing consensus that the scientific evidence is now

In the coming decades, most new cases of dementia will be in lower- and middle-income countries, where the capacity of many individuals to change their lives is constrained. In high-income countries, too, widening inequality means risks are very unevenly distributed.

sufficient to justify policy action across the life course.” It estimated that between 3% and 20% of predicted new cases of dementia in the next 20 years could be prevented by action on behavioural and other risk factors for NCDs, including smoking, poor diet, physical inactivity, and alcohol.

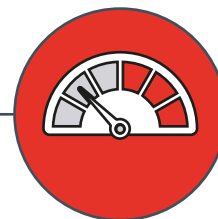
The bigger picture

Population-level interventions attempt to change the risk profile of an entire country. Their impact is even harder to research and quantify than individual-level approaches, and they raise obvious ethical and political issues: to what extent should government legislate to stop people pursuing harmful behaviours they do not want to give up? But some research suggests that population-level approaches work much better than individual-level ones³.

Although modifiable risks are often addressed as split into two distinct camps – with individuals responsible for their physical and mental health risk reduction, and governments accountable for policy – bridging the gap between the two are the public health systems that enable sustainable change, such as population-level interventions aimed at individual behavioural change.

The Centers for Disease Control and Prevention (CDC) in the United States defines public health systems as “all public, private, and voluntary entities that contribute to the delivery of essential public health services within a jurisdiction.”⁴ These can include community- or faith-based organisations, healthcare or workplace settings, or educational facilities that can raise awareness of brain health and integrate risk reduction education and action into their programmes. Community groups can provide a safe and supportive environment for individuals to come together and engage in risk reduction activities such as running, tai chi, language conversation classes, or even singing in a choir (See story page 88). Equally, the collaborative approaches developed by community groups create partnerships that are a convenient vehicle for governments looking to fund impactful public health interventions that, in the long term, can improve health outcomes and reduce chronic disease.

From first principles, this makes sense. As Sebastian Walsh, a public health specialist at Cambridge University, and others have argued⁵, any intervention can only reduce risk factors by a small amount. So to produce a big reduction in the disease burden, it must be implemented on a large scale – and ideally over the whole population. Moreover, even a successful individual intervention, leading to a person's living a healthier life, still has to be maintained after the intervention has ended, or their children, if they live in a similar environment, will face the same difficulties as their parents in pursuing a healthy lifestyle.



In 2017, the World Health Organization (WHO) adopted the Global Action Plan on the Public Health Response to Dementia 2017–2025, which included dementia risk reduction as its third action area.

In 2017, the World Health Organization (WHO) adopted the Global Action Plan on the Public Health Response to Dementia 2017–2025⁶, which included dementia risk reduction as its third action area. All WHO member states committed themselves to translating this into their own national action plans.

The Global action plan notes that growing evidence suggests “an interrelationship between dementia on one side and NCD (non-communicable diseases) and lifestyle-related risk factors on the other”. In fact, the target for the risk reduction action area does not mention dementia at all. Rather, it duplicates another global action plan for the prevention and control of NCDs⁷ such as cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes. As we have seen, dementia shares many risk factors with these NCDs, so progress towards the target would have a great impact on dementia risks. Some factors, however, such as hearing loss, social isolation, depression, and a truncated education, are direct risks for dementia, but not for other NCDs.

So there is debate about whether dementia should be added to the list of NCDs covered by that WHO action plan. Devora Kestel, the head of the WHO Department for Mental Health and Substance Use, explains that such a change would entail a big bureaucratic upheaval. The list is not the WHO's alone, but was enshrined in a 2011 political declaration by the UN General Assembly⁸. That declaration makes a separate reference to



Men from the Rabari ethnic group pose in the village of Kana Kola, in the Indian state of Rajasthan, in 2019. (Domenico Pugliese)

dementia, recognising that “mental and neurological disorders, including Alzheimer’s disease, are an important cause of morbidity and contribute to the global non-communicable disease burden, for which there is a need to provide equitable access to effective programmes and healthcare interventions.”

Besides the difficulty of adding dementia to the list of NCDs, Kestel does not think it would help. “Being included under the umbrella of NCDs would make it lose some visibility,” she tells ADI. She points out that the current four-disease list may be well known in public health circles around the world but has barely entered the public consciousness. Inclusion in the list would not raise the public profile of dementia, she argues.

Nevertheless, those who live with dementia or work with them are left feeling that the condition, the seventh leading cause of death in the world according to the WHO⁹, is still not being given the international priority it deserves. The many issues dementia raises will be hard to tackle if it is always relegated below other priorities – as a subset of mental health problems, or a second-order NCD – and specific, targeted policies are not adopted.

Argument about the details of the Global action plan on dementia, however, is somewhat academic since the plan is largely being ignored. As of May 2023, only 39 of the WHO’s 194

members¹⁰ had produced the promised national action plans¹¹ (so had another seven jurisdictions, including Scotland and Chinese Taipei, which are not WHO members), and another 22 were developing one. Most of those with plans adopted or in development are high-income countries. So bleak are the prospects for the plan achieving its goals by 2025 that ADI has proposed it be extended until 2029. WHO officials concede that an extension is needed, but point out that the initiative has to come from its member governments. It is not a decision the international body can take unilaterally.

Planning ahead

Of the dementia national plans and strategies that have been adopted, Kestel says 51% have dementia risk reduction plans (as do 32% of countries that have no plans as of yet). Wales, for example, explicitly endorses the Blackfriars Consensus¹²; Canada¹³ has a section on expanding “awareness of modifiable risk and protective factors and effective interventions” and on “support measures that increase the contribution of social and built environments to healthy living and adoption of healthy living behaviours”; the Netherlands¹⁴ promises to target risk reduction measures at high-risk groups, such as people with diabetes and cardiovascular diseases. Uruguay starts young with brain health programmes in schools (See story page 52).



Andrias Mangundu, a nursing student at the University of Namibia, printed an ADI graphic and uses it to help screen people for possible signs of dementia in rural communities. (Lee-Ann Olwage)

Beyond such health education undertakings and general statements, however, the plans tend to regard as beyond their scope many of the government interventions in areas that might make the biggest difference to dementia risk factors. These include education; the environment; economic and social deprivation; and consumer regulation.

Most of these are beyond the scope of this report, too. But it is worth pointing out the extent to which dementia is an economic and social issue. Even in high-income countries, relative deprivation heightens the risk of dementia. A study published in 2022 of four boroughs in east London¹⁵ with high numbers of ethnic minorities and acute relative deprivation found that both ethnicity and deprivation were associated with a younger age of the onset of dementia. And these two risk factors played a bigger role than any of the other modifiable risk factors considered (eight of the “Lancet” 12: obesity; depression; diabetes; hypertension; hearing loss; high alcohol intake; social isolation; head injury. Data were not available for the other four). Naheed Mukadam, a psychiatrist at University College London

and one of the study’s authors, tells ADI it shows “the need to prioritise prevention”, especially as post-diagnosis support for minority ethnic groups is not as good as for others.

However, most new cases of dementia in the coming years will occur not in high-income countries, but in LMICs. That is a simple result of demography – both because that is where most people live and because of increased life expectancy. It is also because poverty is itself a risk factor, as it restricts access to many of the positive lifestyle choices described in Chapters 1 and 2. And LMICs are where resources for every aspect of the Global action plan, including risk reduction, are most stretched.

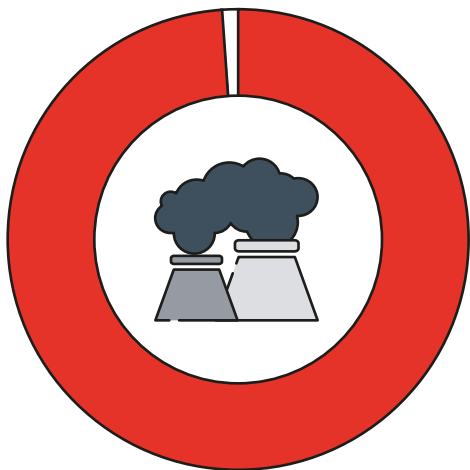
The fire this time

LMICs also suffer worst from one of the population-level risks known to be linked to a higher risk of dementia: air pollution. The 20 cities in the world with the worst air pollution in 2022 as measured by pollution-tracking firm IQAir¹⁶ were all in LMICs, with 14 in India alone.

Poor air quality has been recognised as a threat to health at least since the Victorian era in Britain (as described eloquently by writers such as Charles Dickens¹⁷). Nowadays, an astonishing 99% of the world's people live in areas where air quality does not meet guidelines set by the WHO¹⁸.

Filthy air may be a result not just of industrial pollution and power generation smothering urban areas in a smoggy crust, but of forest or stubble fires, waste incineration, and vehicle exhaust fumes. What is euphemistically dubbed the “haze” – choking pollution from smouldering forest and peatland fires on the islands of Borneo and Sumatra – that regularly smothers much of southeast Asia is thought to have cost tens of thousands of lives¹⁹. Similarly, North America was also afflicted by dangerous smoke in 2023. After the hottest May in Canada's history, with enormous swathes of land burnt by wildfires, New York was, for a couple of days in June, the worst polluted big city on Earth²⁰.

Recent research has suggested various ways in which exposure to woodsmoke may accelerate the onset or progression of Alzheimer's²¹. The danger comes from fine particulate matter (known as “PM2.5”, because its particles are 2.5 microns across) that can increase the risk of strokes, heart disease, lung cancer, and respiratory diseases – some of which are, in turn, risk factors for dementia²². Even when the air outside is relatively clean, many people are at risk in their own homes. Around 2.4 billion people are estimated by the WHO to be exposed to dangerous levels of air pollution from cooking on open fires or simple stoves that use kerosene, wood, dung, or coal.



An astonishing 99% of the world's people live in areas where air quality does not meet guidelines set by the WHO.

Examinations of animals suggest airborne particulates also directly hasten neurodegenerative processes, and hence dementia. High concentrations of carbon monoxide, nitrogen dioxide, and PM2.5 from traffic exhaust are all associated with increased incidence of dementia.

Professor Roxana Carare of Southampton University sits on the British government's Committee on the Medical Effects of Air Pollutants, which has produced a report on the role of air pollution in cognitive decline. The linkage appears strong, but the mechanism remains contentious. Carare tells ADI that the idea that the particles enter the brain directly is far less likely than that there is a cardiovascular route: soluble elements of the particles enter the bloodstream and affect the walls of blood vessels, making them less efficient in fulfilling their function of clearing the brain of waste – such as amyloid plaques and tau tangles. That would explain why air pollution is linked both to Alzheimer's and to vascular dementia.

Setting the rules

Given the dangers, and individuals' powerlessness to effect change for such large-scale issues on their own, laws aimed at curbing air pollution ought to be popular. But because they impose costs, they are always controversial. That is all the more true of measures intended to force or nudge people into living healthier lives, which in many countries immediately raise hackles about “the nanny state”, making prevention measures politically difficult.

They can, however, be effective. Susan Mitchell of Alzheimer's Research UK points to remarkable data in the UK on blood pressure levels²³. In the short period between 2003 to 2011, the average fell from 129/74 to 126/72 (compared to a “normal range” of 120/80). It seems highly likely that this was linked to a nationwide salt reduction programme introduced in 2003–04, which led to a 15% decrease in the overall population's salt intake by 2011.

This is an achievement built less on direct government legislation than on a consensus-building campaign. Action on Salt²⁴ (which was at first called Consensus Action on Salt & Health, or CASH) is a group set up in 1996 at Queen Mary University of London and supported by 24 scientific experts to raise awareness of the dangers of a high-salt diet. It has worked with the food industry and government to reduce the amount of salt in processed foods and added to cooking. A number of supermarkets and food manufacturers have been gradually persuaded to reduce the salt content of their products, and a government-financed campaign raised awareness of the effects of salt on health.

Other interventions are blunter. In many countries, tobacco, a well known risk to health, is highly taxed, banned for sale to children, and subject to strict rules on advertising and packaging. Alcohol, for which the associated risks are also

familiar, tends to be subject to similar but slightly less restrictive laws (on advertising and packaging for example). These measures have also had an effect. Between 2000 and 2020, the prevalence of smoking among men is estimated to have fallen by more than ten percentage points in countries including Australia, Brazil, Britain, Canada, Chile, India, and Russia.

Legal prohibitions, however, are a blunt instrument, and penalise the worse-off, for whom choices are more limited. Dr Chris van Tulleken, the doctor campaigning on ultra-processed food (UPF), is, he says “not a banner”: “I want to be clear. I wouldn’t ban a single product, not a single one.” He points out that, with banned products such as illegal drugs, “most of the harm comes from the illegality.” He argues instead for stringent regulation and better information: “We can certainly label whole food as being good for you and then we need to figure clever ways of labelling individual products that won’t embroil us in endless lawsuits with the food industry. And then finally there may be a few taxes on products, although we are a long way from that... I don’t like nanny state. I want people to have real choice. I want people to be able to afford accessible, healthy food.”

Interventions to curb salt, tobacco, and alcohol consumption must also have played a role in reducing the incidence of dementia, though that is rarely cited as one of the goals of such measures. An important question to consider is whether it would make much difference if it were. Many people are terrified of developing dementia – so could it be the one extra danger that tips the scales and persuades them to abandon a practice that is doing them harm, or to tolerate the restrictions or extra expense imposed by the state? Van Tulleken thinks it might be: “I think dementia is incredibly incentivising.”

But whether an explicit focus on dementia in public health campaigns could make people more likely to change their habits may be the wrong question to ask. Overemphasising individual behavioural changes ignores the myriad of obstacles that make healthy choices impossible for many. Governments have a role to play, and experience has shown that when they legislate to support and empower positive behavioural change, people get healthier. The responsibility for tackling these structural factors, many of the experts in this chapter agree, should not fall only on the individual if society is to achieve sustainable, long-term shifts towards lifestyle choices recommended by scientific consensus.

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*A man poses with his rooster in
Myanmar in 2016. (Domenico Pugliese)*



Uruguay's government takes dementia risk reduction in its own hands



The small South American country has adopted a national dementia plan, as it argues that policy is key to making risk reduction accessible and understandable to all.

BY LUCIEN CHAUVIN IN MONTEVIDEO, URUGUAY

Uruguay, one of South America's smallest countries, prides itself on leading the region with innovative social and economic policies. With one of the highest government expenditures on health and lowest out-of-pocket health payments in the region according to the Organization for Economic Cooperation and Development (OECD)¹, it has more hospital beds per capita than nearly all countries in the region and leads Latin America in the per capita number of psychiatrists.



Uruguay has been at the forefront of brain care in the region, establishing a brain health unit in its Health Ministry in 2020. It is now taking this to a new level, presenting a new national dementia strategy in March 2023 that could serve as a model for brain care in the region.

"It is extremely important to have a published plan that can be systematically implemented. The plan establishes dementia as a public health priority, setting objectives for risk reduction, treatment, and caregiving that are adapted to Uruguay's reality," says Dr Ignacio Amorín, head of the Ministry's brain health unit and one of the architects of the new plan.

"It has been shown across the globe that national plans have a real impact, reducing the prevalence of dementia and age-related disorders," says Dr Agustín Ibañez, head of the Chile-based Latin American Brain Health Institute (BrainLat).

Understanding the local dementia landscape

Amorín says the decision to formulate a national dementia plan was based on a diagnosis of Uruguay's demographics and prevalence of dementia. The government's optimistic scenario

estimates that 22% of the population will be over the age of 65 in 2050. According to the World Bank, Uruguay will have one of the largest octogenarian populations of Latin America in 2050, second only to Cuba.

The government has reported that there were approximately 50,000 cases of Alzheimer's disease and dementia at the end of 2022, estimating that the number will rise to 112,000 cases in 2050. This coincides roughly with the numbers used by BrainLat, which forecast a 200% increase in the prevalence of dementia in Latin America in the next 30 years.

Amorín says risk reduction is the only way Uruguay will have a fighting chance if these estimates are correct and if no radical breakthroughs are found to control the advance of the condition. He says that while new medications are available, they run between \$50,000 and \$150,000 a year per patient – something a country with just over 3 million people and a \$60 billion economy cannot afford.

"Our social system would come under huge pressure if prevalence doubles as forecast. It would impact the national budget, public programmes, and families," he says. "We think we can reduce the estimates by 30% with risk prevention."

Uruguay's National Plan and Strategy for Dementia, which was designed with input from different government ministries and state agencies, the private sector, and non-governmental organisations including the Uruguayan Association for Alzheimer's and Similar Disease (*Asociación Uruguaya de Alzheimer y Similares* – AUDAS), has seven action areas – in line with the World Health Organization's Global action plan on the public health response to dementia.

The national plan is top-heavy on risk reduction, treatment, and caregiving, while including awareness raising, information systems, public policy, and research.



According to the World Bank, Uruguay will have one of the largest octogenarian populations of Latin America in 2050, second only to Cuba. (Sengo Perez)

Montevideo's risk reduction strategy is based on the 12 factors seen as key to understanding and reducing dementia risk, considering each one of them within the local context.

"We are receiving information each day about brain health. I think that we are on the verge of a major change, because if you asked doctors ten years ago if Alzheimer's could be prevented, the answer would have been no. Today, we know that controlling risk factors lowers prevalence," says Amorín.

For Ibañez, understanding that dementia is influenced by a "multi-factor risk culture" is critical to addressing the condition in Latin America – citing studies by BrainLat estimating that 56% of dementia cases in Latin America² are related to modifiable risk factors, compared to 35–40% in the rest of the world.

"While internationally the two main risk factors for dementia are age and sex, this is not the case in Latin America. Socioeconomic and health disparities have a stronger influence here than in other parts of the world," says Ibañez³.

Varied interventions

Uruguay's plan aims to get a handle on risk factors through different interventions, starting young. The plan calls for school-based education campaigns that not only provide information on dementia-related conditions, but on general brain care.

Amorín says that schools could focus on head trauma, showing kids that being hit in head is not something to shrugged off. In a country infatuated with football, Amorín said that it is important to continue research into the effects that heading the ball can have on long-term brain health.

Information campaigns, according to Amorín, also need to combat ageism and the "idea that age is the [only] cause of dementia, which is even prevalent in the health sector. Lack of proper training of health professionals could hasten episodes that affect brain health."

Amorín says the state plays an essential role, because without it risk reduction efforts would be isolated and have little impact.

He lists policies, from warning labels on food about salt intake to expanding educational efforts, that cannot be done by the private sector.

“The state’s role is to design and enforce policies for health and education that reduce risk throughout a lifetime. A new role today comes from social media. There is so much information about dementia, some of which is true, but most false, that the state needs to provide guidelines,” he says.

Another intervention involves programmes for senior citizens, whether or not they have dementia, as a way of guaranteeing socialisation. AUDAS, the Uruguayan non-profit that works with people with Alzheimer’s, runs workshops, including arts and crafts, to reinforce cognitive skills and socialisation – factors that can delay or lower one’s risk of developing dementia.

Adriana Motta, a workshop coordinator, says the more she worked with patients, the more she realised the importance of the workshop in helping to guarantee quality of life.

“We offer outlets for people to express their creativity and to stay engaged. I think that social engagement is an enormous part of the process that we are still trying to understand,” she says.

At the regional level, BrainLat is working on an Arts and Brain Initiative⁴ to use music, painting, and other forms of art to build on the knowledge of the interaction of health and arts and how arts can improve brain health.

“Latin America is filled with people doing arts, but it is not connected to health. There are strong biases and prejudice that believe that art cannot have any impact,” says Ibañez.

Uruguay’s plan extends the idea of risk prevention to caregivers, including it among the seven action areas⁵.

The plan calls for strategies to provide information and resources to caregivers, as well as to provide mental health services in order to prevent burn-out and associated problems. An estimated 90% of caregivers are women, according to Uruguay’s Health Ministry.

María del Carmen Peraza, who cared for her mother with Alzheimer’s for 13 years, said the state needs to have programmes for caregivers, because “people cannot do this alone”.

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Dr Ignacio Amorín heads the Ministry of Health’s brain health unit and is one of the architects of Uruguay’s national dementia plan. (Sengo Perez)

“Caregivers always need to be available, and this not healthy from a mental health point of view. I think the government should provide guidance and, when necessary, assistance,” she tells ADI.

Amorín is on the same page, saying that strategies for caregivers need to include multiple components, from giving information on how people living with dementia will change as the condition evolves, to providing mental health services.

“Caregivers need to be a central component of any dementia strategy,” says Amorín. “The national plan and risk reduction will not work without the involvement of caregivers.”

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‘Dementia is a social justice issue’: Understanding dementia risk in the LGBTQI+ community



Stigma and discrimination play a huge role in influencing both behavioural and environmental risk factors among sexual and gender minorities – leading advocates and researchers to argue that societal acceptance is key to addressing dementia within the community.

BY CHLOÉ BENOIST IN LONDON, UNITED KINGDOM

Mike Parish remembers the moment he first locked eyes with Tom Hughes in 1975, when they were only 19 years old.

“I leaned forward, he leaned forward, and that was it, we fell in love,” he recalls with a smile.



The two young men quickly became a couple, at a time when being openly gay was both illegal and dangerous in the United Kingdom.

While the 1967 Sexual Offences Act nominally decriminalised homosexuality in private for men over the age of 21, sexual and gender minorities – also known under the umbrella acronym of lesbian, gay, bisexual, transgender, queer, and intersex (LGBTQI+) – faced heavy policing and harsh sentences for decades afterwards. It was only in 2001 that the age of consent between two men was lowered to 16 on par with their heterosexual counterparts, and in 2013¹ that gay sex was fully decriminalised in the entirety of the United Kingdom. Not long after that, Mike and Tom finally got married in 2016, after 41 years together.

By that time, however, Tom’s health had been worsening. After around a decade of cognitive decline, he was diagnosed with cortical basal degeneration, a rare form of frontotemporal dementia, in 2019.

Tom passed away at home in September 2022. For Mike Parish, the years of caring for his life partner have left him convinced that more needs to be done to make sure that members of the LGBTQI+ community have access to better resources, support, and awareness when it comes to dementia.

“I was in this situation with my partner where I was experiencing living grief, and I was trying to find support,” says Parish, who helped create the LGBTQ+ Dementia Advisory Group² (Community Interest Company) in 2020. “People would say: ‘Well, of course, there’s online, you can go to psychologists, you can find support groups.’ I’d done all of that, but I felt very strongly that I needed to communicate with people who I didn’t have to explain my life to.”

While there have been strides in recent decades in LGBTQI+ acceptance, members of the community across the world continue to face discrimination and violence in their day-to-day lives because of their gender and sexual identities, even in countries where LGBTQI+ rights have been enshrined into law. According to the International Lesbian, Gay, Bisexual, Trans and Intersex Association (ILGA), homosexuality is still criminalised in 64 countries³, while 111 out of 174 countries and locations had a score of five or under on the 10-point Global Acceptance Index⁴ in 2020.

Increasingly, researchers and advocates argue that the discrimination LGBTQI+ individuals face throughout their lives has an impact on their likelihood of developing dementia later in life, as well as their experience of the condition once diagnosed – and that tackling prejudice should be an essential component of risk reduction efforts within the community and beyond.

“Do I think that Alzheimer’s and dementia are a social justice issue? Yes, absolutely,” says Dr Jason Flatt, an assistant professor at the University of Nevada, Las Vegas School of Public Health. “Both in terms of risk, and in terms of when you do have dementia, your access to care and resources are not the same.”

Risk and prejudice

Some known modifiable risk factors of dementia such as depression, substance abuse, smoking, and social isolation play out with particular significance within the LGBTQI+ community, Flatt explains.

“When we think about the social community and spaces that have been traditionally safe for LGBTQ+ people, they have been bars. There is a bar culture that’s a part of the LGBTQ+ community and that could potentially suggest greater access to alcohol.”

For Barry Moss, a former psychiatric nurse currently working as dementia services development advisor at Age UK, a lot of risky behaviours can be viewed as a response to the stigma that LGBTQI+ people face from their families and broader society.

“You’re discriminated against by the church, by the community, by elders, by family, by peers... and then you start feeling: ‘It must be because there’s something wrong with me,’” he says. “You start to look for ways of coping with the anguish, and that’s when addiction comes in. To me, that’s self-harm.”

“Do I think that Alzheimer’s and dementia are a social justice issue? Yes, absolutely.”

Dr Jason Flatt, assistant professor at the University of Nevada

Surveys over the years have consistently seen higher reported rates of depression, anxiety⁵, and drug use⁶ among LGBTQI+ identifying individuals compared to the rest of the population.

Flatt’s research has meanwhile found higher rates of subjective cognitive decline⁷ (a possible precursor to mild cognitive impairment and dementia) among people aged 45 and older identifying under the LGBTQI+ umbrella than among their heterosexual counterparts.

A 2022 study by Queen Mary University⁸ found an association between ethnicity and socioeconomic disparity (factors which are often correlated) and dementia risk. Flatt believes the findings of this study could easily be transposed to the LGBTQI+ community.

“The idea that certain groups of people are lesser than others, so they’re not entitled to the same wages, the same opportunities for education, the ability to live in high-resourced neighbourhoods with quality healthcare, with access to a grocery store that will have fresh fruits and vegetables... That social deprivation, I think, contributes to the risk factors that we talk about, and why we see them in the LGBTQ+ community” as well as other marginalised groups, he notes.



Mike Parish, right, took care of his husband Tom Hughes for more than a decade as his health declined. (Courtesy of Mike Parish)

Discrimination impacts members of the LGBTQI+ community to different degrees, advocates note, with transgender individuals (especially trans women) and people of colour more likely to be affected by systemic discrimination, hate crimes, and precarious economic situations – increasing their exposure to dementia risk factors.

“It’s still not neutral to be LGBTQ+,” says Julien Rougerie, programme manager for Fondation Émergence, an LGBTQI+ rights organisation in Québec, Canada. “There are many disparities [within the community], and trans people are especially vulnerable to all the risk factors, while facing more barriers to access care.”

Navigating the hurdles of dementia

While there has been increased societal awareness and acceptance of the LGBTQI+ community in recent decades – even if those fragile gains are happening unevenly across the world and can be under threat even in more progressive countries – the so-called Stonewall Generation⁹ continues to face hurdles.

LGBTQI+ individuals aged 60 and over have lived through momentous periods of history such as the 1969 Stonewall riots; the HIV/AIDS epidemic that decimated the gay community in the 1980s and 1990s; homosexuality and transness being classified as “mental disorders” by the World Health Organization until 1990¹⁰ and 2019¹¹ respectively; and same-sex marriage becoming legal in more than 30 countries since 2001.

“If we had held hands or kissed in public, we could have been arrested and imprisoned,” Parish says of the early years of his relationship with his husband. “We had people say things to us on the way to work, on the way home from work, at work, on the train, in cafés...”

Tom, he says, lost his ability to see out of his left eye after a homophobic attack.

"You carry that anxiety or risk radar with you," Parish adds. "When you go into a room full of heterosexual people, you're on your guard because they might not agree with your lifestyle or don't acknowledge that a long-term, loving relationship is even possible between two people of the same sex."

In addition to the impact of these heightened stress levels on one's health, historic and ongoing prejudice affect the trust that LGBTQI+ elders have in the health and social systems designed to provide diagnosis, treatment, care, and support for dementia.

Parish says Tom's HIV-positive status led healthcare workers to dismiss any other possible causes for his worsening cognition. While HIV can be associated with a heightened risk of developing dementia¹², it is now rare thanks to the more widespread use of antiretroviral therapies.

"Nobody was going for the more obvious analyses, like MRIs or spinal taps, because they were so convinced it had to do with HIV," Parish recalls.

Flatt concurs, saying he has spoken to elderly LGBTQI+ individuals about their negative experiences with the healthcare system.

"I've heard from seniors who go to the doctor and say: 'My shoulder's bothering me,' and the doctor will want to do a throat swab or test for gonorrhoea... It's a stigmatising type of care," he says, adding that it deters people from "coming back ever again because of how they were treated in that encounter".

Long-term care homes can also be rife with homophobia, transphobia, or other abuse from staff and fellow residents – sometimes with deadly consequences¹³.

"There's so much meaningful care, loving care, that – because of the LGBT aspect – I could not hand over to somebody else," Parish says of his decision to care for his husband at home. "It is so hard

knowing that you put them in the hands of somebody, who you don't know if they respect them and understand them as well as you do. That's one of the hardest things about it, and that's why it's very different for this community – and other minorities."

Meanwhile, the cliché portrayal of the LGBTQI+ community as overwhelmingly young renders its older members invisible, even among their peers. Coupled with longstanding distrust of health care institutions, this often means that dementia risk is not considered a health priority, and that diagnosis can take place long after the first warning signs have appeared, if at all.

In the United States, it is estimated that LGBTQI+ people over the age of 50 are twice as likely to live alone¹⁴ and four times less likely to have children than the national average.

For Moss, the AIDS epidemic plays a role in this dynamic.

"They lost their peers – people of the same age, who lived in the same city, who partied together, who socialised together, who became members of their family of choice – saw them pass away due to disease," he says. "This has a huge effect on the psyche, on trust, especially for older gay men... This is all based on bereavement and life experience."

The lack of social recognition of "chosen families" and the prioritisation of biological relatives, regardless of the state of their relationship with the person living with dementia, further isolate LGBTQI+ people in need of care.

"When someone loses autonomy, whether it's cognitive or physical issues, the reflex is to only talk about 'family' – as if, past a certain age, your family is your only social network," Rougerie says. "Sometimes those who are part of the chosen family aren't acknowledged in these [health and long-term care] environments. There's always the threat that the traditional, biological family could put into question the role of the informal caregiver."



"When you go into a room full of heterosexual people, you're on your guard because they might not agree with your lifestyle or don't acknowledge that a long-term, loving relationship is even possible between two people of the same sex."

Mike Parish, carer

The long road ahead

One thing those who spoke to ADI all agree on: things are changing.

Groups such as SAGE¹⁵ and Rainbows of are focused exclusively on LGBTQI+ elders, while LGBTQI+ organisations like Fondation Émergence, the Equal Asia Foundation¹⁷, and the LGBT Foundation¹⁸ have programmes dedicated to older members of the community. A number of Alzheimer's and dementia associations are also making inclusive resources available for LGBTQI+ people living with dementia¹⁹ and their carers²⁰.

Meanwhile, a number of retirement communities and long-term care homes for LGBTQI+ elders have sprouted in North America and Europe – although most are costly and out of reach for large swathes of the community.

Parish hopes his efforts with the LGBTQ+ Dementia Advisory Group will bring more awareness of dementia within the community.

“All LGBT people who are living with dementia or caring for something with dementia in the UK should have a safe space to exchange their experiences, to create support networks, and also advise one another, get information that is relevant to us,” he says.

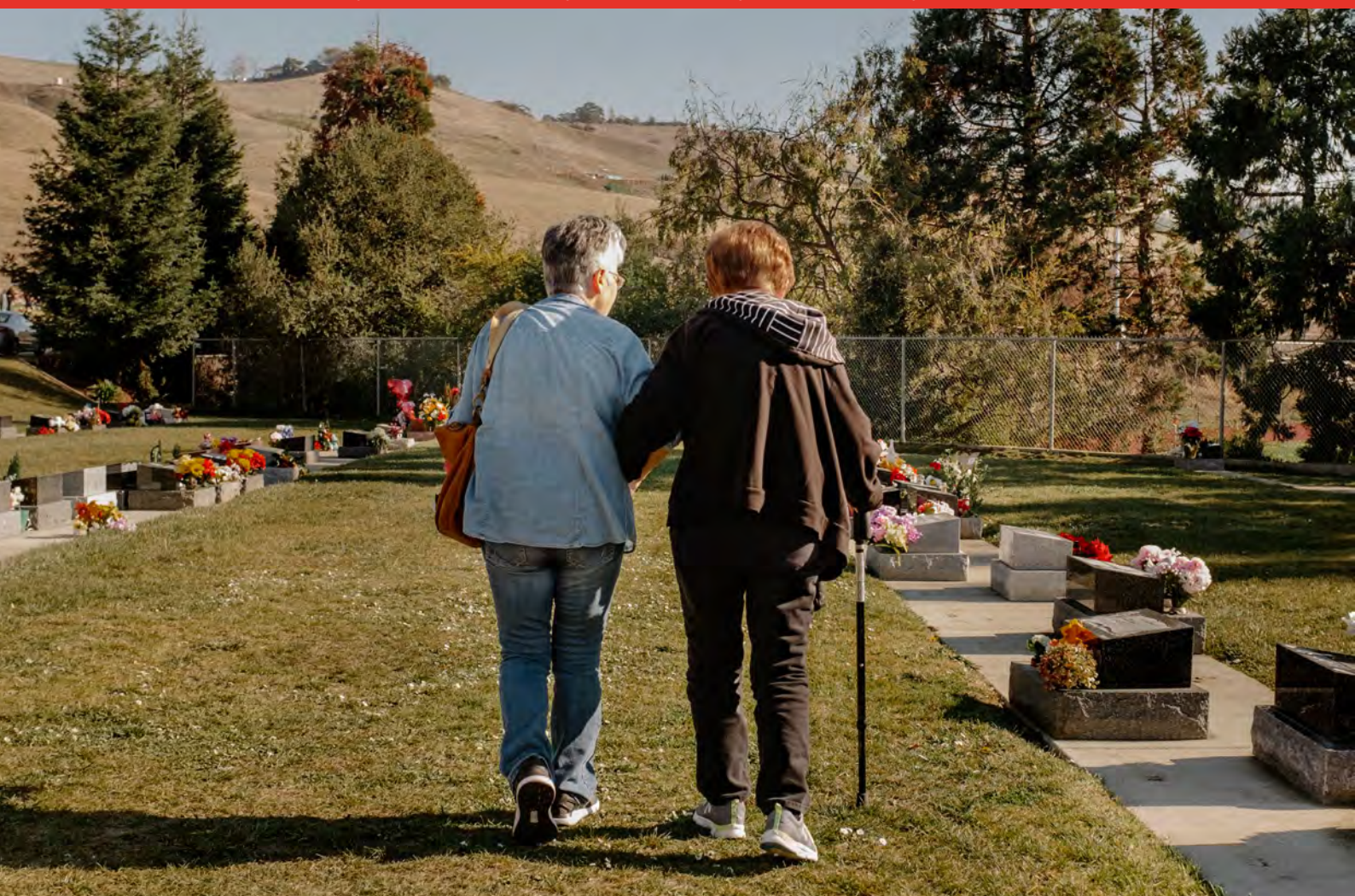
But homophobic and transphobic prejudice need to be tackled head-on in broader society – and healthcare systems in particular – for LGBTQI+ people with dementia to get the care they deserve long before a diagnosis, Flatt says.

For him, this starts with health and care professionals integrating person-centred and inclusive care practices²¹ into their work – and for researchers to make more proactive efforts to include LGBTQI+ individuals as participants in their studies. The Research Inclusion Supports Equity (RISE) registry²², for which Flatt is co-principal investigator, seeks to do exactly that within the field of Alzheimer and dementia research.

Access to inclusive care and research for LGBTQI+ individuals remains highly unequal across the globe. While there is some research on LGBTQI+ elders in Africa²³, Asia²⁴, and beyond²⁵, it is dwarfed by the scale of academic, scientific, and activist efforts carried out with fewer barriers in high-income countries. Advocates have warned that discriminatory legislation and stigma have an impact on the health and wellbeing of LGBTQI+ individuals²⁶, making decriminalisation of homosexuality worldwide a public health concern.

Another big issue to contend with is the fact that efforts to better support LGBTQI+ elders are not only broadly confined to high-income countries, but often concentrated in big cities, leaving many people to fall between the cracks.

Pam Andrew, left, and Virginia Morton walk to the gravesite of Pam's mother, Julia Grippi, on December 26, 2017 in Hayward, California. Pam, who has dementia, went from taking care of her mother to taking care of her partner Virginia, who was also diagnosed with the condition. (Jason Andrew)



“There’s a need for social and political reform to support older populations across the world in getting access to care, both preventative and when they do actually have dementia.”

Dr Jason Flatt, assistant professor at the University of Nevada

The issue of better care for LGBTQI+ people living with dementia, Flatt argues, is indissociable from advocacy against discrimination and inequity at all levels – whether it be tied to sexuality, gender, race, ethnicity, economic status, etc.

“There’s a need for social and political reform to support older populations across the world in getting access to care, both

preventative and when they do actually have dementia,” Flatt says. “Just working on making care, research, all of it, more welcoming to the community – it’s going to require policy change and greater advocacy... ensuring there are protections for everybody.”

“If we do that, that means inclusive care for everyone. It doesn’t take anything away from anyone, it ensures that everyone can have access to the same quality care.”

From understanding how dementia risk factors play out for LGBTQI+ individuals to providing safe, compassionate, and inclusive healthcare systems and societies, many obstacles remain to ensure that sexual and gender minorities have better health outcomes throughout life, on par with their heterosexual peers.

For Parish, the road ahead may be long, but worth it so that others do not face the same hardships as he and Tom did.

“It’s the least I could do for the person who loved me all my life.”

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Chapter 4:

Non-modifiable risks

Genes, hormones, and what we can do about it



A worker at a laundrette in Mumbai, India holds his granddaughter in December 2018. (Domenico Pugliese)

BY SIMON LONG

Not all risk factors for dementia are susceptible to intervention, even at the population level, with the biggest of all being age. By some estimates, 1.7% of 65- to 69-year-olds live with dementia, and its incidence doubles every five years up to the age of 90¹. By another count, at the age of 85, between a third and a half of people have dementia. According to a paper published in 2023 by Rudy Tanzi, a professor of neurology at Harvard, and two collaborators: "Ageing is the leading risk factor for the onset of Alzheimer's disease."²

It is also the biggest risk factor for many other causes of dementia as well. That is why the world faces a relentless rise in the number of people with dementia. Globally, average life expectancy increased by more than six years in the first two decades of the 21st century, from 66.8 in 2000 to 73.4 in 2019³. Despite the COVID-19 pandemic, global life expectancy is likely to keep rising past 77 by 2050⁴. In 2019, 1 billion people in the world were 60 or over. By 2030, that number will have reached 1.4 billion, and by 2050, it will have more than doubled to 2.1 billion⁵.

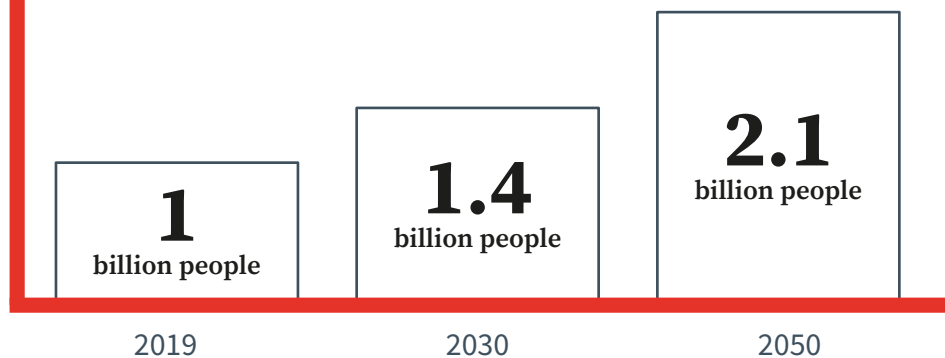
If the most obvious prescription for anyone hoping to reduce their chance of developing dementia is utterly unhelpful ("Don't grow old!"), a second piece of advice is equally useless: "Don't be a woman!" Women are at greater risk of dementia, and not just because they have longer life expectancy than men⁶. As Professor Lisa Mosconi, a neuroscientist who

runs the Alzheimer's prevention programme at Weill Cornell Medicine/New York Presbyterian Hospital, notes in her book, "The XX Brain"⁷: "Women in their sixties are about twice as likely to develop Alzheimer's over the rest of their lives as they are to develop breast cancer. And yet breast cancer is clearly identified as a woman's health issue, while Alzheimer's is not. One of the most startling facts about the disease is that a 45-year-old woman has a one-in-five chance of developing Alzheimer's during her remaining life, while a man of the same age has only a one-in-ten chance."

The reasons for this difference are many, varied, and not fully understood, in part because they have been comparatively little studied. Antonella Santuccione, cofounder and chief executive of the Women's Brain Project⁸, a charity devoted to research on how sex differences affect brain health, suggests the reasons are lifelong. Women tend to be poorer, less well-educated, and are at greater risk of domestic violence and hence traumatic brain injury. Pregnancy, childbirth, and menopause, she says, may also play a role: "There is a strong correlation between hormonal changes and the risk of developing Alzheimer's."

Mosconi, whose research has focused on the role of hormones, says that oestrogen is a "neuroprotective element" for women, as testosterone is for men, and is referred to as the "master regulator of the female brain". So, she

Despite the COVID-19 pandemic, global life expectancy is likely to keep rising past 77 by 2050



Estimated number of people aged 60 or older according to the WHO

explains, male and female brains age in different ways. The brains of both men and women go through dramatic changes during puberty. They are then relatively stable, until they start gradually losing neurons after midlife. The process is generally seen as linear, unless it is affected by a neurodegenerative disorder such as Alzheimer's.

This simplified picture, she says, may be roughly true for men, but is rather different for women. After puberty, women's brains go through hormonal microcycles every month for as long as they are of reproductive age. The changes are "very subtle" but are actually visible under the microscope: "When oestrogen is high, your neurons look bigger." And then there is pregnancy, "an explosion of hormonal power that, however, leads to brain shrinkage as unnecessary connections between neurons are shed... Every time a woman gets pregnant there's a whole remodelling taking place inside her brain." There is evidence that "these changes lead to brain shrinkage during pregnancy and – especially – during the postpartum period, which is about two years. And then the brain either stabilises or bounces back."

And then, she says "in mid-life you get menopause, which may be like being hit by a train." (Mosconi has a book out in 2024 called "The Menopause Brain"⁹) The link between menopause and dementia, and between menopause hormone treatment, also known as hormone replacement therapy (HRT), and dementia remains contentious. A Danish study published in the *British Medical Journal*¹⁰ in June 2023 drew headlines with its conclusion that HRT is "linked to an increased rate of dementia". Mosconi points out that other studies have come to different conclusions and that this one covered a very specific, long-term use of HRT.

Choose your parents wisely

Besides gaining eternal youth and not being a woman, there is a third and equally impossible prescription: choose your parents carefully. Tanzi and his co-authors go on to argue that the second most prominent role in the onset of Alzheimer's, after age, is played by "family history and genetic risk factors". That, too, sounds like something that people can do nothing about. But in fact, understanding the role of genetics in dementia can in some circumstances actually contribute to reducing the risks.

Genetic testing can reveal not only the presence of a predisposition to Alzheimer's, but to dozens of other hereditary conditions, including more than 70 neurodegenerative disorders than can lead to childhood dementia¹¹. Each of these genetic conditions is, individually, extremely rare – but lead to an estimated 700,000 cases of children and young people who live with dementia around the world. Yet, even in high-income countries, few parents of newborn babies are screened for these genes. The Childhood Dementia Initiative, an organisation in Australia that has done much to raise awareness on the issue, is campaigning for that to change.

Family history and genetic risk factors... sound like something that people can do nothing about. But in fact, understanding the role of genetics in dementia can in some circumstances actually contribute to reducing the risks.

Genetic screening of would-be parents might lead some to choose to undergo in vitro fertilisation (IVF), selecting embryos without the dangerous mutation. Screening of newborns might also enable their parents to have them treated early. In developed countries, most newborns are screened for phenylketonuria (PKU), a rare genetic metabolic disorder, through a "heel-prick" test. Kristina Elvidge, the Childhood Dementia Initiative's head of research, says that babies in Australia are at present typically tested for about 30 inherited conditions, compared with more than 50 in America and 12 in Britain – but they do not include most of those leading to childhood dementia. The constraints to adding more elements to the test are the cost and testing capacity – even in high-income countries. In LMICs, where most children with inherited dementia live, the obstacles are far, far bigger.

Far more common than childhood dementia, meanwhile, is Down syndrome. The estimated 6 million people globally with Down¹², also known as Trisomy 21, are probably the largest single population group in the world at a heightened risk of dementia. If they live long enough, they are almost certain to develop Alzheimer's. This has become more obvious as impressive advances have been made in their longevity. In 1960, a child born with Down syndrome in the United States had an average life expectancy of just 10. By 2007, they could expect to live to 47¹³. Nowadays, life expectancy is still some 20 years below the general population¹⁴, but a person with Down can expect to live into their 60s, and many reach their 70s and 80s.

Their chromosomal abnormality has the effect of speeding up the formation of the beta-amyloid plaques characteristic of Alzheimer's in their brains. Indeed, says Eimear McGlinchey, a psychologist specialising in intellectual disability at Trinity College, Dublin, Down syndrome is now considered by some researchers to be a form of genetically determined Alzheimer's disease: "By the age of 40, everybody with Down syndrome has

Mirin, a singer-songwriter from the village of Pedra Azul in Brazil, plays his guitar in 2015. (Domenico Pugliese)



the neuropathology of Alzheimer's." On average, they start to show symptoms of dementia at 53. According to one study, the risk of dementia for people with Down syndrome is 23% by age 50, 45% at age 55, and 88% at age 65. If they live long enough, Alzheimer's is close to an inevitability¹⁵.

For this reason, dementia risk reduction strategies are urgently needed by people with Down syndrome, especially as they are more likely than the general population to exhibit some other risk factors, such as lack of access to education and employment, and have higher rates of sleep apnoea, hearing and sight loss, diabetes, and obesity¹⁶. Dementia risk interventions show potential; engaging in regular moderate- or high-intensity physical activity, for example, was shown in one study published in 2021¹⁷ to markedly to reduce the risk of clinically detectable decline. Another from 2019¹⁸ found that not only was it possible for people with Down syndrome to complete a course of computerised cognitive training, but that those who did so showed promising improvements in tests of their executive functions.

According to one study, the risk of dementia for people with Down syndrome is 23% by age 50, 45% at age 55 and 88% at age 65.

The near-total penetrance of Alzheimer's in the population with Down also offers a unique opportunity to scientists studying dementia, with a predictable, decades-long sequence of biomarker and clinical changes leading to dementia. Sandra Giménez, the clinical neurophysiologist studying sleep disorders, says that the inevitability of the advance of their Alzheimer's biomarkers make people with Down excellent subjects for studying the impact of treating sleep disorders – notably sleep apnoea, which is especially prevalent among them.

They are also obvious candidates for inclusion in clinical trials of new treatments for Alzheimer's itself, from which they have tended to be excluded – though the virtual certainty that they will develop the neuropathology of Alzheimer's should put them at the front of the queue for tests of drugs that seek to reverse or delay the accumulation of beta-amyloid plaques.

That is the view of Andrea Pfeifer, cofounder and chief executive of AC Immune, a Swiss-based biopharma company that has developed an anti-amyloid-beta vaccine. "There's nothing for

these people, who deserve to have a treatment," she explains to ADI, not long after AC Immune's vaccine received fast-track approval from America's Food and Drug Administration (FDA) in June 2023, enabling it to expand its clinical trial to America. The first patient with Down syndrome had already received a dose as part of the trial¹⁹.

Testing questions

Less prevalent than Down syndrome are the genetic defects – identified 30 years ago by Tanzi and colleagues – associated with inherited Alzheimer's, which is very rare, accounting for only a tiny proportion of cases. This early onset form of the disease, which typically appears in a person's 30s, 40s, or 50s, is a consequence of a mutation in three genes: amyloid precursor protein (APP), presenilin1, and presenilin2²⁰. The defective gene is passed from parent to child without skipping a generation, and normally affects many members of a family. The genes are involved in producing the amyloid protein, and in these cases cause an unhealthy buildup of amyloid clumps or plaques in the brain. People with one of these genes will develop Alzheimer's. Their children have a 50% chance of inheriting the gene.

As they grow up, these children face a difficult choice as to whether to have a genetic test to find out if they have indeed inherited it, and if so, at what age to have themselves tested. It is a hard decision for many reasons, not least that in many places they are typically not offered advice or counselling.

Will Dean was 16 when his mother was diagnosed with early onset Alzheimer's in 2016. A former nurse working in a senior administrative role in the police force, she found herself forgetting things and occasionally behaving inexplicably – on one occasion putting her laundry in the fridge. She sought help from the UK's National Health Service and, in what sounds like a fairly brutal phone call at the office, was informed of the diagnosis, and basically given the message: "Live with it." Reluctant to accept this, she consulted a private specialist for the first time in her life, who confirmed the diagnosis.

Her family did have a history of Alzheimer's, but, Will says, his mother had no particular inkling that she might develop it. He was born into a "genetic minefield", with several family members who had had cancer or multiple sclerosis. At the time of his mother's diagnosis, nobody offered Will any counselling or advice about his own choices.

Asked whether he would have been tested for the gene himself at the time, he says: "I would have said I don't want to know." Dealing with what his mother was going through was enough to cope with. "I didn't have the bandwidth to deal with bad news." He got on with his life, opened a skateboard shop, and became a fundraiser for dementia causes. More recently, however, he was encouraged to become more open about his relationship



Two women from a traveller community sit in the city of Pushkar, in the northern Indian state of Rajasthan. (Domenico Pugliese)

to the condition by coming into contact with a Chicago-based charity, Lorenzo's House²¹, that supports families affected by younger onset dementia.

In May 2023, Will ran seven marathons in seven days to raise money for Alzheimer's Research UK (ARUK) – the seventh marathon being carried out partly in a wheelchair and partly on crutches after injuring his knee. Besides fundraising, he wanted to campaign for greater awareness of younger onset dementia and of the availability of genetic tests. Yet as of late July, he had not had a test himself, nor decided when or whether he would seek one. His hesitation stems, he says, mainly from concern about the impact that discovering he might carry the gene could have on his girlfriend and his mother. That changed, however, after his mother said she wished she herself had known earlier.

The first step would be to find out exactly what his mother's own genetics show – he does not know whether she has the early onset genes or ApoE4, a gene that makes Alzheimer's more likely but far from inevitable. Will attended the Alzheimer's

Association International Conference in Amsterdam in July 2023, at which the results of the trial of the new anti-amyloid drug donanemab were unveiled. This was not yet a factor in his thinking. Others, however, might want to know if they are at higher-than-usual risk of dementia, swayed by the prospect of a treatment that might delay its onset if started early enough.

Huntington's disease²², another cause of dementia, is also hereditary. It, too, is extremely rare, estimated to affect just one in 10,000 people²³. They have a defective gene, which, again, their children have a 50% chance of inheriting. The condition attacks nerve cells in the brain, and can affect movement, cognition, and mental health. Symptoms such as mood swings – periods of excitement, depression, anger, and apathy – normally appear between the ages of 30 and 50.

For a person facing such a coin toss – a 50-50 chance of having a genetic makeup that will at some point in the future lead to severe impairment – it is not easy to decide whether to be tested for the defective gene or not.

Luck of the draw

Faced with this genetic lottery, some may find the uncertainty of not knowing too agonising. Others may think that knowing they have the gene would make life even more painful, with every minor upset being mistaken for the onset of the disease. In fact, studies suggest that, worldwide, only 10–15% of the children of people with Huntington's want to be tested²⁴, at least until they want to have children themselves²⁵. The two main reasons for not being tested are the lack of effective treatment or cure, and the fact, that, once people know their genetic status, they can never “unknow” it. Some are optimistic that prevention or cure may become possible in the next few years – another reason, perhaps, to delay a test.

The calculation is entirely different for those with a much more common genetic inheritance that does not make Alzheimer's inevitable, but does make it much more likely. This is the condition Chris Hemsworth finds himself in. The genes identified in his blood test are not deterministic ones that directly cause a disease. Rather, they give him a heightened risk related to one of the types of a gene called apolipoprotein (ApoE). Everybody has two copies of the ApoE gene, in different combinations of three types. One of them, known as ApoE4, present in 10–15% of people, makes a person roughly three times more likely to develop Alzheimer's than the average. Having two, as Hemsworth does, makes the disease eight to 12 times more likely²⁶.

Over time, genetic testing for Alzheimer's risk will become more precise. Genome-wide association studies (or “GWAS”, a research method used to identify genomic variants statistically associated with a risk for a particular disease or characteristic) have found more than 30 genetic loci for Alzheimer's disease in addition to ApoE. Many are related to immune response and microglia, the brain's immune cells²⁷.

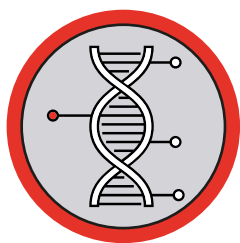
Dr Margaret Pericak-Vance and Dr Jeffery Vance are geneticists at the John P. Hussman Institute for Human Genomics at the University of Miami Miller School of Medicine, whose laboratory first discovered the link between ApoE4 and Alzheimer's. They say the risks associated with ApoE4 are different for men and women and for people of different ancestries. They are lower for

people of African descent than for Europeans, and highest of all for East Asians. These variations have big implications for the development of therapeutic techniques, and for the assessment of genetic risks in different communities: “If we are going to tackle Alzheimer's, we have to think of it as a global problem, not one-size-fits-all,” says Pericak-Vance.

Genetic and genomic databases have been biased in favour of high-income countries. To rectify this, Pericak-Vance leads the Recruitment and Retention for Alzheimer's Disease Diversity Cohorts in the Alzheimer's Disease Sequencing Project (READD-ADSP), one of several attempts at expanding the representation of LMICs in genomic research. The Africa Dementia Consortium, coordinated from Ibadan in Nigeria, brings together more than 100 researchers and is building on an existing biobank of blood, cerebrospinal fluid, and brain samples²⁸ from all over Africa, which has the greatest genetic diversity of any continent.

For people like Hemsworth and others with one or two ApoE4 genes, early genetic testing has obvious benefits: as the doctor in “Limitless” points out, they can adopt the strategies discussed in this report for reducing the risk of dementia and delaying its onset, and do so much earlier than they might otherwise have done. Miia Kivipelto of the FINGERS study tells ADI that its multidomain interventions (which tackle multiple lifestyle factors) have shown clear benefits for ApoE4 carriers. One such study, shared during the Alzheimer's Association International Conference in July 2023, indicated that in Finland, participants of the FINGERS study who had higher genetic risk, ApoE4 or other polygenic risk factors, benefit from multidomain interventions as well as, if not more than, their counterparts without genetic risk²⁹. The researchers recognise it is still early days and that the study was limited to Finland. They will now be extending the study across the Worldwide FINGER network, to do global testing with joint analysis, across a large number of genetically diverse populations to test the statistical significance of their findings.

As with the other genetic conditions already mentioned, a positive test can never be “unknown”, and many of those with two copies of ApoE4 never develop dementia. Some people working in the field, like Friedland or Mosconi, therefore argue that genetic tests are less important than adopting protective



“If we are going to tackle Alzheimer's, we have to think of it as a global problem, not one-size-fits-all.”

*Dr Margaret Pericak-Vance, John P. Hussman
Institute for Human Genomics*

lifestyle strategies, regardless of what one's test results might have been. It is up to individuals to weigh the pros and cons in making this personal decision.

By reducing risks, some who could have developed dementia might avoid doing so, or develop it later. Meanwhile, the hope is that a cure will eventually be found. Treatments such as aducanumab (which is still in confirmatory trials, as a condition of its controversial FDA approval), lecanemab, and donanemab work by removing beta-amyloid from the brain, or blocking it from forming plaques, but are often used much too late, once symptoms have already appeared. Eventually, says Tanzi, those at risk of Alzheimer's could be treated for years before they exhibit symptoms. He draws an analogy with drugs used to curb cholesterol build-up and so protect recipients from heart and circulatory diseases (and hence, indirectly, dementia). The aim is to create a drug that works directly as "a statin for the brain".

In fact, other drugs also aspiring for FDA approval are already in development. US firm Vaxxinity won fast-track approval in 2022 for a drug that attacks the development of amyloid-beta plaques, which has been tested on people in the early stages of symptomatic Alzheimer's. Mei Mei Hu, Vaxxinity's co-founder and chief executive, tells ADI that she hopes to "walk back" the use of the vaccine to presymptomatic stages, and that one day a routine blood test might alert a doctor to high levels of amyloid as well as cholesterol, and for drugs to be available for both conditions.

While we all face some immutable realities about our individual dementia risk, we must remember that the scientific community is continuously pushing forward to better understand dementia and find ways to delay its onset, slow down its progress, and, one day, find a cure. There is no right or wrong answer to the personal choice of whether to undergo genetic testing – but there is hope that, as the science advances, this will become a less scary, and more strategic, decision to make sometime in the future.

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Do genes point the way to an Alzheimer's cure?



Researchers in Latin America hope that the unique genetic diversity of the region holds the key to better understanding Alzheimer's disease.

BY BARBARA FRASER IN MEDELLÍN, COLOMBIA

When clinical trials began for the experimental drug crenezumab, the Colombian city of Medellín was an obvious test site. The hilly, largely rural Antioquia region is home to one of the longest-running studies of early onset Alzheimer's disease, in a family group of some 6,000 people who share a genetic mutation traced back to an early Spanish ancestor.



It was hoped that crenezumab would prevent the buildup of amyloid beta plaques in the brain, protecting people who had the risk factor before they began showing symptoms. When there was no statistically significant effect, the drug was withdrawn from development.

But there was an unexpected silver lining. Genetic analysis of samples taken from 1,000 people who were tested while recruiting for the clinical trial found a dozen more variants of the presenilin 1 (PSEN1) gene that is associated with early onset Alzheimer's. When the researchers tested all 6,000 people, they found two who, despite an early onset mutation, had reached their 70s without symptoms.

One, identified by her family as Aliria Rosa Piedrahita de Villegas, died in 2020 at age 78. Besides the early onset gene, she had lifestyle risk factors such as little formal education, alcohol use, and low income. But she did not begin showing symptoms until her early 70s, and she died of cancer, not Alzheimer's.

The finding re-energised the Neurosciences Group of Antioquia¹ at the University of Antioquia in Medellín. There, a research team led by Professor Francisco Lopera has focused on young people with early onset Alzheimer's for more than 30 years, in an effort to mitigate the impact of the condition. They are now looking for older adults who carry the early onset mutation but are asymptomatic, in an effort to understand – and replicate – the protective mechanisms.

"Until Aliria, we didn't think about older people," says David Aguillón, who heads the research group's medical team. "We only thought about healthy young people who were at risk."

Finding her, he says, "was the switch that brought about the change".

The curious case of Aliria and Alirio

Doña Aliria had a known mutation on the PSEN1 gene² that is associated with early onset Alzheimer's in the Antioquia kindred group. But she also carried two copies of a variant of the apolipoprotein E (APOE) gene, also known as the Christchurch mutation, which protected her. Scans showed amyloid throughout her brain, but tau in only one region. Among the regions protected was the entorhinal cortex, which is critical for memory and is where Alzheimer's disease begins.



The hilly, largely rural Antioquia region is home to one of the longest-running studies of early onset Alzheimer's disease, in a family group of some 6,000 people who share a genetic mutation traced back to an early Spanish ancestor.

She also had greater density of brain cells than other people who are carriers of the mutation and develop symptoms at a younger age. "So the protective factors affect the survival and density of cells, and the pathology does not exist in certain key regions of the brain," Aguillón says.

That points to a possible goal for therapies.

"If we can protect a [key] area at a certain moment, that could stop the spread of the pathology and the start of the disease," he adds. "Aliria also taught us that amyloid is necessary, but not sufficient, for developing the disease. Tau is also needed."

But the mere presence of tau is also not enough.

The second puzzling case – a man in his 70s whom the researchers call "Alirio" to protect his privacy – had amyloid along with a fairly large amount of tau, but still showed no symptoms. In his case, the entorhinal cortex and other regions were free of tangles.

His protective mutation, on a gene that codes for a protein called reelin, was different from Doña Aliria's. It also did not provide as much protection – he began showing signs of

dementia when he was in his late 60s, although that was still substantially later than expected for a carrier of the PSEN1 mutation shared by the extended family, the researchers reported in a paper published in May 2023 in *Nature Medicine*.

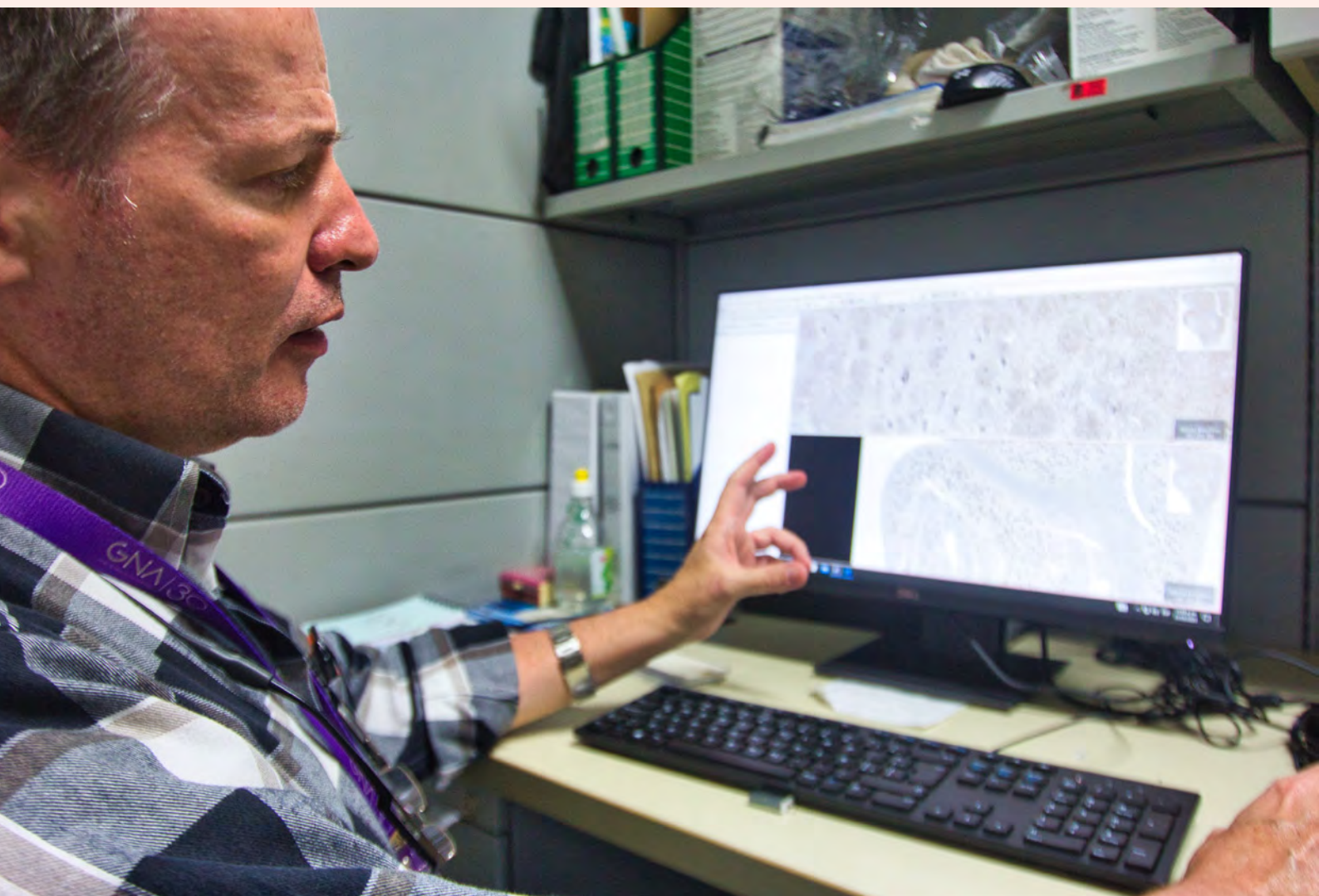
"The interesting thing is that the actions of both genes are in the same metabolic pathway," Lopera explains. "We concluded that Alzheimer's disease is in nature and the cure is also in nature. It's not necessary to invent anything. What we have to do is imitate what nature is doing."

"We concluded that Alzheimer's disease is in nature and the cure is also in nature. It's not necessary to invent anything. What we have to do is imitate what nature is doing."

*Professor Francisco Lopera,
University of Antioquia in Medellín*

The discovery of protective genes opened an enormous path for study, Professor Francisco Lopera believes. (Courtesy of UdeA/Alejandra Uribe)





The Neurosciences Group of Antioquia has been carrying out one of the longest running studies of early onset Alzheimer's disease in Colombia. (Barbara Fraser)

If future drugs or gene therapies can delay Alzheimer's onset by 30 years, they would offer a huge reprieve to people whose genetic risk profile means they might otherwise develop Alzheimer's in their 30s or 40s, he adds.

Understanding risk factors in Latin America

The search is now on for other cases that could reveal protective factors. With its genetic mix of descendants of Indigenous peoples, enslaved Africans, and European colonisers, Latin America is ripe for such investigation, and Lopera hopes that a multi-country effort will be funded soon. Meanwhile, his group's brain bank shares samples from more than 480 brains with researchers around the world, a task made easier by digital imaging equipment and, increasingly, artificial intelligence.

Most Alzheimer's assessment tools were created for populations in Europe or North America and are not necessarily adapted for use in countries with cultural differences and poor educational systems.

“The discovery of protective genes opened an enormous path for study. If nature has protective genes for Alzheimer’s, it should also have them for Parkinson’s, Huntington’s, frontotemporal disorders, and other neurodegenerative diseases.”

Professor Francisco Lopera, University of Antioquia in Medellín

The region’s heterogeneity, however, poses challenges. Most Alzheimer’s assessment tools were created for populations in Europe or North America and are not necessarily adapted for use in countries with cultural differences and poor educational systems, says Nilton Custodio, medical director of the Peruvian Institute of Neurosciences.

A test that requires a person to count backward from 100, mentally subtracting seven each time, may be impossible for someone who does not have a formal education, but that is not necessarily a sign of cognitive decline, he says. And when shown African animals in the Montreal Cognitive Assessment (MoCA), older adults in the rural Andes have identified the rhinoceros as “a pig with a horn” and the dromedary as “a llama with a hump”.

Custodio and his colleagues have developed a testing tool designed to eliminate those kinds of cultural differences, although it would still miss cases in older Indigenous adults who do not speak Spanish.

Still, he has used it with Quechua, Aymara, and *mestizo* – mixed-ancestry – populations in the Andean highlands and Lima, Peru’s capital, and plans to expand it to other cities and to Amazonia.

Already, there are some intriguing findings. In a study of 625 people, dementia prevalence was highest among mestizos, although still lower than the global average. It was lower among Quechua people in the Andean region of Arequipa, and very low among Aymaras in the southern highland region of Puno.

The question now, he says, is whether that very low level in older Aymara adults, despite risk factors such as little formal education and low economic income, is due to genetics or to social and environmental factors among a population that maintains strong community ties, gets more sleep, and walks more than people in Lima.

Custodio and his colleagues are working with other research groups to expand their studies, reflecting the growing interest in the genetics of Alzheimer’s in Latin America.

Lopera, too, is enthusiastic about the implications of genetic research.

“The discovery of protective genes opened an enormous path for study,” he says. “If nature has protective genes for Alzheimer’s, it should also have them for Parkinson’s, Huntington’s, frontotemporal disorders, and other neurodegenerative diseases.”

That doesn’t mean abandoning lifestyle changes – eating healthier food, giving up smoking, reducing alcohol consumption, getting more sleep and exercise – that can reduce the risk of developing Alzheimer’s, he says. “But we believe this is the path to a cure for non-modifiable factors of dementia.”

In fact, he is not sure now that there is such a thing as a non-modifiable factor. “For us, everything is modifiable, because we’ve found that protective factors can show us the way.”

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Chapter 5:

Preventive risk reduction

Taking care of the brain at any age



Pam Andrew, 76, who lives with dementia, puts a flower in her granddaughter Chloe's hair in June 2023 in Alameda, California. (Jason Andrew)

BY SIMON LONG

Since the neuropathology that accompanies dementia starts forming decades before symptoms manifest, it is never too early to adopt risk reduction measures. But the difficulties in changing one's behaviour, which have been alluded to in earlier chapters, apply all the more when the risk seems remote, and for most young people, dementia is a distant problem. That is one reason why some campaigners for dementia risk reduction advocate changing the conversation. Rather than talk about preventing or delaying dementia, it might be more productive to advocate "brain health". Just as physical fitness is seen as a goal in itself besides its benefits in reducing the risk of disease, so should keeping the brain well-functioning.

How the issue is framed does make a difference. Alzheimer's Research UK (ARUK) called its risk reduction campaign, launched in January 2021, Think Brain Health¹. Extensive polling and focus group work it had conducted showed that few people – only a third – were aware that dementia risk could be lowered. But other research showed that twice as many believed that they were able to influence their brain health. ARUK sits on the steering committee of a global initiative, also called Think Brain Health² (financed by, but independent of, some big pharmaceutical companies).

Social gerontologist Dr Laura Booi and neuroscientist Dr Francesca Farina have set up Next Generation Brain Health³, a programme for research looking at the brain health of young adults between the ages of 18 and 39. They agree that using the word "dementia" can be counterproductive. Farina says their focus groups with young adults in Europe and North America suggested that "as soon as you bring that in, people kind of shut off their focus and think: 'Well, okay, that won't affect me for the next few decades.' But if you say, 'brain health'...then this generation is a lot more liable to pay attention." Booi adds that this generation is the first to be

so acutely conscious of cognitive diversity and neurodiversity: "A lot of people are walking around with their own diagnoses of ADHD or autism, so they are already primed to really care about their brain health and whatever they can do to better it."

Scotland is one country where dementia risk reduction has been formalised as Brain Health Scotland, an initiative that the Scottish government commissioned Alzheimer Scotland to set up in 2019, in partnership with the Centre for Dementia Prevention at Edinburgh University. Starting in late 2022, it has taken the "never too early" injunction to a new level with My Amazing Brain⁴, a programme to raise brain health awareness among 8- to 12-year-olds with animations, worksheets, and games.

Although the aim is "to reduce the incidence of dementia", the material itself is all about positive lifestyle choices known as the STARS plan ("Spending time with friends and family; Tucking into healthy food; being Active and healthy; Rest and relax; and paying attention to Safety – keep your head safe"). The hope is that it can help build good habits early in life. The programme has been introduced to 13,000 children in more than 270 schools.

Sophie Fraser, education programme coordinator at Brain Health Scotland, says feedback has been positive from children, teachers, and parents. "I recently visited a school that had completed a My Amazing Brain six-hour block of lessons. Many children were going to bed earlier, were working on screen-free time before bed, and really enjoying new activities to replace screens. Two children came to speak to me after the session about their parents vaping and smoking and said that they were worried about their parents' brain health. Although these conversations are tricky, I think it shows the impact that the programme can have on not just the children, but on parents and families too."



A Brazilian woman shows her notebook in 2015. She started learning how to read and write in her later years, and says she was proud of realising her dream. (Domenico Pugliese)

Generation Next

For the younger generation – the one Next Generation Brain Health is aimed at – very little attention has been paid to dementia risk reduction. Yet, as Booi and Farina point out, many of the known risks for dementia are already present at this time of life: mental health problems; excessive drinking; or traumatic brain injury from playing sports or an abusive partner. Many other possible risks in this age group have been very little studied because of the focus on older people: illegal drug use; vaping; the use of hormonal contraceptives (the subject of a forthcoming paper by Booi and Farina). Because of their relative newness, it may be decades before new longitudinal studies are complete. But given what is already known about the modifiable risk factors contributing to dementia, the neglect of this generation in most public health campaigns seems shortsighted.

Still, most dementia risk reduction programmes are understandably aimed at older generations. One of the most comprehensive national approaches has been developed

in South Korea, which is both ageing very fast (20% of its 52 million inhabitants are expected to be 65 or older in 2024⁵), and producing very few babies (it has a total fertility rate of about 0.8, the lowest of any country in the world⁶). So caring for the elderly is a huge national issue, and preventing or delaying the onset of dementia an obvious priority.

South Korea has had a national dementia plan with a risk reduction component since 2008, and has updated it several times⁷. The “SoUth Korean study to PrEvent cognitive impairment and protect BRAIN health through lifestyle intervention in at-risk elderly people” or SUPERBRAIN programme⁸, was devised by researchers at the Korea Institute of Science and Technology and is now being rolled out. It has four components. One is cognitive training, including exercises to improve memory, concentration and problem-solving. Second is physical activity, with aerobic exercise and some strength training. Social engagement involves organised events, volunteering, and time with friends and family. The fourth component involves the management of vascular risk – controlling blood pressure and blood sugar and cholesterol levels.

Since 2017, 256 local dementia centres (LDCs) have been set up across the country. They are responsible for risk reduction, early diagnosis, and raising public awareness, as well as running short-term care shelters and supporting the families of people with dementia. Anyone can visit their local LDC to have a screening test. The LDCs keep a continuous eye on people at high risk, phoning and texting those with mild cognitive impairments (MCI), the over-75s, and people living alone. They also provide classes in risk reduction for the unimpaired and “cognitive enhancement” classes for those with MCI. They also counsel family members, assess how the burden of care is affecting them, and run family education classes and self-help groups.

Besides self-referrals, Okjin Rhee, a researcher at the National Institute of Dementia, says people are also referred to the LDCs based on the results of a nationwide screening of cognition as part of a general medical checkup for those over 66. Those at high risk are screened annually; everybody else once every two years. Means-tested government grants are available to cover the costs of the LDCs. Meanwhile, people also have access to a smartphone app enabling them to check their cognition and pay attention to dementia risk reduction.

Early detection

Two other important aspects of early, preventive risk reduction are the identification of those at heightened risk of developing dementia in later life; and the early diagnosis of those beginning to show symptoms of cognitive impairment. This was until recently a fairly neglected field.

George Stohart, a cognitive neuroscientist at Bath University who has been working with medical technology company Cumulus Neuroscience on developing a diagnostic test for early detection of Alzheimer's, says the development of such assessment platforms used to be inhibited “by almost a moral question – What is the point of early diagnosis when there is no treatment?”

“We were not proactively looking for the problem. Instead, we were waiting for symptoms, and diagnosis was subjective, reactive, and, quite frankly, late.”

Sina Habibi, Cognetivity Neurosciences

As a result, most diagnoses were carried out when symptoms of dementia were already noticeable. As Sina Habibi, a founder of Cognetivity Neurosciences, tells ADI: “We were not proactively looking for the problem. Instead, we were waiting for symptoms, and diagnosis was subjective, reactive, and, quite frankly, late.”

The advent of new Alzheimer's treatments has changed all that, for two reasons. First, Aduhelm, Leqembi, and donanemab have been shown to have an effect on the neuropathology of the condition. Second, they are much more likely to be effective if used in the early stages. These factors, combined with the very rapid progress in developing artificial intelligence, have contributed to an explosion of recent work on new diagnostic techniques.

So many new devices and techniques are under development or already being deployed that a comprehensive survey is impossible. To take just some examples from Britain alone, the National Institute for Health and Care Research (NIHCR) announced £11m (\$14m) in funding in March 2023 for projects designed to facilitate the early detection and diagnosis of dementia. They included a smartphone app for monitoring the brain health of people with early memory problems; wearable “augmented-reality devices” that monitors and tests spatial navigation and memory; a sensor that can fit under a mattress and identify early signs of dementia by measuring changes in sleep and nighttime behaviour; and new hearing tests⁹.

Machine learning and artificial intelligence are enabling big improvements in cognitive testing, which has been prone to cultural and educational bias as well as a “learning bias” (diminishing accuracy as practice improves participants' results). The smartphone app NIHCR is supporting, for example, (reaCTIVE) is based on work done for a large study, known as PROTECT, run by the University of Exeter. The study uses online tests to monitor cognitive health, and since its launch in 2015 has built up a database of 43,000 people, from whom it also takes DNA samples. This provides a solid foundation for the app, which uses similar testing techniques to gauge cognitive performance both over time and compared with other people of the same age. Anne Corbett, the project's academic lead, says that the point is to detect people with mild cognitive impairment – the overwhelming majority of whom at present never see a doctor. It is for these people that intervention can be most effective, whether or not disease-modifying treatments are available, she says: “It can go a long way to reducing deterioration.”

The NIHCR has also backed Stohart's project, which aims to detect people who will develop dementia years or even decades before they show obvious symptoms of cognitive decline. His team has built very quick, passive tests using electro-encephalographic (EEG) headsets that show promise in detecting cognitive impairment early, by comparing brain-wave responses to a series of images. The headsets are relatively

inexpensive (in the hundreds of dollars), and the test can be conducted on a tablet computer. The NIHCR funding will be used to come up with a cheap platform that can be produced in large quantities and used at home.

Habibi's Cognitivity Neurosciences produces an "integrated cognitive assessment" that has already been deployed by some regions of Britain's National Health Service and has been approved by America's Food and Drug Administration (FDA) and regulators in the European Union¹⁰. It relies on a series of flashing images, among which some of animals are embedded for the person tested to identify.

Even before the blossoming use of artificial intelligence in recent years, scientists could detect evidence of dementia from how people used words. A study in 2011¹¹, for example, found clear retrospective evidence in the writings of novelist Iris Murdoch in her 40s and 50s of the Alzheimer's she was to die with in 1999, aged 79. The research arm of computing giant IBM scoured data from the Framingham heart study, which has tracked three generations of people in a town in Massachusetts since 1948, to improve knowledge of cardiovascular health. It found that changes in their use of language over time could be used to predict which of the participants would acquire dementia years later¹².

Keeping an eye on you

A variety of do-it-yourself cognitive tests of various standards are already available online¹³, and will become important diagnostic tools. Modern life meanwhile generates massive amounts of data, such as the navigation apps on a smartphone, that could be used to help identify early symptoms of cognitive impairment. This however brings up obvious concerns about privacy – do you really want your internet search engine to have an interventionist role in your healthcare? There are ethical considerations as well – what follow-up information and support are available for those taking at-home tests should their results indicate possible cognitive decline? And how can they make sure that the resources that they have access to online are trustworthy?

Once cognitive impairment is identified, a patient may then be referred for tests to identify which of the dozens of causes of dementia are to blame. Identifying Alzheimer's normally requires a brain scan and perhaps a lumbar puncture (the insertion of a needle into the lower spine), to extract cerebrospinal fluid and measure the levels of the two proteins associated with Alzheimer's, beta-amyloid and tau¹⁴.

Pam Andrew, 76, plays with her granddaughter Christiane, 2, inside of her home on June 27, 2023 in Alameda, California. (Jason Andrew)



Some patients are reluctant to undergo the intrusive procedure. The scans are usually by magnetic-resonance imaging (MRI), to look at the size of the brain, along with a positron-emission-tomography (PET) scan that can measure the buildup of beta-amyloid. PET and MRI scanners are expensive pieces of machinery, running into the hundreds of thousands of dollars.

So there is considerable excitement at the development of simple blood tests to distinguish Alzheimer's from other neurodegenerative conditions, and perhaps of other fluid biomarkers, such as urine and saliva. One blood test, announced in 2020 and reportedly close to validation for routine use¹⁵, measures a form of tau called p-tau217. It has been found to predict Alzheimer's with 96% accuracy¹⁶.

Already, those with access to private medicine can have their blood tested. Dr Andrea Pfeifer of AC Immune thinks that by the end of the 2020s, a simple blood test should be widely available, though expensive follow-up PET scans would still be needed in some cases. By then, an anti-amyloid-beta vaccine – whether from Pfeifer's firm or another organisation – may also be accessible.

But, despite the rapid scientific progress, Pfeifer is a firm believer in the importance of living a healthy life: "If you eat well, exercise, play chess, or do some other brain activity, and avoid diabetes, you can reduce your risk of dementia by 40%...This is not science fiction. It is very solid science fact."

Dr Howard Fillit, cofounder and chief science officer of the Alzheimer's Drug Discovery Foundation (ADDF), also believes that we are on the verge of new breakthroughs in dementia treatment – which, he argues, make risk reduction efforts all the more crucial.

"The next frontier of Alzheimer's treatments lies within combining lifestyle modifications with novel therapeutics based on the biology of ageing for a precision prevention approach that allows clinicians to treat the right patient at the right time based on their individual risk factors," he tells ADI.

"It is crucial that we continue to advance our arsenal of tools to prevent Alzheimer's disease, even if only by a few years, because any delay of disease onset makes a tremendous difference in patients' lives."

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Finding community, mutual support, and meaning in a remote Japanese village



In Ogimi, yuimaru and ikigai are essential concepts in daily life – but the lifestyle that has made the village famous for the longevity of its residents is under threat.

BY ASHLEY OGAWA CLARKE IN OGIMI, JAPAN

It's a balmy evening, and the cicadas are softly trilling in the trees as waves lap in the distance. The sizzle of *goya champloo*, a stir-fried dish with pork and bitter melon, travels through the air from a nearby kitchen, while a group of grandmothers dance to traditional Okinawan music, the twang of the *sanshin* playing merrily in the background as the evening light slowly dissipates.



“The reason for [their longevity] is because of diet and lifestyle.”

Dr Hidenori Arai, president of the National Centre for Geriatrics and Gerontology (NCGG)

This is an average Friday night at the local community store in the small village of Ogimi in Okinawa, a subtropical string of islands which sit some 400 miles south of mainland Japan. Known as the village of longevity, 20 of Ogimi's 3,000 or so residents were centenarians, with over 150 people in their 90s, and around 230 more in their 80s, according to the 2023 census. Even compared to the rest of Japan, which boasts one of the most consistently high life expectancy figures on the planet (the current average is 84), Ogimi's numbers are impressive.

“The reason for [their longevity] is because of diet and lifestyle,” says Dr Hidenori Arai, president of the National Centre for Geriatrics and Gerontology (NCGG). “The warm temperature and good food with lots of fruit and vegetables, plus pork, which is rich in micronutrients, lipids, and protein, helps them to live longer lives.”

Okinawans also favour what Arai refers to as “a more old-fashioned lifestyle” compared to mainland Japan. “They have a lot of communication with other people in the community or live in big houses with a lot of family members.”

Along with Sardinia in Italy and Icaria in Greece, Okinawa is designated as one of the world's Blue Zones where people live longer than average – though it is now largely recognised to be in decline. The American occupation in the wake of World War II and its resulting influence on Okinawan culture (32 US military bases remain active in Okinawa today¹) has dramatically changed the diet and lifestyle here over the past 70 years. Around the year 2000, a phenomenon known in Japan as “Okinawa Shock 26” occurred, where the life expectancy of the prefecture's men plummeted from 4th to 26th in the country in a single year, largely attributed to the Westernisation of their diet.



Along with Sardinia in Italy and Icaria in Greece, Okinawa is designated as one of the world's Blue Zones where people live longer than average.



Etsuko and Morio Taira live on the beach in the village of Ogimi. They have been married for 55 years. (Reina Ogawa Clarke)

Now, “people are dying early from lifestyle-related diseases such as alcoholism. Diabetes is also common,” says Yuya Nohara, an official at Ogimi’s citizen welfare division.

Situated in the rural north of Okinawa, Ogimi has remained relatively sheltered from international food. Still, even here in the remote countryside, Japan’s ever-present convenience stores have taken root, meaning cup ramen, fried chicken, candy bars, and soda are now an easy option for Ogimi’s youngsters or tired commuters. “The idea of ‘I’m hungry at night, so I’ll just put up with what’s available’ has changed to ‘I’ll just go to a convenience store,’” says Fumimaru Osaki, Ogimi’s director for tourism.

Not everyone is tempted, however. “I don’t eat that kind of thing,” says Morio Taira, an 88-year-old retired politician who, alongside his wife Etsuko, hosts students on school trips from all over Japan, cooking local food for them from their large house that looks out onto an idyllic stretch of coast. They grow bananas and often get fish and locally grown vegetables from Etsuko’s brother, who lives nearby, and have a seemingly endless supply of watermelon and pineapple on their dining table.

Much like the Tairas, the older people in Ogimi generally prefer to eat traditional staples that they grew up with. *Goya champloo*, *ashitebichi* (pig’s feet soup), soba noodles, and plenty of fresh fish and vegetables are popular. *Shikwasa*, a tart citrus fruit a similar size and colour to lime, is also a famous local export that some tout as a key to longevity, as it contains nobiletin, which has shown promise in protecting against cognitive decline in animal trials², though research is ongoing.

“Most of the old people here have their own house, so they don’t have to pay rent, and then most of the vegetables they get are free because they grow them or get them from their neighbours,” says Hiroko Yamashiro, a 67-year-old from Kansai who moved to Ogimi a few years ago to retire and care for her elderly mother. “They have had hard lives in many cases, but now they have no stress at all.”

A community coming together

What is clear is that people in Ogimi don’t remain able to live independently into their 90s and 100s because of diet alone. “The real secret of Ogimi’s longevity is that people continue doing social activities no matter how old they are,” says Nohara at the welfare division.

There are no recent statistics on dementia specifically in Ogimi, although dementia prevalence is estimated to be 13.1% for people over the age of 65 in Okinawa. This is slightly less than the national rate for the same age group, which stands at around 15%, says Professor Takashi Sakurai, a researcher at the NCGG’s Center for Development and Advanced Medicine for Dementia.

“This is quite high compared to other countries such as the United States or China. We don’t know why [it is so high], but we suspect is maybe due to the statistical difference, or the accuracy of our investigative process in Japan,” says Sakurai.

Despite their high prevalence, dementia and cognitive impairment carry a strong stigma in Japan, and many Japanese families will try to hide it out of shame or social pressure, says Sakurai. In that way, the unavoidable openness of a small village like Ogimi is a saving grace when it comes to early dementia support. "They are gathering every day in the neighbourhood, eating, dancing, communicating with each other," he says. "That will help keep their brains healthy, and that's very important."

"Everyone knows everyone in Ogimi," says Misako Oyama, a 70-year-old retired city councillor whose daily schedule is often packed with taking local seniors to their hospital appointments. "If someone starts showing symptoms [of Alzheimer's disease], we don't have to hide it; we share the information with everyone in the village and make sure we visit their house every day to make sure they're okay." Osaki, the local tourism director, agrees: "People can become isolated after retiring from not interacting with other people as much, but in Ogimi, they are in a state where they can't be alone. It's a situation where there's always someone else there."

Nohara points to a special term in Okinawan culture: *yuimaru*. Referring to the mutual support of a tight local community, it's this that makes Ogimi special, and is key to its support of people with dementia, he says.

"The real secret of Ogimi's longevity is that people continue doing social activities no matter how old they are."

*Yuya Nohara, Ogimi's
citizen welfare division*

"The elderly in Ogimi are very independent, so even in the early stages of dementia they are able to do almost everything on their own," says Yuko Taira, who works alongside Nohara. "Many people grow their own vegetables and give them to others, for example. The people who have a purpose in life, or *ikigai*, do not usually present a worry."

Though the set-up for elderly support is currently strong, Nohara is concerned for the future. As Ogimi's population ages, fewer people are joining the local senior citizens associations, and their numbers have halved in the past two decades, he says. "As times change, it seems that fewer and fewer people want to belong to an organisation. We need to create a space where people can enjoy themselves, where it's easy for them to become part of the community."

Residents of Ogimi play gate ball with friends of all ages regularly. (Reina Ogawa Clarke)



Keeping the embers of *yuimaru* aglow

One answer to this is the aforementioned local community centre store, or *kyodo baiten* (literally cooperation store). Functioning as the soul of the village, it's here that Ogimi's *yuimaru* can be observed most clearly: people of all ages gather to trade gossip, share food, play music, or rehearse dance routines for the local festival. *Baiten* are volunteer-run, unique mutual aid organisations that emerged in Okinawa at the start of the 20th century before spreading around mainland Japan. "They were created in the past as a way for everyone to help each other, so people would naturally come together," explains Yurie Miura, 67, who runs the store alone.

Kyodo baiten have been disappearing across Japan for the past few decades due to volunteer shortages; the one in Ogimi closed down twice before Miura reopened it in the spring after retiring. For her, it was important that the elderly locals have a place to gather. "Everyone had been staying at home during the pandemic, and they were losing their physical strength. They didn't have many opportunities to talk to each other, so they became like hermits. I thought that if there was a place like this, not only the elderly but also young people would be able to come and have more opportunities to communicate with each other. It's made everything feel much more lively," she smiles.

For the residents, the reopened gathering place has had a huge impact. Miura's mother, 97-year-old Kikue Oshiyama, is one of the regulars there. She walks the few blocks from her home to the *baiten* every afternoon to pick up a few essentials or catch up with the other villagers. "It's an excuse for me to go for a walk, and I like talking to people or dancing. It's something to do every day," she says.

To keep the embers of Ogimi's *yuimaru* aglow, as well as providing the building for the *baiten*, the Ogimi Village Office also facilitates activities to prevent isolation for people over 65, including gate ball, karaoke, and go, a board game. Seijin Arakaki, a 93-year-old known as Jimmy to his friends, is one of the local gate ball pros, and walks over to the park to play most days. "It's 3,000 steps there and back, plus about 2,000 steps during the game," he says, keeping track of his progress on the pedometer on his mobile phone. When a typhoon hits (not uncommon in Okinawa), Arakaki will take the day off hitting the ball around the park, and pore over his study books at home. "I study English, arithmetic, brain training, *kanji* characters, history, or just watch TV. Anything that gets my brain going," he says.

Over at one of Ogimi's day services, which takes place once a week in a large local community building, a classroom of around 20 seniors is in fits of laughter while they race to pass a soft green ball across the room with paper fans. After the games, it's time to do a few physical exercises curated to improve muscle strength and prevent falls. The group will do around 20 exercises in total before singing – often a traditional Okinawan song they've grown up with.

Shige Nakada, 92, and Yoshiko Yamashiro, 91, are two sprightly regulars at the daycare service, and have known each other since elementary school. They were part of a *yuimaru* of ten women harvesting rice and sugar cane growing up, so being an active part of the community is what they've always been accustomed to. As well as meeting with the other seniors, Nakada's favourite part of the day service is the exercises. "I don't get out much and I can't do [the exercises] at home, so it's a lot of fun," she says. "I feel good. I'm surprised at myself to have gotten this far!"

For Sakurai, the importance of Japan's daycare services in dementia prevention became especially clear over the COVID-19 pandemic, when many services were stopped. "To be honest, I used to think the daycare service wasn't so effective for brain health before the pandemic, but I saw many dementia patients get a lot worse during the pandemic," he says. Now, he considers the day service to be one of the most important parts of dementia care.

"These services have allowed the locals to be more sociable," says Shinjou Sugako, a careworker who helps run the service. Sugako currently has about 150 elderly people under her care; her role includes making home visits to seniors, or inviting them to come to the day service to prevent them becoming shut-ins.

"The grandmothers used to work in fields every day, cook dinner at home, and take care of their children, and then that would be the end of their day." Now, instead of retiring, the day service has become part of their *ikigai*. "They'll always take a bath and get dressed up when they come to daycare, I think it's amazing," she says.

The hard work of Sugako and others in the village like her is essential for Ogimi's future as a place where old people can live long, independent lives and keep that precious sense of *yuimaru* going. This year marks 15 years since Sugako started working with Ogimi's seniors. "I really enjoy talking with the elderly," she says. "For me, this job is my own *ikigai*."

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Chapter 6:

Post-diagnosis risk reduction

Life isn't over after a diagnosis



Friends celebrate with traditional music in San Jerónimo Norte, Argentina on June 9, 2013. (Alex Kornhuber)

BY SIMON LONG

Improvements in diagnostic techniques have in many cases not been matched by improvements in the way a diagnosis is delivered or how it is followed up. The experience of Will Dean's mother (See Chapter 4) seems all too typical.

Des O'Sullivan was first diagnosed in late 2016, when he was 60. The UK resident had sought a diagnosis because of some mildly alarming symptoms (he was always mislaying things), some more serious ones (he was struggling to cope with a fairly stressful job as a project manager at a publishing company), and one downright scary one (he would have violent fits in the middle of the night, during which he would hit his wife, Valli, in his sleep).

But he was nevertheless surprised to be told he was living with dementia. Like many people, his reaction was a curious mixture of relief, denial, and fear. The relief was to feel "validated", that his own sense that something was wrong now had medical opinion to back it up. He recalls how chronic fatigue syndrome used to be dismissed as "yuppie flu" and feared that people would similarly dismiss his symptoms as largely self-induced or imaginary. He felt a bit like Spike Milligan, a British comedian who had inscribed on his gravestone the words: "I told you I was ill!" Valli and his two children, then in their teens, were also relieved to know that what had been troubling him had an identifiable cause.

The denial came from his belief that his condition was not that serious. He did not see himself as a person with dementia as he understood the term. Months later, however, after a battery of tests and scans and a day and a night in hospital wired up to an encephalograph, he was told he probably had dementia with Lewy Bodies; a definitive diagnosis cannot be made until after his death, when his brain can be autopsied.

If there is a best way to cope with the fear that a diagnosis of dementia brings, Des may have found it. "I made it my life's work to live as positively as I can," he says. He retired at around the time he received the diagnosis, but with Valli's support, he threw himself into a busy life. He speaks often at meetings, is a member of the Young Dementia

Network¹, an online community offering support to people with young onset dementia, their family, and friends, and has volunteered to take part in a number of research projects. ("My only complaint is they keep asking me to count backwards from 99.")

Although he felt unsupported by the medical profession when he first received his diagnosis, he now has a neurologist he trusts. Every six months, he and Valli see him and are told Des is doing worse than he was six months ago – but not as bad as the neurologist had expected. That is success.

Others, like Des, have responded to a diagnosis of dementia by becoming advocates for their community. Laurie Waters, a 57-year-old in Clover, South Carolina, was diagnosed in 2017 with young onset Alzheimer's, and has since become an active campaigner for issues such as the expansion of federal health insurance coverage to new Alzheimer's drugs. She says that her advocacy "has helped 100%". Emily Ong, a Singaporean who was diagnosed with dementia in 2017 at the age of 51, has become a frequent speaker on her life with the condition, and works on dementia-friendly design, while being a member of ADI's board (See story page 88).

These advocates have also responded by familiarising themselves with the most up-to-date medical thinking on how they should adapt their lifestyles to their new condition. Emily, who has suffered from inflammation-related complaints all her life, has adjusted her diet to maximise anti-inflammatory foodstuffs, and is very conscious of her gut health, eating a lot of probiotics and prebiotics. Laurie does a lot of exercise (mainly walking), has adopted a low-sodium diet, and eats plenty of vegetables. She allows herself a steak only once a fortnight.

Going slowly

Most forms of dementia are degenerative conditions, meaning that they get worse over time and the progress of the condition is usually irreversible. But, just as the way people behave can have an influence on the timing of the onset of dementia, so can progress of the condition be slowed or accelerated by their actions after a diagnosis.

Many of the activities, behaviours, and lifestyle choices recommended in earlier chapters for those hoping never to develop dementia remain available and beneficial after diagnosis for those living with mild cognitive impairment or dementia. A diagnosis is no reason to start smoking, gorge on saturated fats, drink too much, and stop exercising; still less to retreat from the world, give up socialising, and abandon thoughts of trying new things.

Even the medical profession has taken to prescribing non-medical interventions. Cognitive Stimulation Therapy (CST), in wide use in many places, had its origins in the 2001 PhD thesis of Professor Aimee Spector of University College London. She devised what has become the only non-medical therapy endorsed by Britain's National Health Service for people with dementia. Indeed, all government-accredited memory services are obliged to offer CST, which is now being used in at least 38 countries around the world² after having been found suitable for most people living with mild to moderate dementia.

It involves a course of themed meetings or classes typically held in groups of five to eight people twice a week for seven weeks. Activities include word association, categorisation, number games, and discussions on universal topics such as food and current affairs. The underlying concept is “use it or lose it” – that the brain needs to be exercised – with activities calibrated to be challenging enough to stretch participants, but not so much as to make them feel helpless. Sessions typically begin with music and warm-up activities, a brief discussion of current affairs and then the main themed activity (such as “childhood” or “using money”).

The theory is that targeted mental stimulation can lead to the development of new neuronal pathways. Practice suggests it works, with participants showing noticeable improvement in

cognitive function and in their quality of life, as assessed both by them and their family members. CST has also proved remarkably adaptable – the versions used around the world are very much the same (though for the Māori in New Zealand it was found necessary to add an extra introductory session; and current affairs discussions in Brazil had to avoid politics and football).

Spector thinks some of the benefit comes from the group setting. Prescribed just after a diagnosis of dementia, it helps prevent a slide into feeling anxious and antisocial. The main drawback is that its benefits appear to fade quite quickly. A randomised control trial in Beijing from 2012 to 2015 found that CST slowed down the process of cognitive impairment and eased the burden on caregivers. But three months later, participants showed no improvement over those who had not been through CST³. Spector herself believes that in an ideal world, people would have access to CST for as long as they need it.

Keep dancing

People diagnosed with dementia would also benefit from continuing to engage in the helpful activities described earlier in this report. Take dancing. Magda Kaczmarek⁴, a self-described “teaching artist and creative ageing advocate” based in New York City, is one of the most eloquent evangelists for the cognitive benefits of dancing, already mentioned as one of the pastimes associated with a lower risk of dementia.

Kaczmarek holds a Master's of Fine Arts in dance performance and choreography – but she also graduated in biochemistry and molecular biophysics, and spent ten years working in preclinical neuropharmacological research. For over 15 years, she has worked in teaching dance and creative expression to people of all ages, especially older adults, including some living with



Alzheimer's Indonesia (ALZI) risk reduction specialists lead more than 1,000 participants in a poco poco dance in Jakarta, Indonesia in 2018. (Courtesy: Dipa Mulya, Alzheimer's Indonesia)

A diagnosis is no reason to start smoking, gorge on saturated fats, drink too much, and stop exercising; still less to retreat from the world, give up socialising, and abandon thoughts of trying new things.



A couple dances at the senior club of Santiago de Cuba in 2015. (Domenico Pugliese)

dementia. In June 2023, ADI joined one of her classes held online – and had a lot of fun, as well as marvelling at her skill in engaging a group spread over several venues, including a care home.

The class, known as “Stories in the Moment”, began with warm-up dance movements (all sitting) to an eclectic selection of music. The culmination was a fantasy visit to the beach, devising dance moves to replicate the experience – swimming, eating ice cream, etc. For one participant, it was eating scrambled eggs at a café and reading the *New York Times*, like he and his wife used to do decades ago. “It’s all about memory,” one participant explains. But it is also all about community, making connections, having fun, being alert, and keeping moving.

Virginia Tech professor Julia Basso, who also has a background in both dance and neuroscience, explains that “through dance and through movement practices, we can enhance neural synchrony or neural coordination between different parts of our brain”⁵. Dance, with its many aspects – choreographic, rhythmic, social, cognitive – enhances white matter activity in the brain in a way that is observable on electro-encephalographs. The benefits of dancing have been recognised all over the world. In

Indonesia, researchers have found remarkable benefits from *poco poco*⁶ – an elaborate dance/gymnastic routine from the east Indonesian archipelago of Maluku.

Part of the magic of dance, of course, is the music. Many carers for people with dementia recognise the power of music to bring solace, happiness, and restored memories, even when verbal communication becomes difficult. Sally Magnusson, a journalist, broadcaster, and novelist who wrote a wonderful book about her mother and Alzheimer’s, “Where Memories Go. Why dementia changes everything”⁷, founded Playlist for Life⁸ in 2013. The goal is to help people build personal playlists of music that matters to them, offering training in the role of music in helping people with dementia. Its philosophy is that “every person with dementia should have access to a unique personal playlist, and everyone who loves and cares for them should know how to use it to make living with the condition easier and happier.”

Adapting

Perhaps the most important post-diagnosis interventions, however, are at the population level in order to make life manageable for people with a mild cognitive impairment



Participants in a dance class at a senior centre in São Paulo, Brazil, show off their moves on March 29, 2019. (Alex Kornhuber)

or dementia. As the number of people with dementia rises inexorably, this will become more and more important: societies will not have the resources to provide residential care for all those who might need it. They will have to adapt to allow the cognitively impaired to continue to live at home, with their carers or independently, for longer. Adapting public spaces to be more easily navigated and used by people with dementia, as Singapore is beginning to do (See story page 88), has another important benefit: it raises awareness among the rest of the population that dementia is a very common condition and that people living with it need and deserve special consideration.

In Japan, which has the highest proportion of people with dementia of any country⁹, some municipalities are also trying to make daily life more dementia friendly. A national dementia plan known as the Orange plan was adopted in 2013¹⁰ and updated two years later¹¹. People are helped to continue living at home through visits from professional carers, and as of 2020, 12 million people across Japan had been given rudimentary training as “dementia supporters” to provide help for people with dementia and their families.

Across Japan, there are also thousands of dementia cafés¹², some of them permanent establishments catering for (and sometimes catered by) people with dementia; other more informal weekly

get-togethers are organised by local governments and volunteers. For those with relatively mild dementia, they offer a fixed point in the week and a chance for social contact. A volunteer tells ADI how some people have been coming for two years and show no obvious signs of cognitive deterioration.



Across Japan, there are thousands of dementia cafés, some of them permanent establishments catering for (and sometimes catered by) people with dementia.

His wife Helena attributes part of Kevin's resilience to something that cannot be diagnosed or, perhaps, modified: his personality.

In 2019, the local government of Matsudo, a suburb of Tokyo, began organising “Orange Patrols”, groups of five or six mostly elderly volunteers in high-visibility jackets keeping a lookout for endangered schoolchildren and disoriented old people. People with dementia are also encouraged to carry a QR code on them, stuck to a walking-stick, hat, or on a lanyard. If somebody finds them looking lost (and, thanks to a vigorous public information campaign, knows what to do), a smartphone scan of the code will reveal details about them.

Some uses of technology can be more overtly intrusive. In some public housing blocks in Singapore, for example, neighbours or family members of the vulnerable elderly will be alerted if, say, a tap in a wash basin has not been used for a while. George Stothart, the cognitive neuroscientist at Bath University introduced in the previous chapter, describes an experimental scheme in Bristol that keeps an eye out for the increased use of an electric kettle, which might suggest that someone keeps forgetting they have already started to make a cup of tea.

Life goes on

Whatever adaptations society makes to accommodate people living with dementia, however, it is going to require enormous reserves of strength and courage. Kevin Quaid, an Irishman diagnosed with Lewy Body dementia in 2017, decided that “advocacy would become my job”, and has become a frequent

speaker as well as an acclaimed author¹³, in order “to tell you that there is a life after diagnosis”. He is a member of the Irish Dementia Working Group, as well as vice-chairperson of the European Working Group of People with Dementia. Like Des O’Sullivan, he constantly surprises his neurologist by doing far better than expected.

His wife and, in her own words, “caring companion”, Helena, attributes part of Kevin’s resilience to something that cannot be diagnosed or, perhaps, modified: his personality. He has always had “this great bounce-backability... In the face of adversity he has the personality to do it,” she says. But he himself wonders how long he can keep it up: “As time is passing, the fight is getting tougher and tougher.”

Living well with dementia doesn’t have to be a matter of having an exceptionally resilient personality, however. What the reader will hopefully glean from these pages is the importance of having a sense of purpose and meaning, a reminder that life isn’t over after a diagnosis.

At a time of great hope about the emergence of effective disease-modifying treatments for Alzheimer’s, and of a growing body of evidence about how the risks of developing dementia can be reduced, it is worth remembering that it is still a condition expected to affect 139 million people by 2050, and those living with it need and deserve support.

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Advocacy for hope: post-diagnosis dementia risk reduction in Singapore



Advocates have helped make the small island state more dementia friendly, in a bid to keep people living with the condition more engaged with their community – reducing risk, even after a diagnosis.

BY SIMON LONG IN SINGAPORE

It was a morning in 2017 spent trying and failing to make French toast that suggested to Emily Ong something was seriously wrong. A 51-year-old consultant for children with special needs, she had suddenly forgotten how to make the usual family breakfast. She remembered she needed bread and a skillet, but that was it. Later, writing of the experience, she described it as a computer virus attack on her brain: “the French toast file had been corrupted.”¹



Since then, she has had to adapt to the new challenges of daily life. She switched to a whistling kettle as she kept forgetting the old one and letting it boil dry. After a while, that stopped working, too, and she has had to resort to a transparent kettle so she can see the bubbling water. But despite these daily obstacles, Emily has become Singapore's best-known advocate for people living with dementia.

A round of bewildering and depressing neurological assessments followed the French toast scare. Her scores in Montreal Cognitive Assessment (MoCA) tests, a widely used method of detecting cognitive impairment, suggested she was living with dementia. An initial diagnosis of Fatal Familial Insomnia (a rare genetic degenerative brain disorder) was followed by another of a psychiatric disorder, perhaps depression, and then of Alzheimer's. She had several MRI scans and a lumbar puncture to extract cerebrospinal fluid. That found no tau neurofibrillary tangles, so Alzheimer's was excluded. The next diagnosis was of frontotemporal dementia (FTD), but that too has since been retracted. The cause of her dementia is still unknown.

Many people around the world face similar problems in trying to gain clarity regarding changes in their cognition. Emily's experience, however, also highlights the approaches to people living with dementia adopted in her country, the island state of Singapore.

Her neurologist referred her to Dementia Singapore (formerly known as the Alzheimer's Disease Association), and in the summer of 2019 she joined the third cohort of a remarkable programme known as Voices for Hope.

“I put a lot of heart and soul into the Voices for Hope,” she says. “When I joined, it was not really structured at all. It was just a programme to get people newly diagnosed with dementia to come together, with their primary care partners, with the hope that [...] they will have the confidence to step up to share their story.”

What the programme has achieved, however, has gone beyond simply boosting the confidence of people living with dementia. It has helped raise awareness of their needs, hopes, and abilities in the broader community. And it has begun to bring about changes to help them live their lives to the fullest.

Raising one's voice

Voices for Hope is facilitated by Ruth Wong, an inspirational Singaporean who discovered her vocation in caring for people living with dementia while studying gerontology in Canada and doing an internship at a dementia care centre. At Dementia Singapore, she worked on the organisation's Memory Cafés², which provide forums for informal interaction, offering people with dementia and caregivers alike some respite and new social opportunities.

In switching focus to set up Voices for Hope, Wong received a lot of support and advice from Kate Swaffer, an Australian diagnosed with FTD in 2008 and cofounder of Dementia Alliance International, a non-profit advocacy organisation whose membership is limited to people with medically confirmed diagnoses of dementia.

They devised a ten-week programme for a small number of people with dementia and their care partners, designed to foster their confidence and equip them with the skills to share their experience in public. Not only would this help them navigate their condition and enable them to make new friends, but it would also spread greater awareness of dementia in Singapore and reduce the stigma that still casts a pall over those living with the condition.

After an ice-breaking session where participants get to know and trust each other, the programme covers the skills required for advocacy and overcoming stigma, how to “live well with dementia”, with a focus on involvement in family and the wider community. The Voices for Hope graduation ceremony is for many their first experience of public advocacy, where they talk to their cohort, earlier alumni, family, and friends about their lived experience of dementia.

As of July 2023, 13 cohorts – a total of 98 people – have been through Voices for Hope, and about a third of them were still active advocates. Emily became a core facilitator, as did three other “graduate” families. The dropout rate for the course is low, perhaps because of the care taken in selecting participants. All are referred by doctors or Dementia Singapore itself. People

“It gave us so much hope for the future.”

Evon Estrop, carer

with all types of dementia are welcome, but they have to be able to understand the course and to express themselves, so some people who have had a stroke and have vascular dementia are ineligible.

Evon Estrop cares for her husband Peter Estrop, who was 61 when he was diagnosed with early onset Alzheimer's in 2021. For them, Voices for Hope did what it said on the tin. “It gave us so much hope for the future,” says Evon.

Peter's Alzheimer's diagnosis changed a lot of things for the couple. Peter resigned from his job. He would lose his keys, forget where the light switches were, or get lost on the way to the supermarket. They installed a white board on which are

A man exercises outside a senior centre in Ofunato, Japan, on June 11, 2019. (Alex Kornhuber)



inscribed his daily tasks. “At first,” says Evon, “he did not want to socialise. He just did not know how to handle the disease... Voices for Hope opened our eyes.”

And now? “We are shameless people. We get out and have fun!” For Peter, that means a lot of music. He is a member of Singapore’s first choir for the cognitively impaired, a venture called Sing to Remember³, whose members have seen remarkable improvements in cognition, social connectedness, and lessened anxiety.

The Estrops, who participated in Voices for Hope, are also dementia advocates, and have spoken about their experience in schools. “When he shares about dementia,” says Evon, “they see it is more than just forgetfulness.”

Raising awareness about dementia is a big part of Voices for Hope’s purpose. But besides giving its participants the confidence to speak in front of schoolchildren, the programme also empowers people living with dementia to advocate for issues that matter to them, such as the impact of a dementia diagnosis on one’s employment. A diagnosis of dementia will often mean the loss of a job – and with that, a loss of social contact and confidence. Employers are encouraged to think of alternatives, such as changing the work environment, or easing the employee’s responsibilities.

The very act of advocacy – the process of sharing one’s story, engaging with others, pushing for more inclusive measures for people living with dementia – allows them to continue being proactive and purposeful participants in their community for longer, a risk reduction measure if there ever was one.

Creating a dementia-friendly society

But Voices of Hope’s most visible contribution to Singapore comes from a collaboration between Dementia Singapore and public transport. “Find Your Way” is intended to make daily life easier for people living with dementia by helping them navigate busy bus stations and MRT (metro) stations.

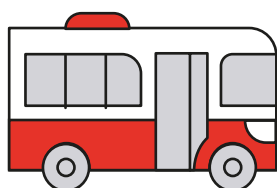
Public transportation can be daunting for people living with dementia, who may struggle with their sense of direction and reading comprehension while looking at maps and signs.



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Emily showed ADI around the bus station at Ang Mo Kio, a busy hub in the Singapore “heartlands” outside of the city centre. Directions are indicated by brightly coloured signs on the wall and floors, illustrated with a selection of familiar Chinese pastries (elsewhere other icons have been used, such as children’s games⁴).

The project has been counted a success, and will be extended in its second phase, with the aim of making public transportation more inclusive to people with other types of disability, thus enabling them to maintain their independence longer.



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Projections suggest that by 2030, 152,000 people in Singapore will be living with dementia, out of a permanent population of 4.2 to 4.4 million.

Although the number of Voices for Hope alumni is relatively tiny, the programme has had a big ripple effect. And Singapore needs it. Like other high-income East Asian countries, its population is ageing rapidly, and so has its number of people living with dementia. A 2015 study found the prevalence of diagnosed and undiagnosed dementia to be one in every ten Singapore seniors⁵. Projections suggest that by 2030, 152,000 people in Singapore will be living with dementia⁶, out of a permanent population of 4.2 to 4.4 million⁷.

Yet it is unclear whether the country has fulfilled its WHO obligation to produce a national dementia plan. From Plan to Impact⁸, ADI's annual stock-take of progress towards the goals of the WHO's Global action plan for dementia, lists Singapore's plan in 2023 as "adopted but not fully communicated".

In 2023, the government did, however, produce and publish an action plan for successful ageing⁹. This is still a rare example internationally of a joined-up strategy for coping with the strains of a rapidly ageing society. It has a big emphasis on preventive care, including an initiative called Healthier SG¹⁰, which offers support from a family doctor, subsidies for preventive health, personalised health plans, and "connection to a wide range of healthy lifestyle activities". The action plan's section on "managing dementia" promises a scaling-up of a community exercise programme known as "HAPPY" (Healthy Ageing Promotion Programme for You), which is designed to improve cognition, physical function, and reduce isolation – a fantastic example of bringing together individual behavioural changes and population-based interventions.

The government is also committing resources to the needs of people with dementia. Its Agency for Integrated Care is creating a "Community Mental Health Ecosystem" that takes a population-level health approach to dementia. It comprises Community Outreach Teams (CREST) to raise awareness and provide early identification, and Community Intervention Teams (COMIT), led by allied health professionals providing care, psychosocial support, and case management, as well as equipping caregivers with the support they need.

Evon Estrop credits the government with having "listened". Two examples she cites are efforts currently underway to raise awareness of dementia in the police force, and that elderly care centres are being located next to kindergartens in Housing Development Board estates, where the vast majority of Singaporeans live.

That, too, is a form of risk reduction. What all of these interventions have in common is a recognition that risk reduction is not only possible, but necessary, even after a diagnosis of dementia. Besides adopting a healthy lifestyle and keeping the brain challenged, the best way to reduce the risk of faster cognitive decline is to remain engaged socially. And that is much easier if people with dementia can go out and about without getting lost, and if they are given enough opportunities to socialise.

People living with dementia can lead active, useful, and fulfilling lives a lot longer than many realise – provided society makes it possible for them.

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Conclusion and recommendations



Kankor Jijire sits in front of her hut in February 2022 at the Gambaga 'witch camp' in Ghana, where many women are banished after showing possible signs of dementia. Jijire has been living in the camp since 2009. (Lee-Ann Olwage)

In the process of writing this report, we have been struck – and encouraged – by the breakneck speed at which the science around risk reduction in dementia is moving. News around research has been ‘breaking’ constantly, with trials publishing new data and new interventions promising hope.

Throughout these pages, we have explored in detail key areas of dementia risk reduction, including: **physical risk reduction** (diet, heart health, hearing loss, sports...); **brain health** (education and cognitive training, social contact, depression...); **environmental and population-level risks** (social determinants of health, socioeconomic inequities, government intervention, air pollution...); **non-modifiable risks** (genetic risk, sex and gender, ageing societies...); **preventive risk reduction** (childhood and lifelong interventions, early detection...); and **post-diagnosis risk reduction** (modifiable risks to slow progression, meaningful activities, sense of purpose...).

There are two key things we have gleaned from this experience. First, we recognise that we have provided you with a snapshot of the latest science around risk reduction. The current financial and intellectual investment in dementia research means that opportunities and understanding around risk reduction are evolving quickly. It's

exciting and reassuring to think that even one year from now, knowledge around risk reduction will have increased further and individuals will have even more opportunities to reduce or delay risk of onset.

Second, and perhaps more important, is the sense that each one of us has a choice. There are things we cannot individually control (genetics, pollution, socioeconomic inequalities, even hormones), but we can make small changes to our daily lives that can reduce our risk. We might not be able to change a lot or to get it right every day – and inevitably we won't – but if we keep trying, we can find ways to reduce our risk, delay onset, and increase our brain health.

Although the field is advancing quickly and we are at the forefront of new treatments for dementia, delaying onset remains the most feasible and equitable option that could provide individuals with more healthy years as they wait for the science to catch up.

Key areas of risk reduction



Physical risk reduction



Non-modifiable risks



Brain health



Preventive risk reduction



Environmental and population-level risks



Post-diagnosis risk reduction

Reflecting on the wealth of information shared in this report, here are ADI's key recommendations:

1. In the absence of a cure or a treatment that is globally accessible, risk reduction remains the most feasible and proactive way to combat dementia.
2. Just as there is rarely a simple answer to a complex issue, there is no magic bullet for dementia. But there are tangible steps – big and small – that individuals can take to reduce risk, and any step is better than nothing:
 - Eat as healthy a diet as possible – diversify the food groups you consume and avoid ultra-processed foods. There are many ways to eat well; personalised diets incorporating foods that are local and affordable where you live and fit your needs are best.
 - Exercise – be creative; walking, bike riding, tai chi, dancing... it all counts.
 - Keep learning – challenge your brain, whether it is by picking up a new language, doing crosswords, singing...
 - Pay attention to your cardiovascular health and any other chronic diseases.
 - Maintain connection – humans are social animals; socialising replenishes our brain health and reduces depression and isolation.
 - Pay attention to your general physical maintenance – check the health of your teeth, avoid head injury, make sure you get enough sleep, don't smoke nor drink excessive amounts of alcohol.
 - One step that has stood out as a possible game changer is getting a hearing aid for those with hearing loss, which has not only shown to slow cognitive decline but is cost effective and scalable. ADI encourages governments and healthcare systems to improve access to these devices, particularly in lower- and middle-income countries.
3. Risk reduction is a lifelong endeavour and most effective when awareness and understanding of brain health begins at a young age, establishing good habits.
4. Risk reduction does not end at diagnosis – people with dementia can implement healthy lifestyle changes aimed at slowing the progression of the condition. More research is needed and more should be done to ensure that people who have been diagnosed with dementia have access to education and the support they will need to modify their behaviours and to continue to live a purposeful life.
5. Some risks cannot be addressed individually. Governments must address broader issues such as green spaces for safe exercise, air pollution, access to education (especially for girls), more equitable access to healthcare, and regulations/guidance around ultra-processed foods, etc.
6. Governments must provide support and incentives to people to reduce their own risk. One way is by funding community public health systems that can play an integral role in facilitating behavioural change.
7. On an international level, an extension of the Global action plan on dementia beyond 2025 is needed. ADI calls on member states to bring this initiative to the WHO to ensure dementia remains a global health priority. ADI further notes that member states have already committed to risk reduction through action area 3 of the Global action plan.
8. ADI calls on governments to develop robust risk reduction strategies to include in their national dementia plans, aligned with non-communicable diseases (NCD) risk reduction targets. Recognising that these conditions have shared risk factors, there is an opportunity to leverage existing awareness campaigns, and even to create new integrated ones to benefit public health.
9. The risk reduction field is evolving quickly, but it is paramount to ensure diversity and inclusion in all research if we are to address dementia risk across the global community.
10. ADI calls for governments to keep up the momentum and invest further in risk reduction research, driving new understanding and innovations to promote healthy ageing, including after a diagnosis.

There may not be a cure for dementia yet, but there is a lot we can do, as individuals and societies, to reduce our risk of developing the condition. Even the smallest of changes can make a difference – and we owe it to our loved ones, our communities, but most of all to ourselves, to try.



Liaqat hugs her granddaughter Sidrat-ul-Muntaha in Islamabad, Pakistan. (Saiyna Bashir)

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