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# Sydney Centenarian Study (SCS)

Perminder Sachdev



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- **"All my possessions for a moment of time."**  
Elizabeth I of England  
(1558-1603)



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# Why study centenarians?

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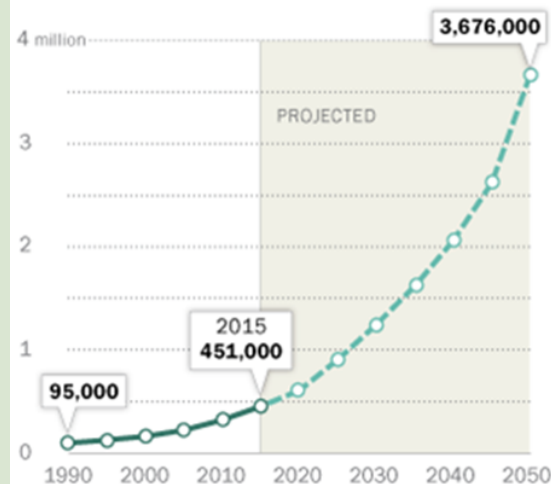
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# The number of centenarians is increasing exponentially

## The world's centenarian population projected to grow rapidly

Number of persons ages 100 and older



Source: United Nations, Department of Economic and Social Affairs, "World Population Prospects: 2015 Revision"

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There are now about 4,250 people aged 100 years or older living in Australia. By 2050, statisticians believe Australia will have more than 50,000 people aged 100 and over.

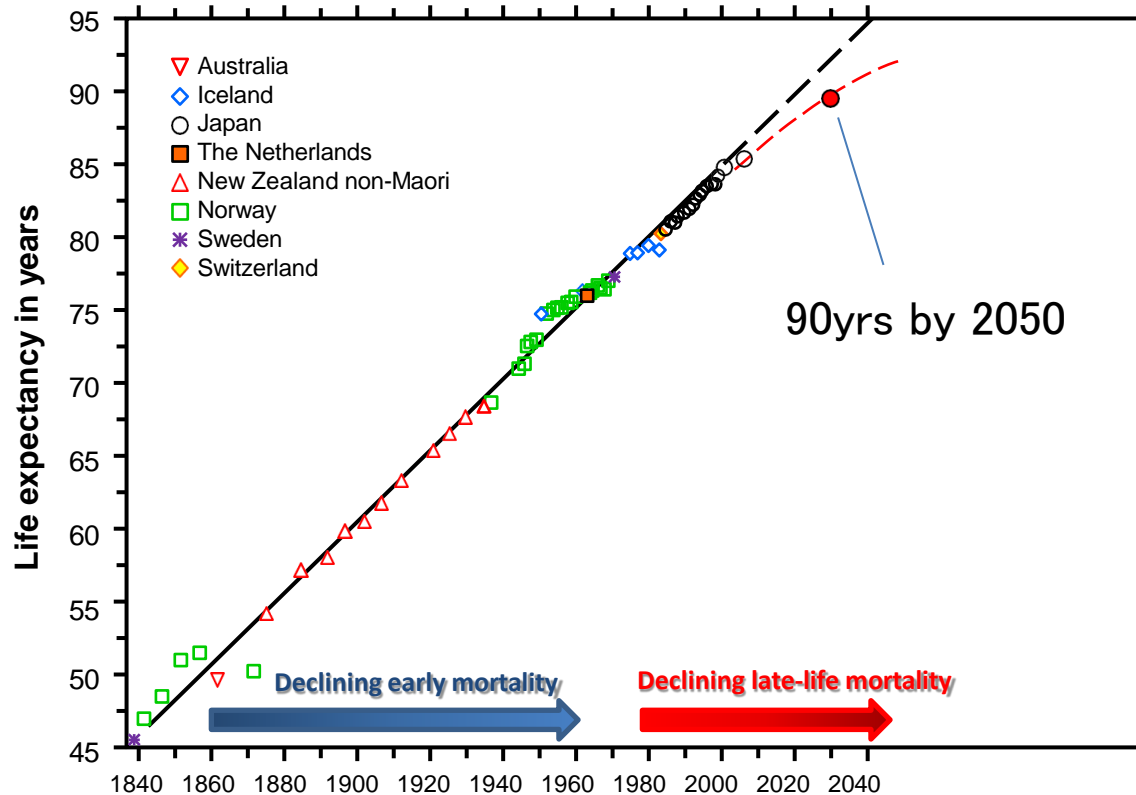
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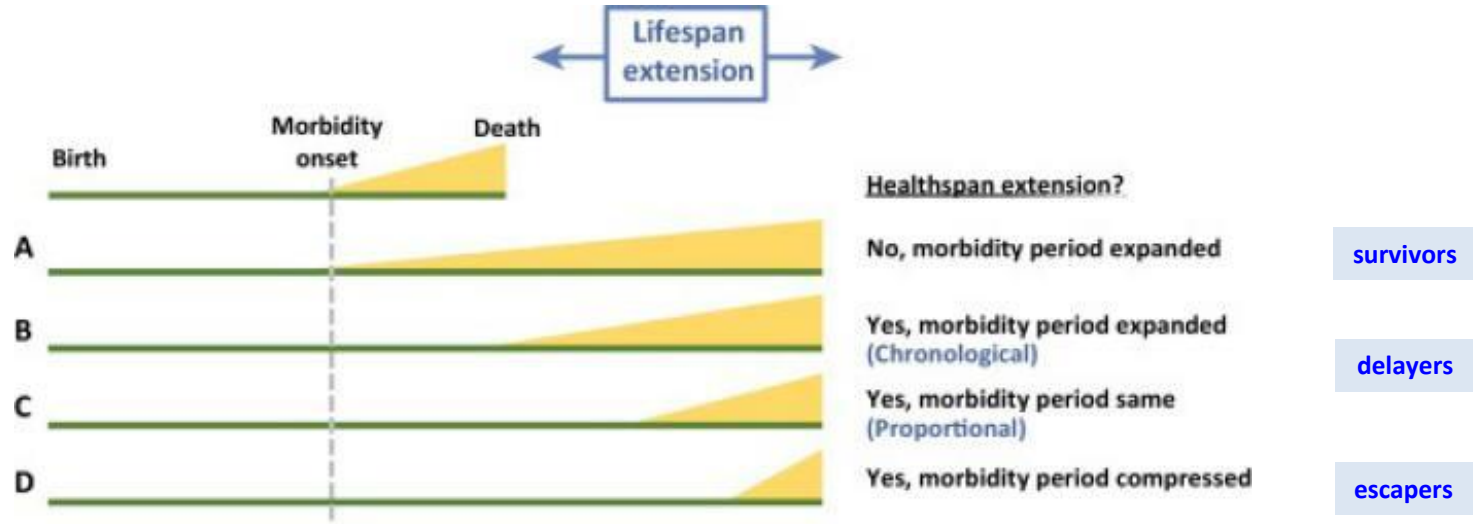


# Continuing Increase in Life Expectancy (Woman)



In Australia, a boy born in 2019–2021 can expect to live to the age of 81.3 years and a girl would be expected to live to 85.4 years

## Schematic illustrating effects of lifespan extension on healthspan extension



**$\text{lifespan} - \text{healthspan} = \text{healthspan gap}$**

Trends Cell Biol. 2016 Aug; 26(8): 565–568.

# Centenarians may help respond to two challenges

## 1. Extending life span

- What is the limit? 110; 120; 150?

## 2. Bridging the healthspan gap

- A key factor is **frailty**: a state of low reserve and increased vulnerability to poor resolution of homeostasis after a stressor
- Another challenge is dementia

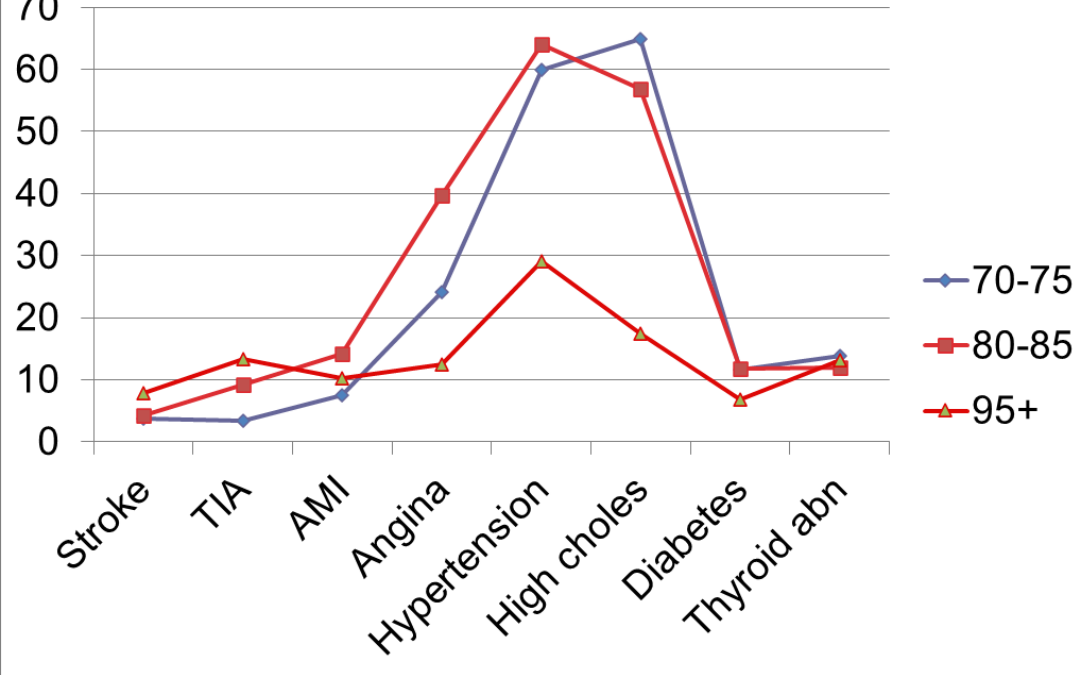






# Some findings

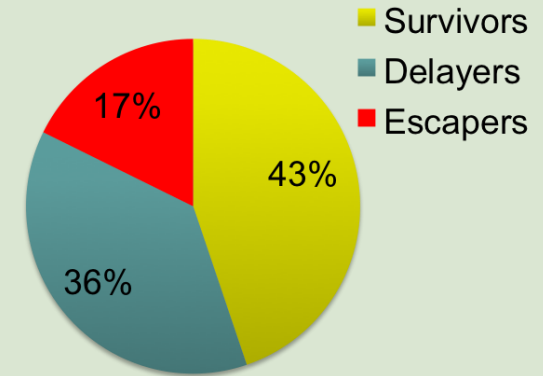
- Female to male ratio 4:1
- Men who reach this age are healthier (survivor effect?)
- Majority of centenarians maintain autonomy until a very late age: In SCS, about 50% in a private dwelling



MAS

SCS

## Morbidity rates



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Behavioural factors	Biomedical factors	Psychosocial risk factors
No smoking	Good mental health; not prone to dementia	Not depressed
Keeps physically active	Good genes: family Hx of longevity - siblings & family	Well supported by family and friends
Variable diet and nutrition; does not overeat results in normal or underweight	Good health to age 90 years. Delays or avoids chronic diseases assoc with ageing: heart disease, cancers, dementia	Acute life events, BUT able to cope with life's stresses by stress-shedding.
No alcohol use or safe levels of drinking	Women have higher rate of successful ageing. Ability to bear children into 40s: reprod system slowly ageing	Low in neuroticism High conscientiousness
Independent functioning	Low BP & cholesterol. Looks young for age.	

## Factors associated with living to 100

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# Satisfaction with Life



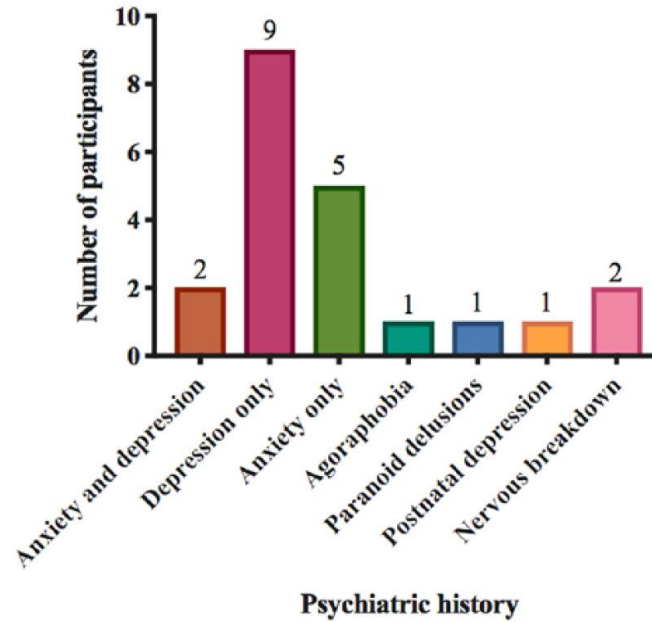
- Although 83.2% of participants were impaired on Activities of Daily Living (ADLs), 86.8% reported being satisfied with their general health.
- Those with fewer family and friends had higher psychological distress and less satisfaction with life.

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## Psychiatric history in non-demented Sydney Centenarian Study participants (N=207)

# Dementia

- 47% in centenarians and 35% in near-centenarians (95-99 yos)
- Risk factors: Old age, Low education, Untreated hypertension
- No association with APOE4 status (one participant with E4/E4 is dementia-free)

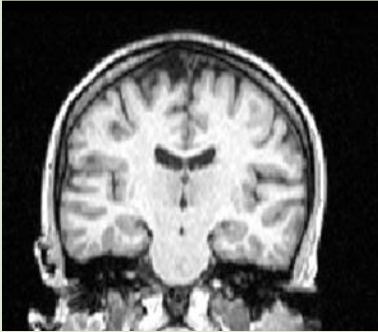
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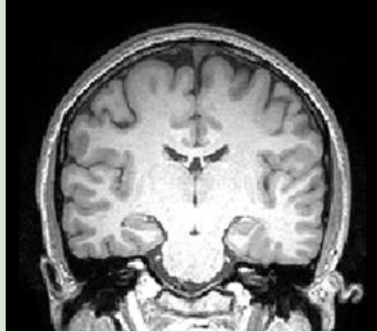
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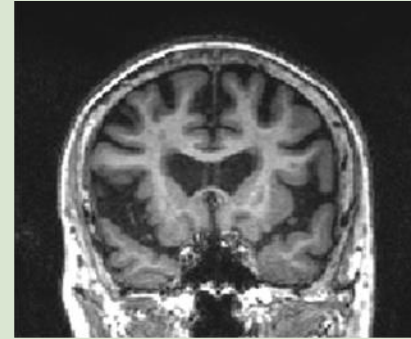
# Brain atrophy



A 20-year-old



A 40-year-old



A 100-year-old

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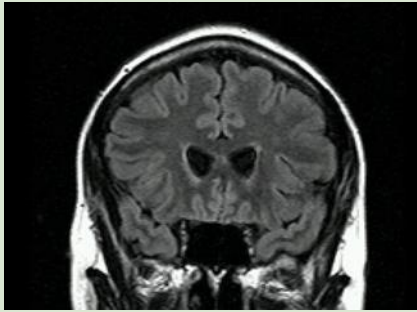


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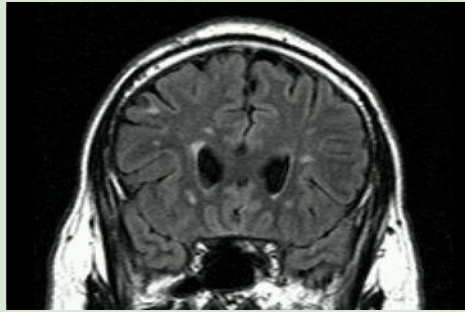




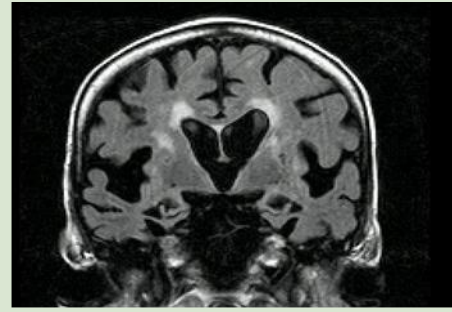
# White matter change



A 20-year-old



A 40-year-old



A 100-year-old

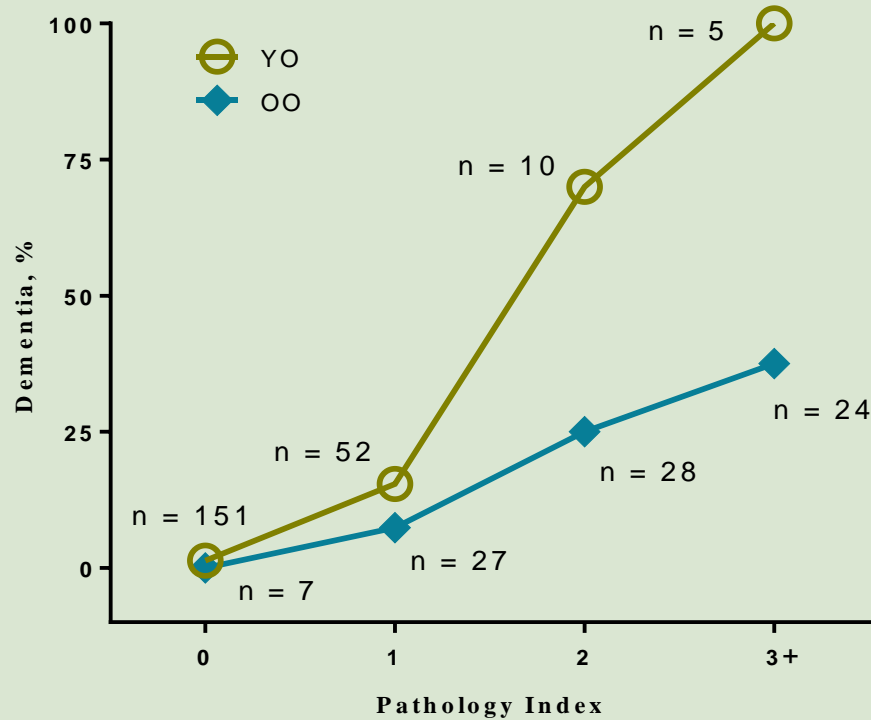
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# Rates of dementia by age group and pathology index



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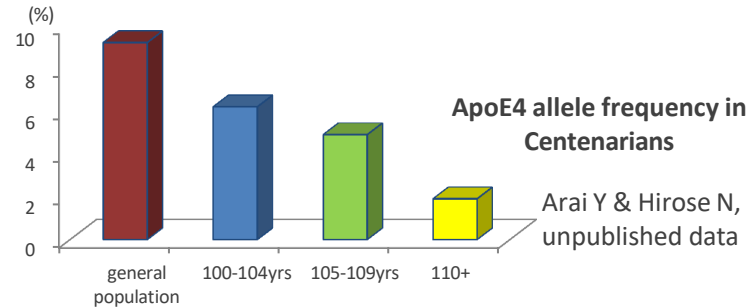
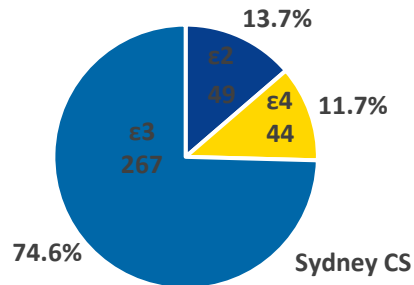


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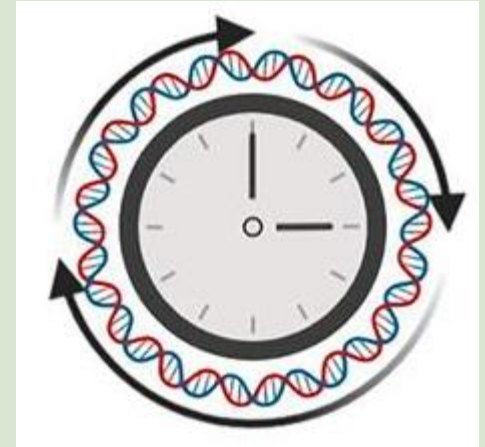
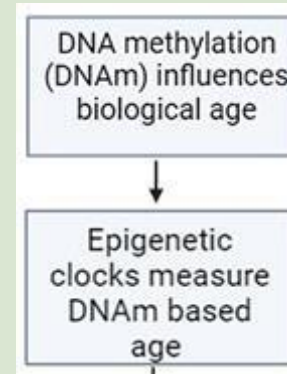
# Genetics of Exceptional Longevity

Gene names	Strategy	Population
<i>APOE</i>	Candidate gene	Australian, French and Finnish centenarians
<i>MTP</i>	Linkage analysis	long-lived ( $\geq 93$ y/o) siblings in US
<i>CETP</i>	Candidate gene	Ashkenazi Jewish centenarians
<i>FOXO3a</i>	Candidate gene	long-lived Americans of Japanese ancestry
<i>ADARB1</i>	GWAS	US-based centenarians, replicated in Italian,
<i>ADARB2</i>		Ashkenazi Jewish, and Japanese



# Epigenetics

- The biological age of centenarians is younger than their chronological age (**epigenetic clock**)



# CONCLUSIONS

- 1. Centenarians, and in particular supercentenarians, are indeed models of successful ageing.**
- 2. They can inform us about mechanisms of ageing, and possible strategies to achieve successful ageing.**
- 3. We can follow the lessons from their lifestyle to increase lifespan and reduce the healthspan gap.**

# SYDNEY CENTENARIAN STUDY



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Healthy Brains Positive Ageing

# Thank you



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