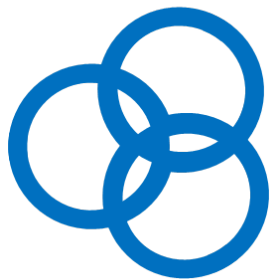




Australia's
Global
University

Living Well to 100

Henry Brodaty



DCRC

Dementia Collaborative
Research Centres



TWO CERTAINTIES OF LIFE



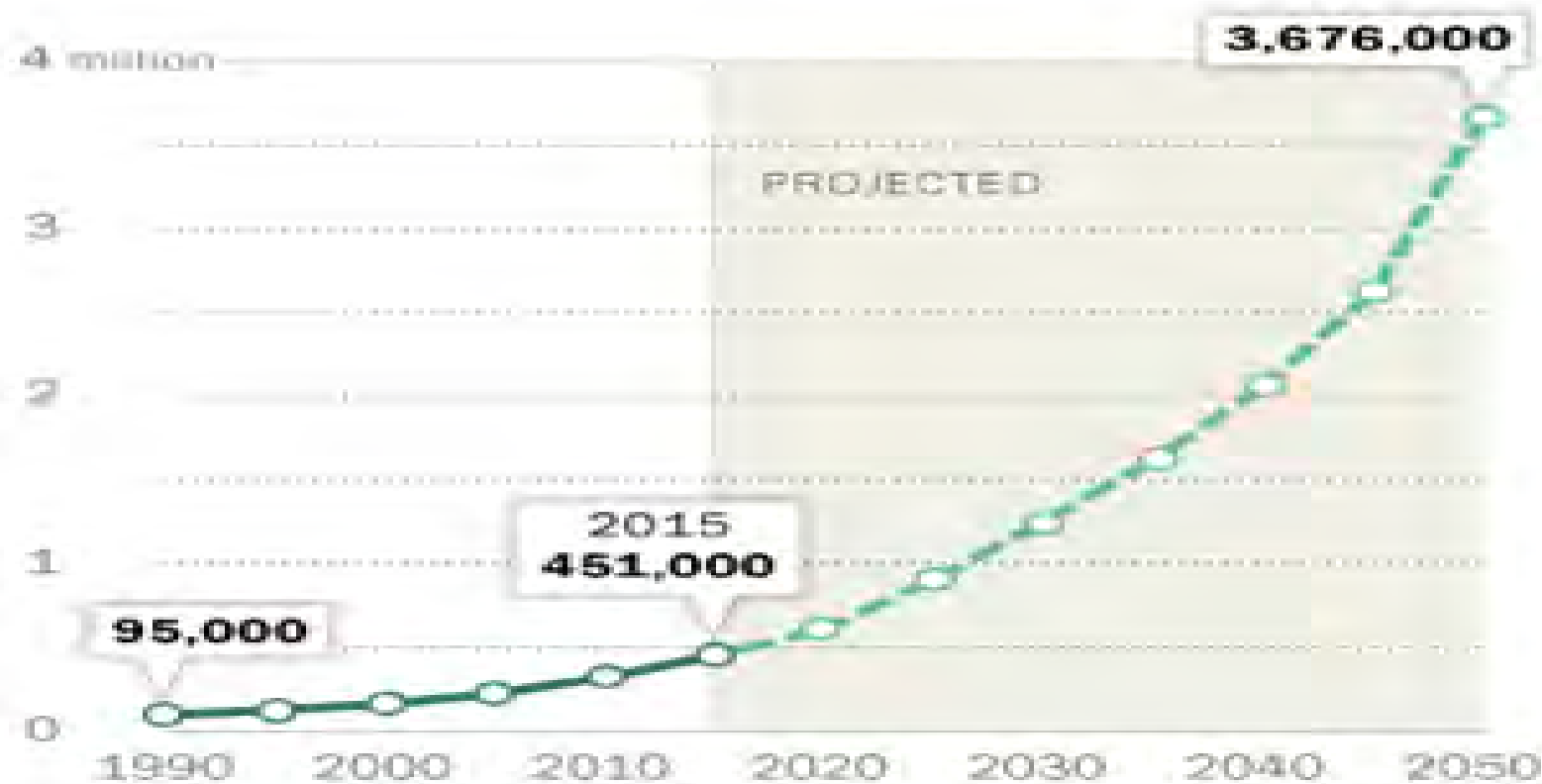
A THIRD CERTAINTY





The world's centenarian population projected to grow rapidly

Number of persons ages 100 and older



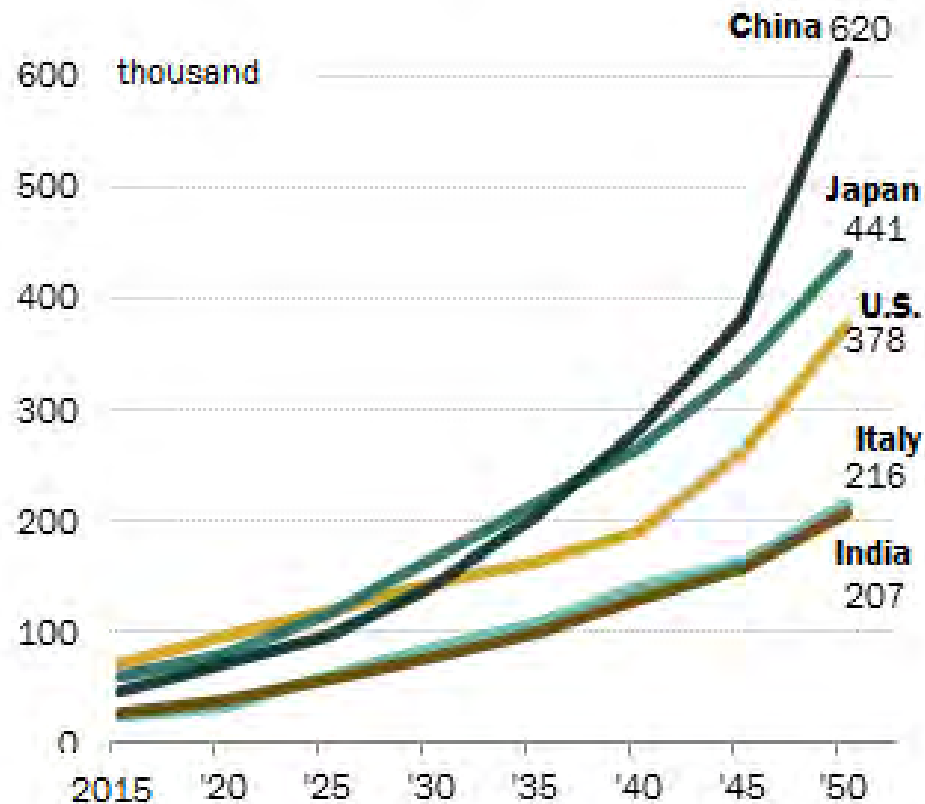
Source: United Nations, Department of Economic and Social Affairs, "World Population Prospects: 2015 Revision"

PEW RESEARCH CENTER

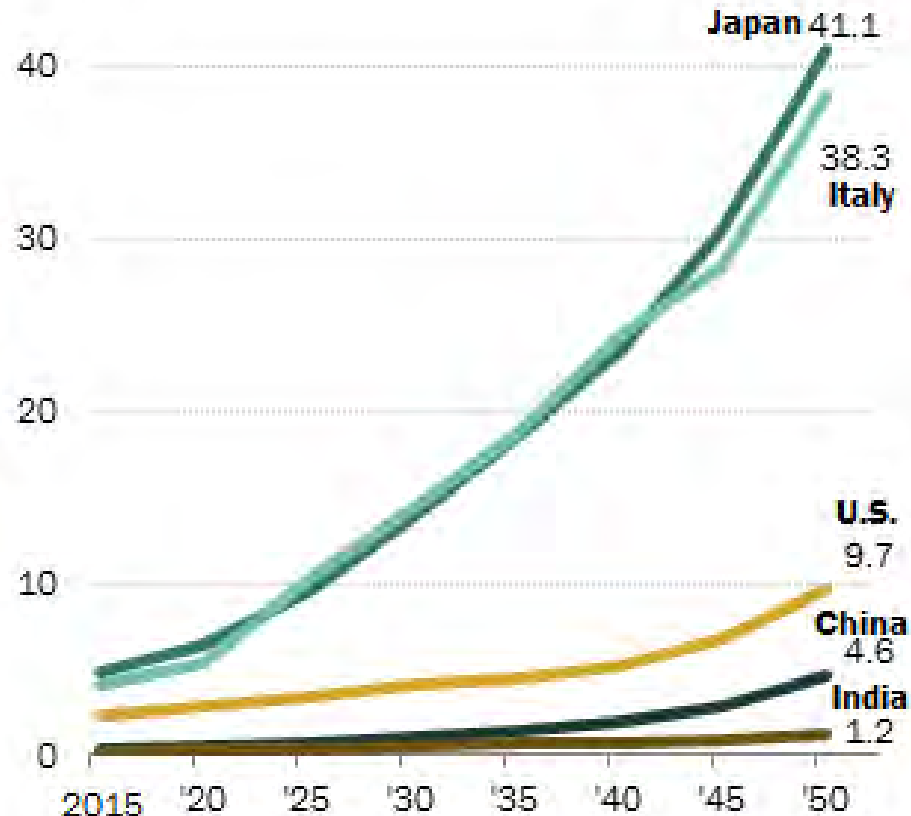
Centenarians around the world

Number of centenarians in China and Japan expected to surpass number in U.S.

Number of persons ages 100 and older



Number of persons ages 100 and older per 10,000



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

PEW RESEARCH CENTER

Centenarians in Australia and NZ

- Over the past ~20yrs Australian centenarians $\uparrow$ 254%¹
- Australia (2016): = 3500 ²
- NZ³:
 - (1996) 258
 - (2001) 399
 - (2006) 534
 - (2013) 558 ... <50 were $\geq$ 105yrs

¹www.abs.gov.au/ausstats/abs@.nsf/featurearticlesbyCatalogue/7A40A407211F35F4CA257A2200120EAA?OpenDocument;

²www.abs.gov.au/ausstats/abs@.nsf/mf/2024.0;

³<http://nzdotstat.stats.govt.nz/wbos/Index.aspx?DataSetCode=TABLEC ODE8011#>



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SMH 3/1/17

"I have a heart condition which restricts me to a very slow type of life," he said. "I used to go to libraries, museums, exhibitions in the city. Reading is my main occupation, besides cooking and cleaning. "I am still interested in what's happening around the world. I

120

People celebrated their 100th birthday in 1975

know that I am out of the way and I don't know - it might be the next morning I'm not here. But still I am interested in it."

People always tell him he is ex-

exceptional longevity of the residents - have been identified in Costa Rica, Sardinia, the Greek island of Ikaria and Okinawa in Japan. Those communities prioritise family and are socially engaged. They tend not to smoke, have diets high in vegetables and legumes and en-

600

People turned 100 in 2016

joy constant moderate physical activity.

Researchers at UNSW's Centre

anned the determinants of suc-

4870

Centenarians in 2016

still living independently in the community, CHeBA co-director Perminder Sachdev said.

"One important finding was that these individuals have often been very healthy until a very late age," he said. "If they have diseases such as hypertension, coronary artery

disease, diabetes, often these are late in developing, so somehow they've been able to push back [these diseases] - and some have been able to avoid it altogether."

41,100

Centenarians by 2050

ing] healthy old age is actually a lifelong enterprise. You're really looking at your risk factors, your diet, your weight, your exercise, cognitive activity."

Along with research by former La Trobe University lecturer John McCormack, who interviewed 130 centenarians, the study helps dispel assumptions that anyone living to such an old age will inevitably be dependent on aged care and public health services. "It's a negative stereotype that anyone at that age is decrepit, almost in a vegetative state, in a nursing home," Dr McCormack said.

He found a history of physical work and not being overweight were the most common characteristics among centenarians and

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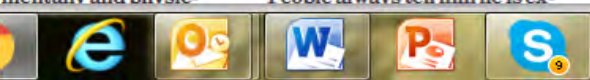
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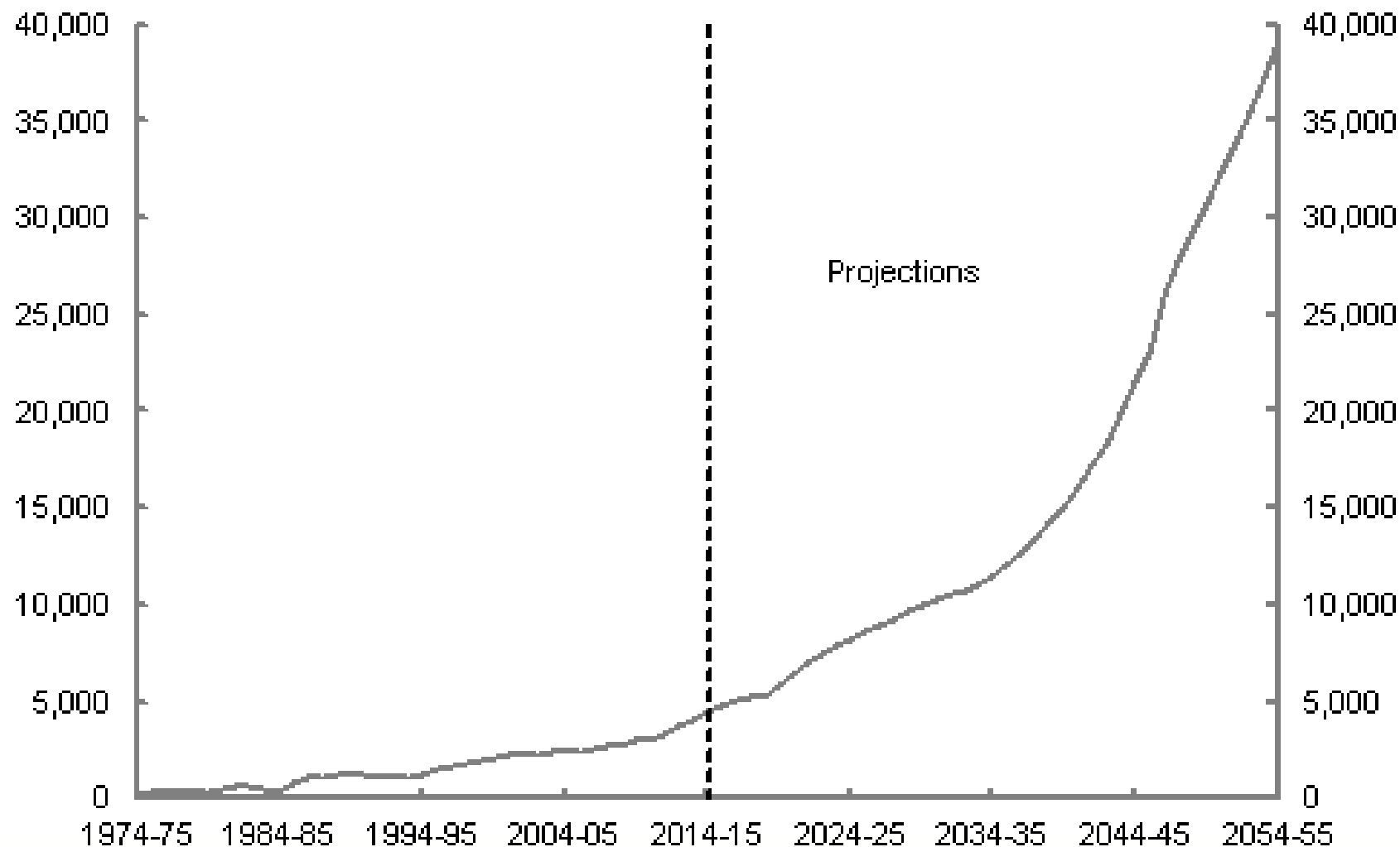
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Australian Centenarian Projections



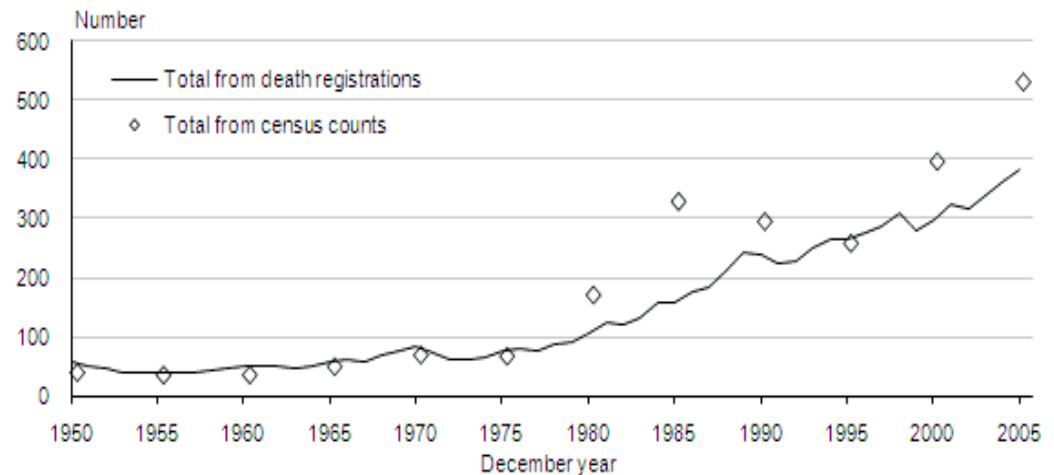
Source: ABS cat. no. 3105.0.65.001, 3101.0 and Treasury projections

Centenarians in New Zealand



Four Kapiti Coast centenarians

Estimated population aged 100+ years
1950–2006



Source: Statistics New Zealand

The number of centenarians is projected to climb from 300 in 1999 to 12,000 in 2051 and 18,000 by 2101.

Why are numbers increasing?

- **Global rise in centenarians driven by reductions in mortality below 100 years**
- **No improvement in mortality amongst centenarians themselves in past 30 years**
- **Annual risk of death plateaus to 50% at 103 years for men and 107 yrs for women**

Chances of Reaching 100

(from UK data)

- **Baby girl born today in a developed country = ~ 35%**
- **Baby boy born today in a developed country = ~ 28%**



Centenarian Hotspots

**Lomo Linda,
CALIFORNIA**

**Sardinia,
ITALY**

**Okinawa,
JAPAN**

**Nicoya,
COSTA RICA**

**Ikaria,
GREECE**

Blue Zone: Okinawa, Japan

- General female life expectancy = 87yrs
- Increase in centenarians:
 - 30 (1975) ↑ 1000 (2016)
- ~35% function independently
- Factors influencing longevity:
 - Diet?
 - Genetics?
 - Physical activity?



Okinawa: Reasons for Longevity

- **A lean diet with fewer calories:**
 - **Vegetables**
 - **Tofu**
 - **Miso soup**
 - **A little fish or meat**
- **Confucian-inspired adage:**
 - **"hara hachi bu" = until your stomach is 80% full**

Okinawa: Reasons for Longevity



Okinawan woman harvests seaweed – a staple

- Okinawans grow much of their own food
- Their gardens = cabinets of preventive medicine:
 - Herbs, spices, fruits, vegetables
 - Chinese radishes, garlic, scallions, cabbage, turmeric, tomatoes

Japanese Centenarians: Autonomy

Autonomy associated with:

- **↑ visual acuity**
- **Preserved masticatory ability**
- **Being male**
- **Exercise**
- **Spontaneous regular waking**
- **No drinking history**
- **No Hx severe falls $\geq$ 95yrs**
- **↑ frequency of protein intake**

Japanese Centenarians: Autonomy

**Autonomy not
associated with:**

- **Seaweed intake**
- **Smoking status**



Blue Zone: Sardinia, Italy



- Villagrande Strisaili holds world record for male longevity¹
- ~ 47 male & 44 female centenarians in 2011²
- Factors influencing longevity:²
 - Genetics?
 - Family support?
 - Community support?

¹Piras et al. (2015); ²Poulain et al. (2011)

Blue Zone: Ikaria, Greece

GREECE (HELLAS)



IKARIA ISLAND



Blue Zone: Ikaria, Greece

- Life span = ~ 8yrs longer than other developed nations¹
- 1% live > 90 years²
- 20% less cancer, 50% less heart disease¹
- Low rates of dementia^{1,2}
- Daily physical activities, healthy eating habits, avoidance of smoking, frequent socialising, mid-day naps and low rates of depression³

Power 9 Principles of the Blue Zones



Buettner, Dan (2012). *The Blue Zones, Second Edition: 9 Lessons for Living Longer From the People Who've Lived the Longest*. National Geographic.

Power 9 Principles of the Blue Zones

1. Moderate, regular physical activity
2. Life purpose
3. Stress reduction
4. Moderate calories intake
5. Plant-based diet
6. Moderate alcohol, esp wine
7. Engage in family life
8. Engage spiritually/ religion
9. Engage in social life

1. Move Naturally

Right Outlook

2. Know your purpose
3. Down shift

Eat Wisely

4. 80% rule
5. Plant slant
6. Wine@5

Belong

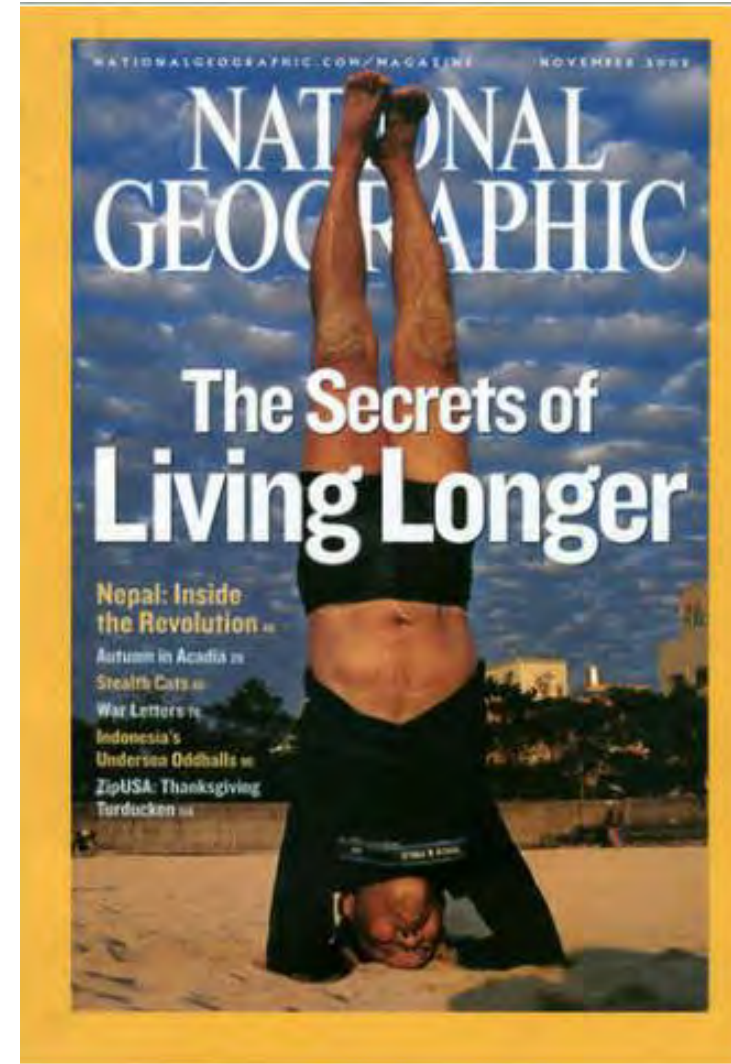
7. Family first
8. Belong
9. Right tribe

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Lifestyle

Seven protective factors

- Not being a smoker or stopping young
- Adaptive coping style
- Absence of alcohol abuse
- Healthy weight
- Stable marriage
- Some exercise
- Years of education

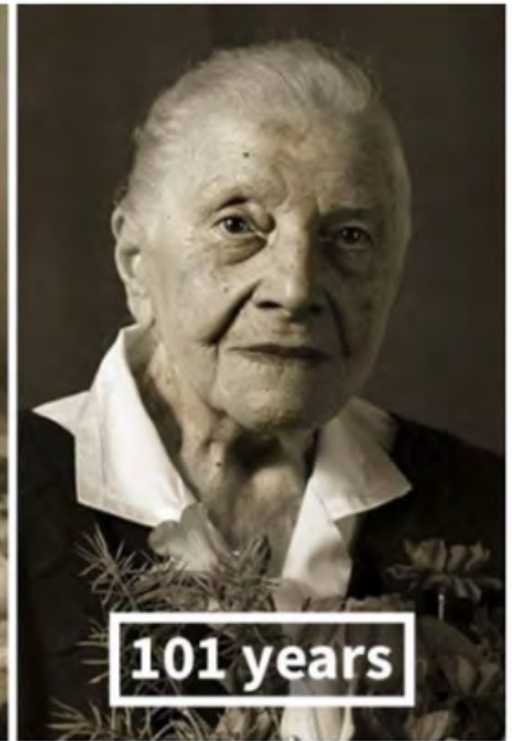


Vaillant GE, Mukamal K. *Am J Psychiatry* 2001;158: 839-847

Would you want to live to 100?

What does your answer depend on?

- Cognition?
- Physical health?
- Mental health?
- Family?
- Friends?
- Quality of life?
- Finances?



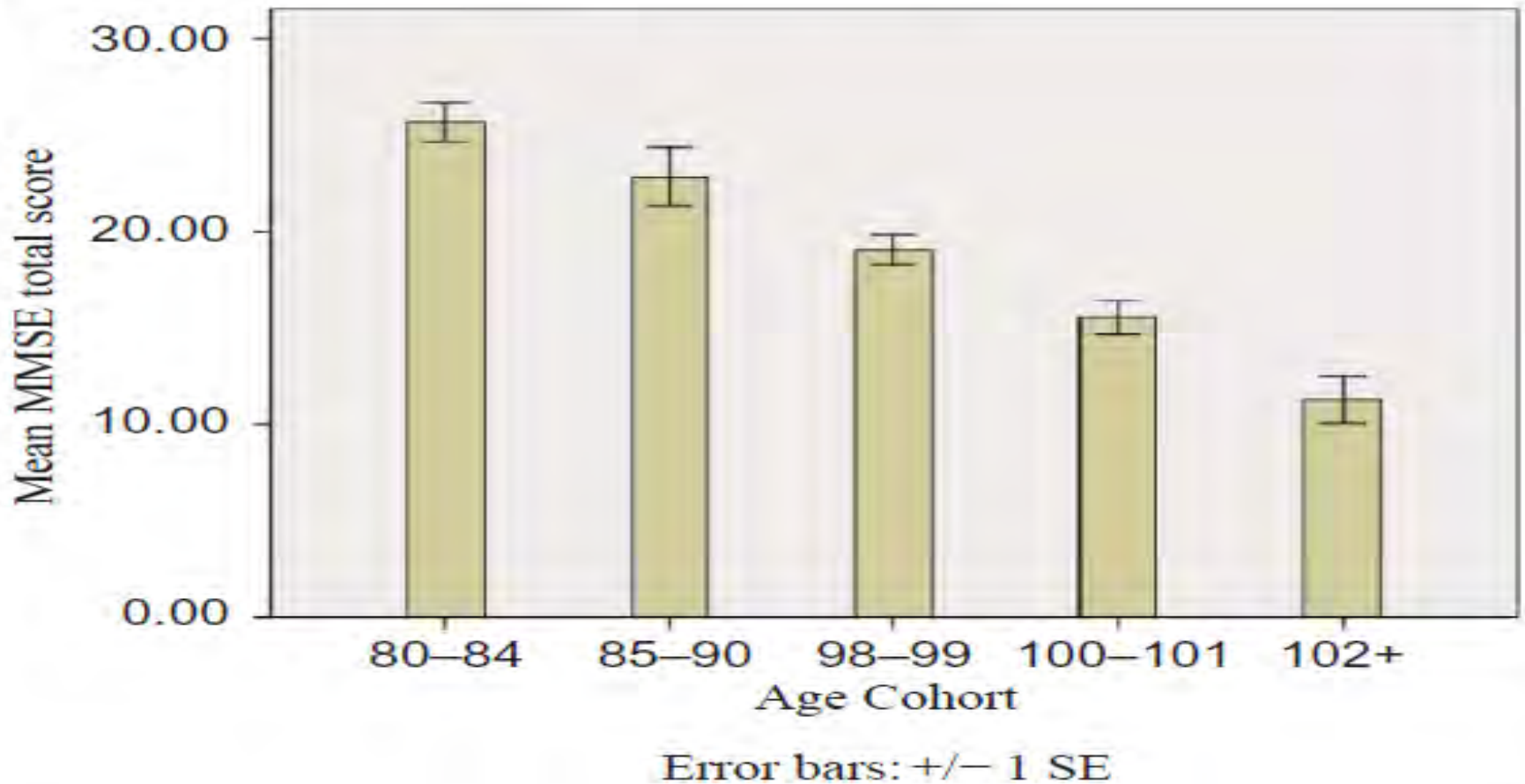
Cognition in Centenarians

- **Cognition intact in many centenarians^{1,2}**
- **↑ variability in performance³**
- **Common impairments:**
 - **Basic attention (DS forwards)²**
 - **Working memory (DS backwards)²**
 - **Processing speed¹**
 - **Verbal skills (e.g. verbal reasoning)²**
 - **Immediate & delayed verbal recall¹**

¹Piras et al. (2015); ²Hagberg et al. (2001); ³Miller et al. (2010)

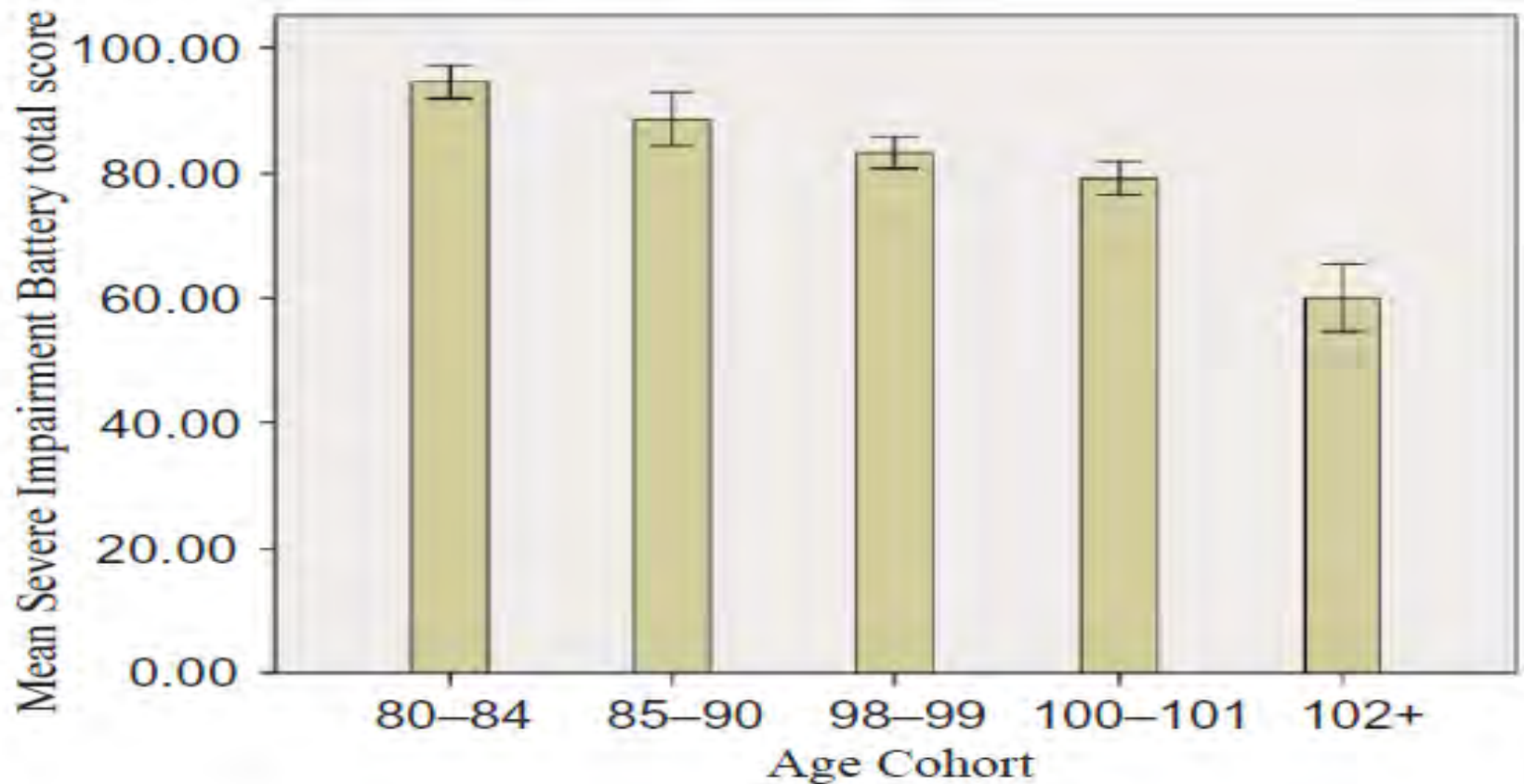
Centenarians: MMSE

FIGURE 1. MMSE scores by age cohorts.



Centenarians: Severe Impairment Battery

FIGURE 2. SIB scores by age cohorts.



Dementia in Centenarians



- ~ half of centenarians are dementia free^{1,2,3}
- Prevalence of dementia:
~ 40-60%^{1,2,3,4}
- Incidence of dementia:
~ 41% per yr ⁴
- Incidence similar for men and women⁴

¹Richmond et al. (2011); ²Andersen-Ranberg et al. (2001);

³Sachdev et al. (2013);

⁴Corrada et al. (2010); ⁴CHeBA data

Cognitive Impairment & dementia across older ages

- **Prevalence of cognitive impairment ↑ with age**
 - **39.7% (95-99 age group)**
 - **69.5% (100-104 age group)**
 - **80% (105+ group)**
- **Prevalence of dementia increases**
 - **37.9% (95-99 age group)**
 - **59.9% (100-104 age group)**
 - **73.5% (105+ group)**

Centenarian studies globally

	Dementia	Normal Cognition
Sweden	27	22.5
North Italy	62	20.6
Tokyo	62	24.3
Heidelberg	52	25
Danmark	51	25
New England	76	16.2
Korea	62	6.7
Finland	56	44
Sydney	54	< 30

Is incidence of dementia/ cognitive impairment declining?

- **Review 14 studies ... trends in dementia prevalence (9 studies) and incidence (5)**
- **Sweden, Spain, UK, Netherlands, France, USA, Japan and Nigeria.**
- **All (except Japan) → stable or declining prevalence and incidence of dementia**
- **Some effects in males; others females only**
- **No single risk or protective factor fully explains observed trends, but**

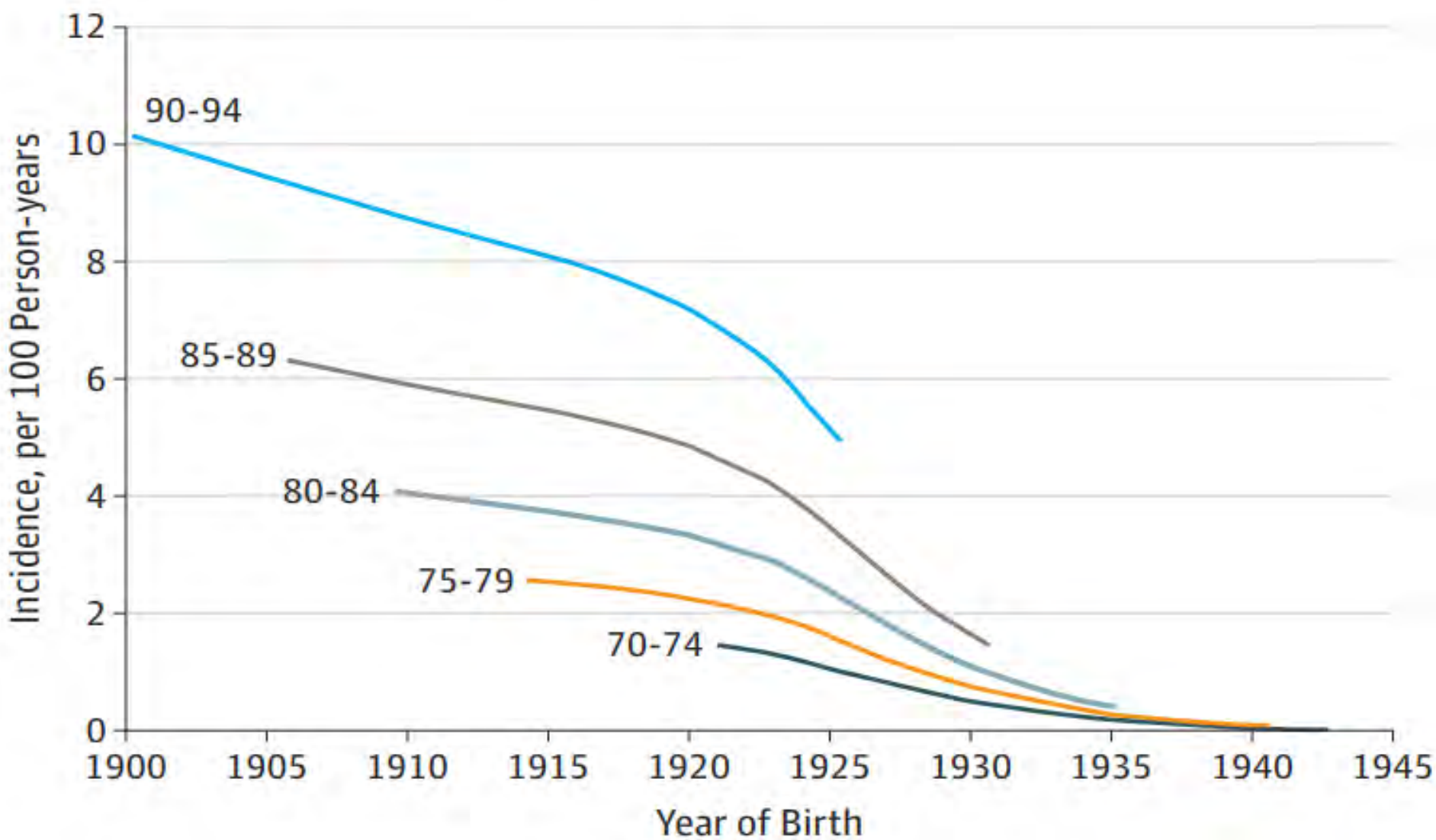
Wu YT et al Nature Neurology Reviews 2017

Is incidence of dementia/ cognitive impairment declining?

-major societal changes and improvements in
 - living conditions, early childhood
 - education
 - healthcare , cardiovascular
- might have favourably influenced physical, mental and cognitive health throughout life, and
- be responsible for ↓ risk of dementia in later life

Wu YT et al Nature Neurology Reviews 2017

Figure 1. Crude Dementia Incidence in the Einstein Aging Study Cohort as a Function of Date of Birth and Age



Sensory Functioning in Centenarians

- Significant visual impairment ~31%¹
- Significant hearing impairment ~14%¹
- No problems with vision ~ 37%²
- No problems with hearing ~ 27%²



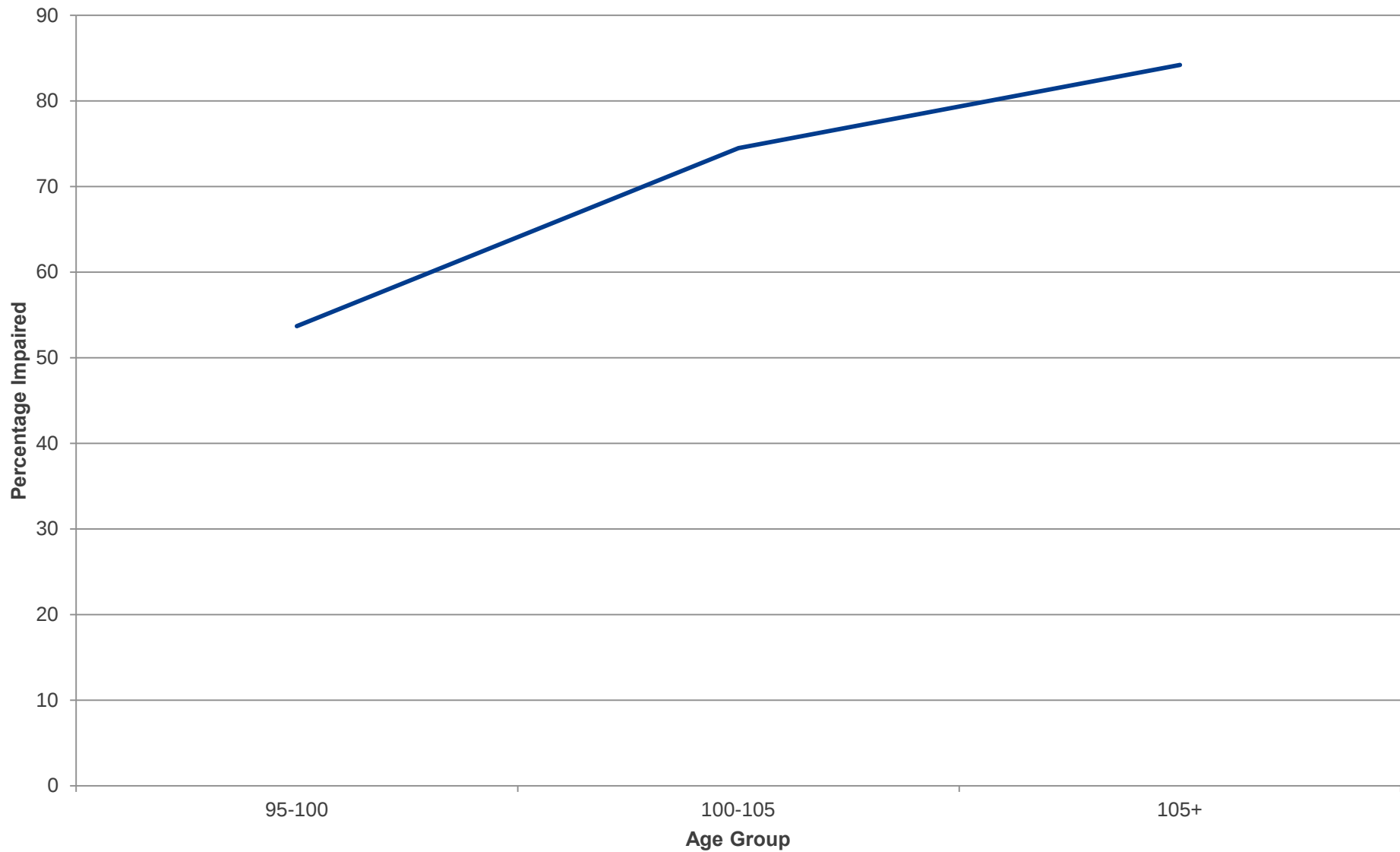
¹ Engberg et al. (2008); ²Gondo et al. (2006)

Centenarians: General Functioning

- ~46% men & 25% women don't take any prescription medications¹
- +ve health self-rating ~ 54%²
- No major disease/disability ~29%²
- Active social companionship ~73%²
- Active community engagement ~ 20%²
- ADLs and IADLs often impaired³

¹Hazra et al. (2016); ²Araújo et al. (2016); ³Sachdev et al. (2013)

(a) Functional Impairment by Age Group



Australian Living Circumstances: Centenarians and Near Centenarians

- Private dwelling in community ~56%
- Retirement village ~3%
- Low-level care ~19%
- Nursing home ~23%



Sachdev et al. (2013), International Psychogeriatrics

Sydney Centenarian Study

	N	%
Currently have someone to confide in	156	48.7
Volunteers 'several times a year'	12	6.2
Volunteers 'several times a month'	13	6.7

Centenarians: Home Support

- RDNS institute analysed health records of 123 centenarians & ≥ 1000 95-99yrs
- Near centenarians required ~72 home visits over two years
- Centenarians required only ~58 home visits over two years
- Why? Life experience? Genetics? Lifestyle? Nutrition?

Depression & Life Satisfaction: Centenarians and Near Centenarians

- 119 individuals aged 95-107 in NY
- Average of 4.85 ± 2.32 illnesses...however 67% reported good to excellent health
- 17 % reported no difficulty with daily activities
- ~ 80% = no depression (GDS<8)
- ~ 66% = moderate-high Satisfaction with Life (SWL)

Predictors of Mental Health: Centenarians and Near Centenarians

- $\uparrow$ Subjective health, N° living children & ADLs = $\uparrow$ SWL¹
- $\uparrow$ Subjective health, IADLs & support from relatives = $\downarrow$ depression Sx¹
- Living in NH, > depression Sx²



¹Jopp et al. (2016); ²Margrett et al. (2010)

Centenarians & Anxiety

- ~ 45% = clinically significant anxiety (GAI-SF $\geq$ 3)
- $\uparrow$ anxiety Sx $\propto$
 - $\downarrow$ health perception
 - $\uparrow$ medical conditions
 - $\uparrow$ financial concerns
 - $\uparrow$ loneliness

Mental Health of Australian Centenarians

- **Convenience sample of 118 centenarians (RACFs and community)**
- **Centenarians had regular contact with friends (59%), neighbours (62%), family (72%)**
- **54% were religious**
- **Mean MMSE = 21.5**
- **Anxiety = 10% (HADS)**
- **Depression = 14% (HADS)**

Personality Traits of Centenarians

- Study of 165 centenarians in Italy
- Personality traits assessed
- Extroverted = 65.4%
- Open-minded = 50%
- Emotional stability = 34.5%
- Centenarians with ↑extroversion described themselves as “very energetic, dynamic, active and loquacious”

Successful Ageing in Centenarians

- Of 602 Italian centenarians, 20% were free of invalidating chronic diseases, were autonomous and maintained good physical and cognitive capacities
- However, they had not maintained any social or productive activities.

Motta M et al Successful aging in centenarians: myths and reality
Archives of Gerontology and Geriatrics 40 (2005) 241–251



UNSW
AUSTRALIA



Do elixirs of youth exist?



Immortal Hydra?

**Non-senescence
may be optimal
because lifetime
reproduction may be
enhanced more by
extending adult life
spans than by
increasing daily
fertility**



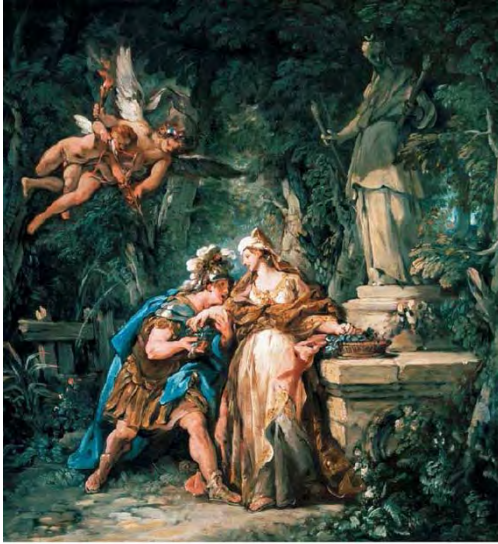
**Schaible R,PNAS, 2015:112 (51):15701–15706
doi: 10.1073/pnas.1521002112**

Patriarchs

Enoch	365 yrs	Seth	912 yrs
Lamech	777 yrs	Adam	930 yrs
Mahalalel	895 yrs	Noah	950 yrs
Enosh	905 yrs	Jared	962 yrs
Kenan	910 yrs	Methuselah	969 yrs

- 10 oldest people on record (according to modern standards) have an age range from 115 to 122 years

Quests for eternal life



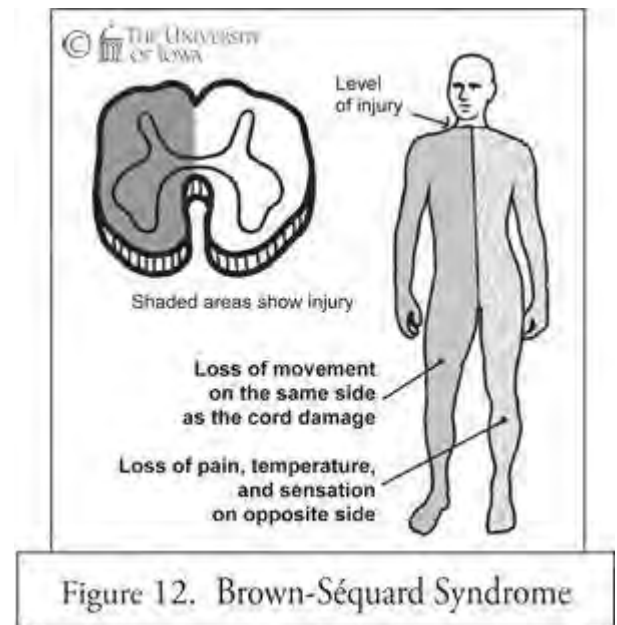
Permission: Corbis, National Gallery, London



- Ancient Greek myth
- Sorceress Medea injected King Aeson with a mixture of ram's blood, snake's skin, roots, herbs & other ingredients which gave him energy and youthful vitality
- Pope Innocent VIII (1432-1492)
- Requested injection of blood of young men
- He died almost immediately

Quest for eternal life

- 19th century Dr. Charles Edouard Brown-Sequard claimed old men could be made young by the injections of mashed up dog testicles.



Quest for eternal life

- 20th century John Romulus Brinkley advocated transplanting goat testicles into men



Goat testicles at
Beijing market

A “cure” for ageing?



- Anti-ageing medicine, antioxidants, hormones - No evidence that these decrease rate of ageing^{1,2}
- Lifestyle modification
- Exercise, balanced diet contribute to maintaining health, may delay age-related diseases. No evidence of modifying the ageing process¹

¹Olshansky SJ, et al. (2002). Sci Am, 286, 78–81

²Bjelakovic, G., et al. (2007). JAMA, 297(8), 842-857.

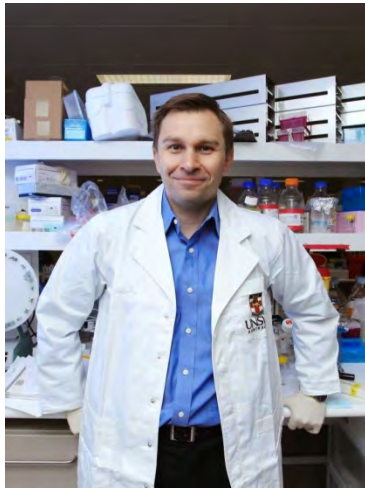
Search for eternal youth

- Sirtuins – ? mediate longer life of lab rats & mice on v. low-calorie diet
- Resveratrol – reported activate sirtuin
- 2008: GlaxoSmithKline paid \$720 m to develop drugs to mimic resveratrol
- 2011: study published that questions role of sirtuins in promoting longevity



NY Times 21/Sep/2011, '*Longevity gene debate opens trans-Atlantic rift*'.
Burnett et al. Nature 2011;477(7365):482-485.

Current searches for youth elixirs



David Sinclair

- Calorie restriction
- Sirtuins – “longevity genes”
- Resveratrol
- NAD (nicotinamide adenine dinucleotide)
- NMN (nicotinamide mononucleotide) → mice leaner, >energy, run further
- Human trials just started*

*Harvard Magazine, Sept 2017

Eternal life?

- *“What do the ancient purveyors of physical immortality all have in common?”*
- *They are all dead.”*

S. Jay Olshansky, (3/12/2004)



Conclusions

- Number of centenarians ↑
- Variable decline cognitⁿ & function
- Rates of dementia ? $\approx$ 50% ($\propto$ defⁿ)
- Moderate anxiety; low depression
- High Satisfaction with Life
- Search for elixir of youth continues

Thank you

www.cheba.unsw.edu.au

www.dementiaresearch.org.au

Thanks to Perminder Sachdev, Louisa Gibson
and Sydney Centenarian Study team



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