What is successful ageing and how do we achieve it?

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WESTERN AUSTRALIAN CENTRE FOR HEALTH AGEING

Summary

- What is “healthy ageing” or “successful ageing”
- Data from some of our own studies – BMI, alcohol, Physical activity
- Data from MCCS focusing on factors for successful ageing
- C.O.I. Current BMI 25.6 Drink 20-30g/day

Ageing Well

- In recent times, movement to characterize a section of the ageing population not so much in terms of negative aspects, typically disease and disability, but in more positive terms, such as ‘healthy’ or ‘successful’.
- There is no consensus over the definition of these terms
- In Rowe and Kahn’s landmark article (Human aging: Usual and successful. Science. 1987;237:143–149), a distinction was made between ‘usual’ and ‘successful’ ageing, some essential features of which may be the absence of chronic disease and disability, high cognitive and physical functioning, and active engagement with life.
- Clearly you have to be alive to age well.

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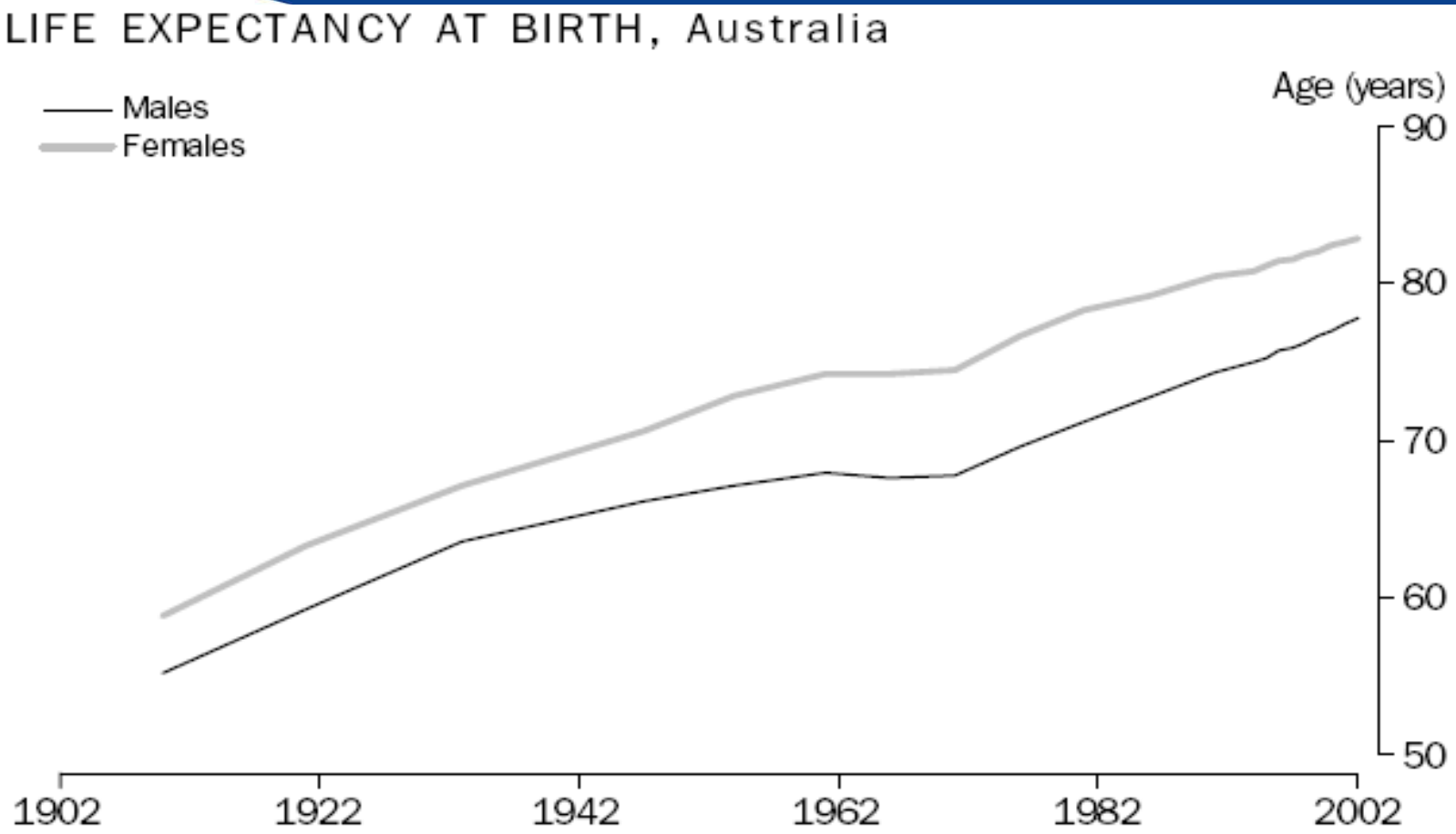


Between 1980–1982 and 2001–2003, life expectancy has improved each year by around 0.30 years for males and 0.25 years for females. This trend has been observed since the early 1970s. For both sexes the smallest increase during this period was recorded between 1995–1997 and 1996–1998 (with male life expectancy increasing by 0.17 years and female life expectancy by 0.15 years) while the largest growth was recorded between

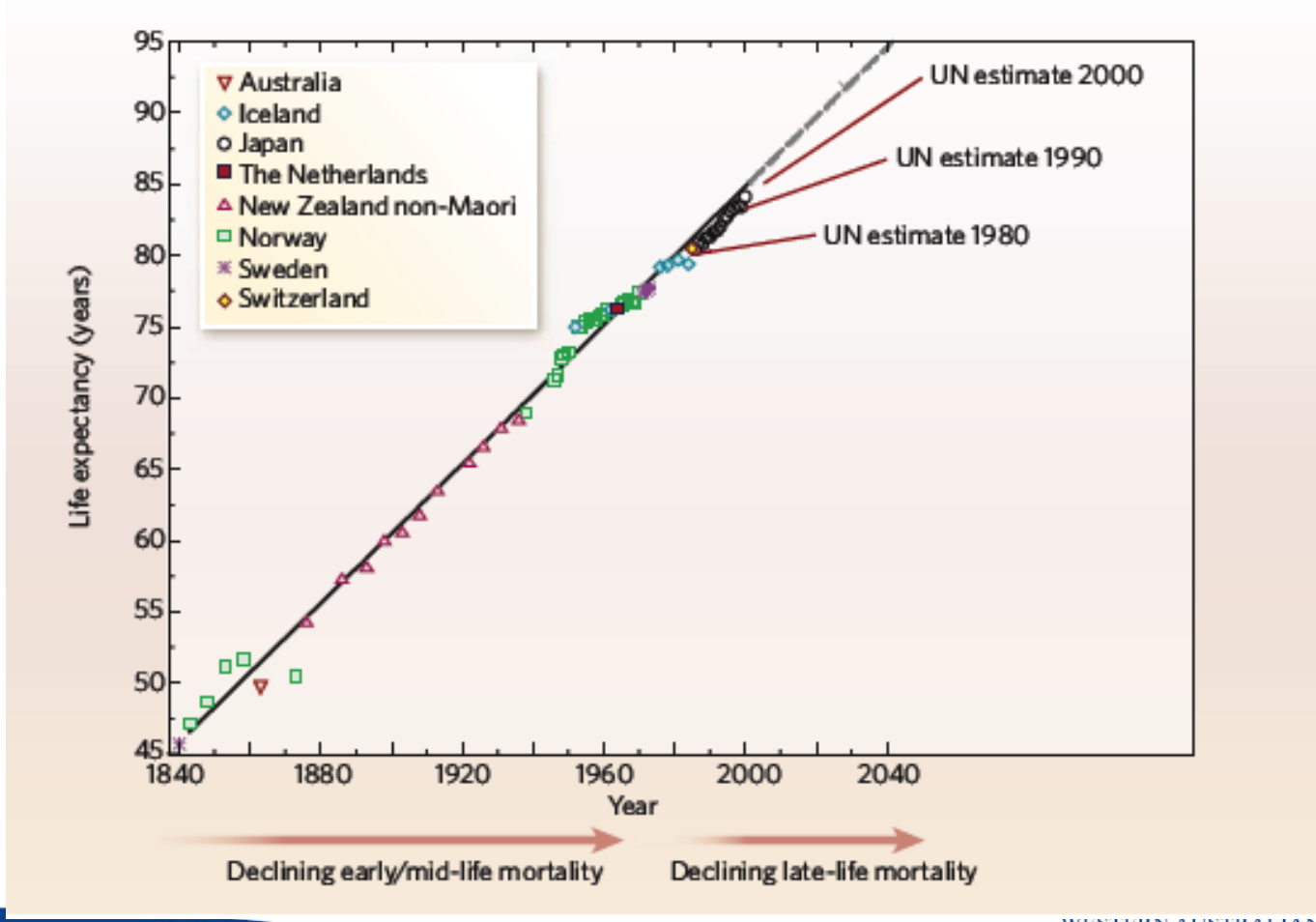
What would happen if there is a constant improvement in life expectancy?

	Men	Women
2005–06	(a) 79.16	(a) 83.89
2010–11	80.66	85.14
2015–16	82.16	86.39
2020–21	83.66	87.64
2025–26	85.16	88.89
2050–51	92.66	95.14

Cohort versus Period Life Expectancy
We live even longer

Year of Birth	2015	2025	2035	2045	2055
Cohort LE					
Men	91.5	92.6	93.6	94.4	95.1
Women	93.6	94.5	95.3	96.0	96.6
Period LE					
Men	80.7	82.9	84.9	86.6	88.1
Women	84.8	86.4	87.9	89.3	90.5

? Maximum Life Span



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A comparison of health expectancies over two decades in England: results of the Cognitive Function and Ageing Study I and II

*Carol Jagger, Fiona E Matthews, Pia Wohland, Tony Fouweather, Blossom C M Stephan, Louise Robinson, Antony Arthur, Carol Brayne, on behalf of the Medical Research Council Cognitive Function and Ageing Collaboration**

Summary

Background Whether rises in life expectancy are increases in good-quality years is of profound importance worldwide, with population ageing. We investigate how various health expectancies have changed in England between 1991 and 2011, with identical study design and methods in each decade.

Lancet 2016; 387: 779–86
Published Online
December 8, 2015
http://dx.doi.org/10.1016/

- Baseline data Cognitive Function and Ageing Studies (CFAS) in populations aged 65+ in three geographically defined centres in England (Cambridgeshire, Newcastle, and Nottingham). CFAS 1 1989-1994, CFAS II 2008-2011
- Prevalence estimates for three health measures: self-perceived health (excellent–good, fair, or poor); cognitive impairment (defined as moderate–severe (0-17), mild (18-25), or none (26+), on MMSE) and disability in activities of daily living (defined as none, mild, or moderate–severe).
- Health expectancies for the three regions were combined
- Adjustment for non-response bias

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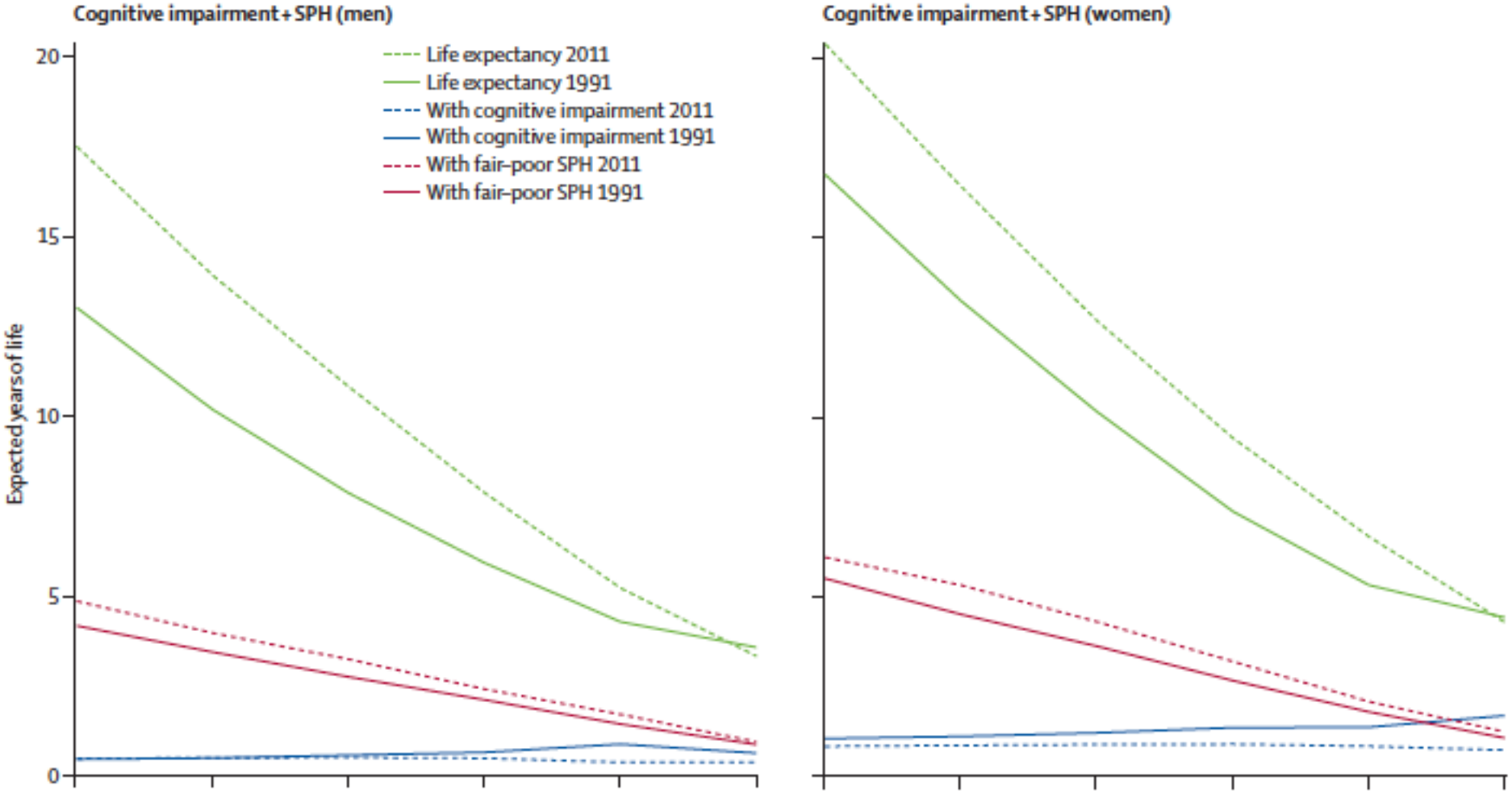

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- Extent of change in women a gain of Cognitive impairment free life expectancy of 4.4 years [4.3, 4.5] and a drop of 0.7 [0.2, 1.3] years with any CI. In men increase of 4.2 years but no change in years with CI
- Improved access to education, less deprivation, ?dec smoking Better vascular care calculations can only explain about half of the observed effect
- NB Framingham also found similar results, Satizabal et al (N Engl J Med 2016;374:523-32)

Ageing Well

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- In Rowe and Kahn’s landmark article (Human aging: Usual and successful. Science. 1987;237:143–149), a distinction was made between ‘usual’ and ‘successful’ ageing, some essential features of which may be the absence of chronic disease and disability, high cognitive and physical functioning, and active engagement with life.
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2 papers from Nurses Cohort Study

- Followed these nurses from middle age
- Surviving to age 70 years or older,
- Freedom from chronic diseases
- No major impairment of cognitive or physical function
- Good mental health

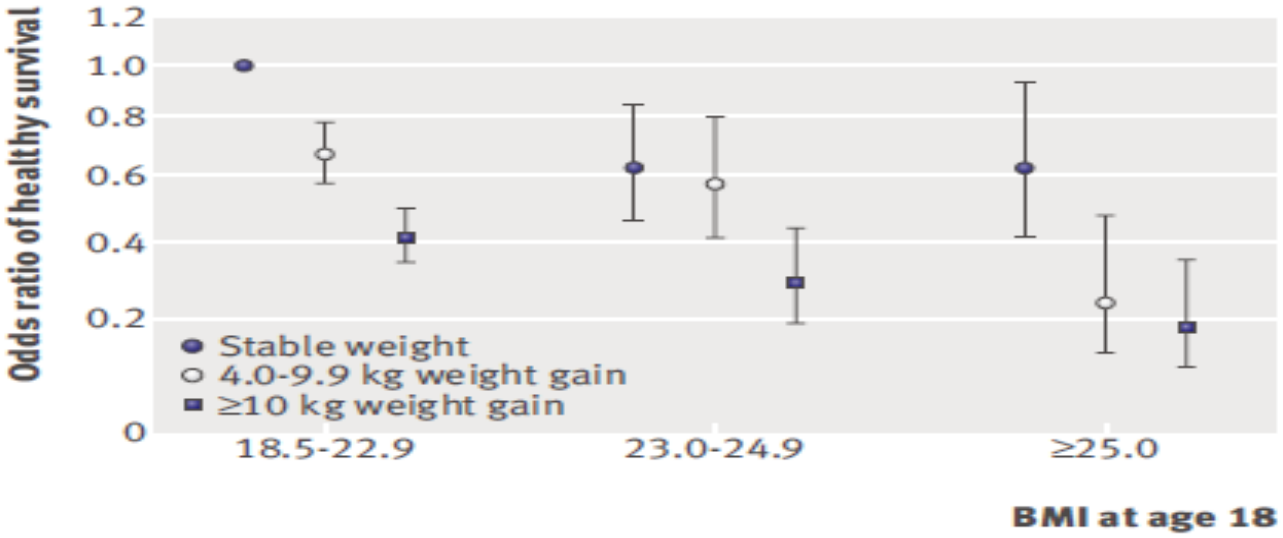
2 papers from Nurses Cohort Study

BMJ

RESEARCH

Adiposity and weight change in mid-life in relation to healthy survival after age 70 in women: prospective cohort study

Qi Sun, research associate,[1] Mary K Townsend, research fellow,[2] Olivia I Okereke, associate epidemiologist and associate psychiatrist,[3] Oscar H Franco, assistant clinical professor in public health,[4] Frank B Hu, professor of nutrition and epidemiology,[1,2,3] Francine Grodstein, associate professor of epidemiology[2,3]



Joint effect of BMI at age 18 and weight change on healthy survival in the Nurses' Health study. Adjusted odds with 95% confidence intervals (see table 3)

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2 recent papers from Nurses Cohort Study

Physical Activity at Midlife in Relation to Successful Survival in Women at Age 70 Years or Older

Qi Sun, MD, ScD; Mary K. Townsend, ScD; Olivia I. Okereke, MD; Oscar H. Franco, MD, ScD, PhD; Frank B. Hu, MD, PhD; Francine Grodstein, ScD

Arch Intern Med. 2010;170:194

Table 2. Odds of Successful Survival Among Women 70 Years or Older in the Nurses' Health Study[22] by Physical Activity Level at Midlife

Characteristic	Total Physical Activity Quintile[a]					*P* Value for Trend[b]
	1 (Lowest)	2	3	4	5 (Highest)	
Activity level, METs (h/wk), median (range)	0.9 (0.2-2.3)	3.6 (2.4-5.1)	7.9 (5.2-11.4)	16.2 (11.5-22.8)	37.1 (≥22.9)	NA
Usual/successful survivors, No./No.	2603/213	2349/195	2466/307	2382/303	2279/438	NA
Age-adjusted model	1 [Reference]	1.01 (0.83-1.24)	1.53 (1.28-1.84)	1.57 (1.31-1.89)	2.39 (2.01-2.85)	<.001
Multivariate model 1[c]	1 [Reference]	0.98 (0.80-1.20)	1.37 (1.13-1.65)	1.34 (1.11-1.61)	1.99 (1.66-2.38)	<.001
Multivariate model 2[d]	1 [Reference]	0.96 (0.78-1.18)	1.30 (1.08-1.57)	1.25 (1.03-1.51)	1.76 (1.47-2.12)	<.001

The Men, Women & Ageing Study

- Two population-based longitudinal studies that began in 1996: the Health in Men Study (HIMS) and the older cohort from the Australian Longitudinal Study of Women's Health (ALSWH).
- Eligible women were aged 70-75 years, and were resident in metropolitan and rural areas throughout Australia. The response fraction was 37%.
- HIMS is a cohort study based on he follow-up of over 12000 men who participated in a study of abdominal aortic aneurysm screening.

Definitions

The standard recommended by the World Health Organization for adults aged 18 years and over is based on the association between BMI and illness and mortality (WHO 2000):

- underweight: BMI < 18.5
- healthy weight: BMI ≥ 18.5 and BMI < 25
- overweight but not obese: BMI ≥ 25 and BMI < 30
- obese BMI ≥ 30.

Who should we tell to lose weight and why?

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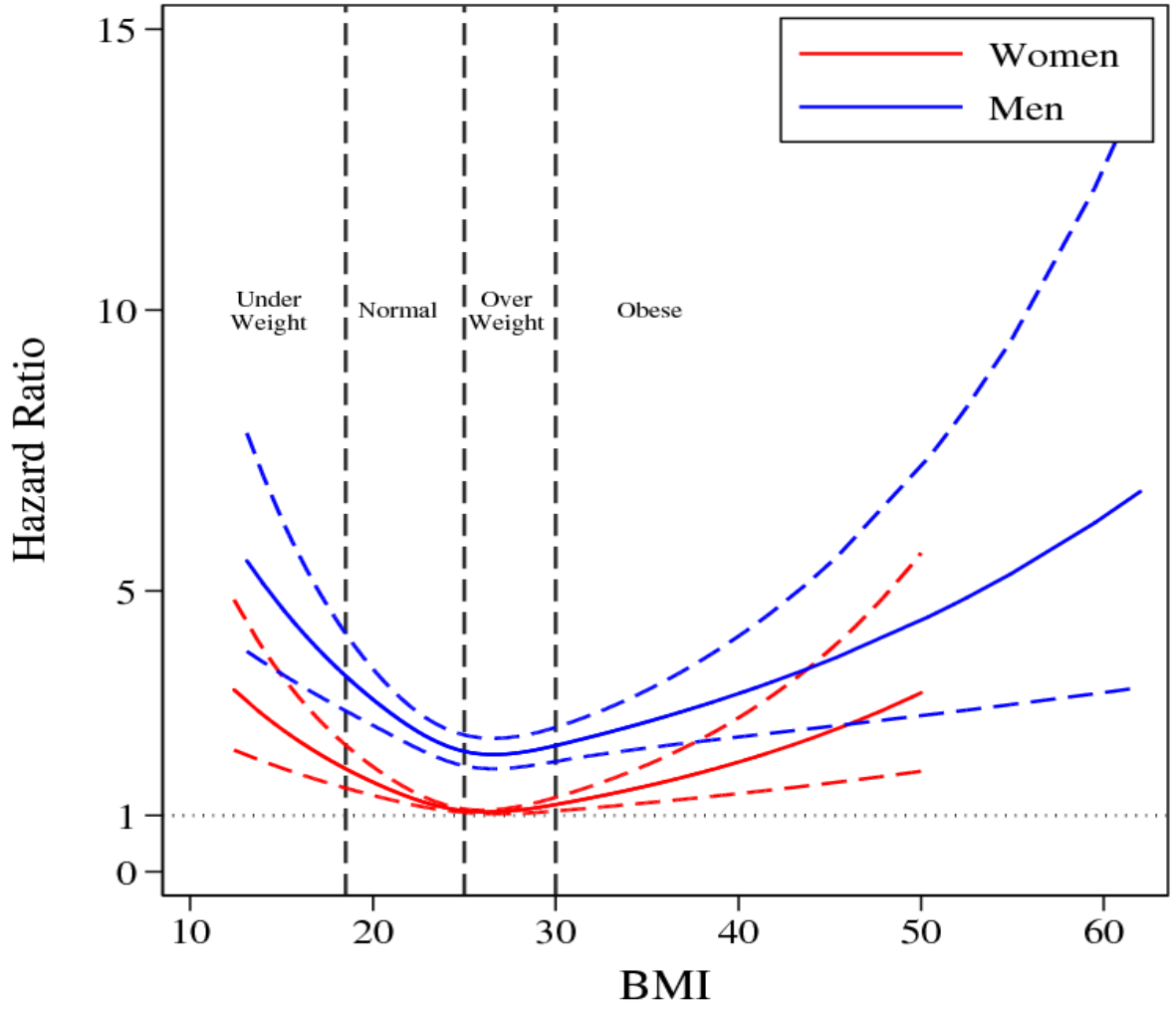
Methods

- Self-reported measures of height and weight and these were used to calculate the BMI.
- In addition,
  - demographic (e.g. age, education, marital status),
  - lifestyle (e.g. smoking, alcohol consumption, exercise)
  - health status characteristics (e.g. self-reported history of hypertension, diabetes)
  - current alcohol use was categorised into three levels using the now old NHMRC guidelines
  - Subjects reported time spent in vigorous and non-vigorous exercise and were categorized as ‘sedentary’ if they reported no time in either of these activities in a usual week.

Relative risk of all-cause mortality by BMI in men and women aged 70 to 75



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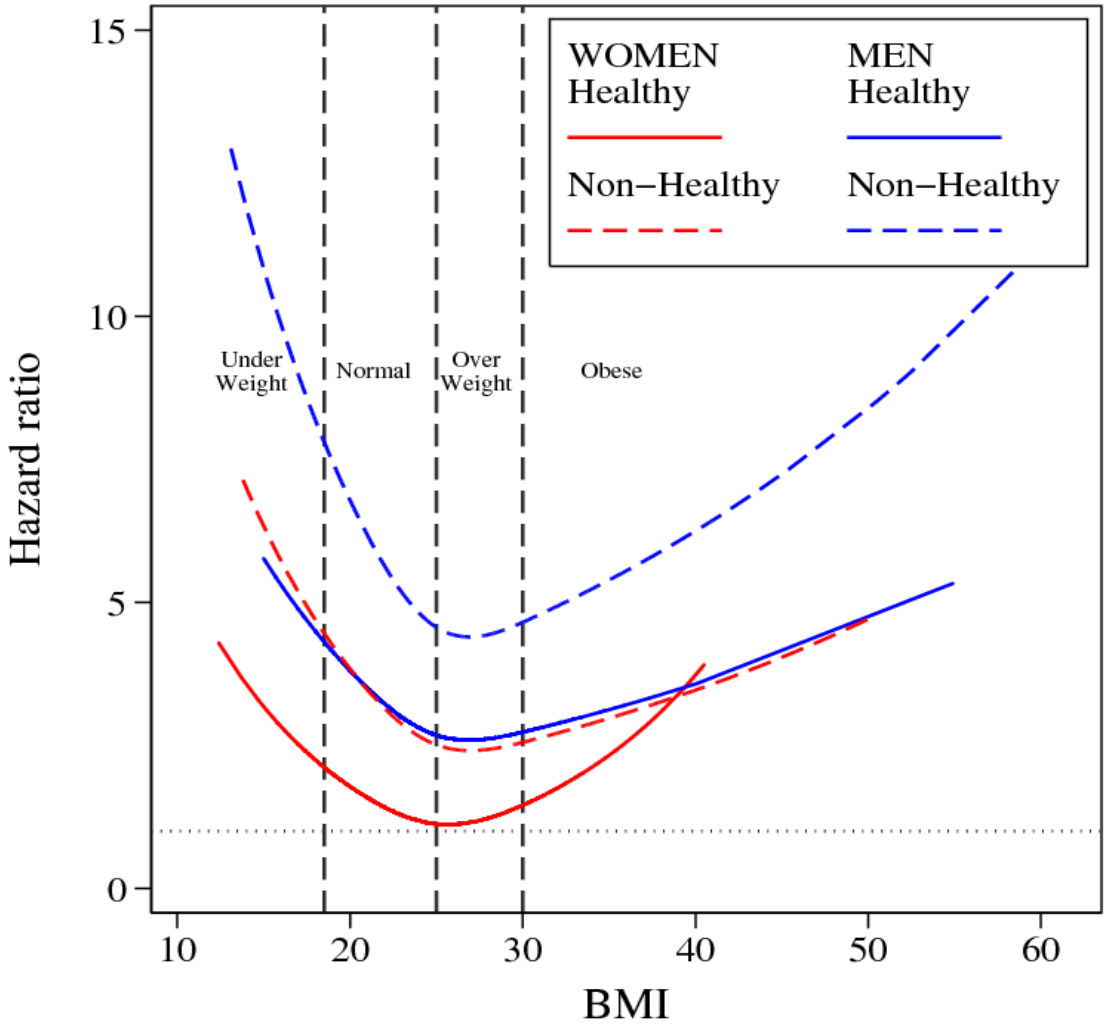
Relative hazards of all-cause mortality by BMI in “healthy” and non-healthy” men and women aged 70-75 years



To determine whether the relationship with BMI was modified by the presence of pre-existing illness, men and women were categorized as “healthy” if they reported no prior history of diabetes, heart disease, stroke, hypertension, chronic respiratory illness and if they were not current smokers.

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Relative risk of all-cause mortality in men and women age 70-75 years by BMI and being sedentary or not, adjusted for smoking

BMI	Sedentary		Non-sedentary	
	Men	Women	Men	Women
Underweight	4.01 2.25 - 7.16	4.88 3.07 - 7.75	3.16 1.99 - 5.02	1.47 1.00 - 2.18
Normal	2.42 2.01 - 2.92	2.15 1.73 - 2.67	1.74 1.50 - 2.01	1.00 (ref)
Overweight	2.03 1.67 - 2.45	1.57 1.22 – 2.02	1.61 1.38 - 1.86	0.82 0.68 - 0.98
Obese	1.95 1.47 - 2.58	1.91 1.43 - 2.56	1.92 1.53 - 2.41	1.01 0.78 - 1.31

Being sedentary increased the risk of mortality in men by 28% (HR = 1.28; 95% C.I.: 1.14 to 1.44) but doubled the risk in women (HR = 2.08; 95% C.I.: 1.79 to 2.41).

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Conclusions

- Our results add further credence to claims that the WHO BMI thresholds for overweight and obese are overly restrictive for older people.
- Overweight older people are not at increased mortality risk, and there is little evidence that dieting in this age group confers any benefit
- Together with other studies suggests that there is a “tipping point”, probably in the 60s where overweight ceases to be detrimental

Preventing Dementia
Spectrum of Possibilities

1. We will develop a series of interventions which will be effective, cheap and these interventions will not be prone to side-effects. We will then provide these interventions universally e.g. BP treatment, vitamins, physical activity, smoking cessation, cognitive stimulation….

2. The major disease process causing dementia is a single disease process, called Alzheimer Disease. This disease process has a stable pathogenic pathway with specific inhibitors. It is thus possible to devise a specific strategy to target those individuals who are highly likely to develop the disease.

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PLoS one

Body Adiposity in Later Life and the Incidence of Dementia: The Health in Men Study

Brian D. Power[1,2,3], Helman Alfonso[2,3], Leon Flicker[2,4,5], Graeme J. Hankey[4,6], Bu B. Yeap[4,7], Osvaldo P. Almeida[1,2,3]*

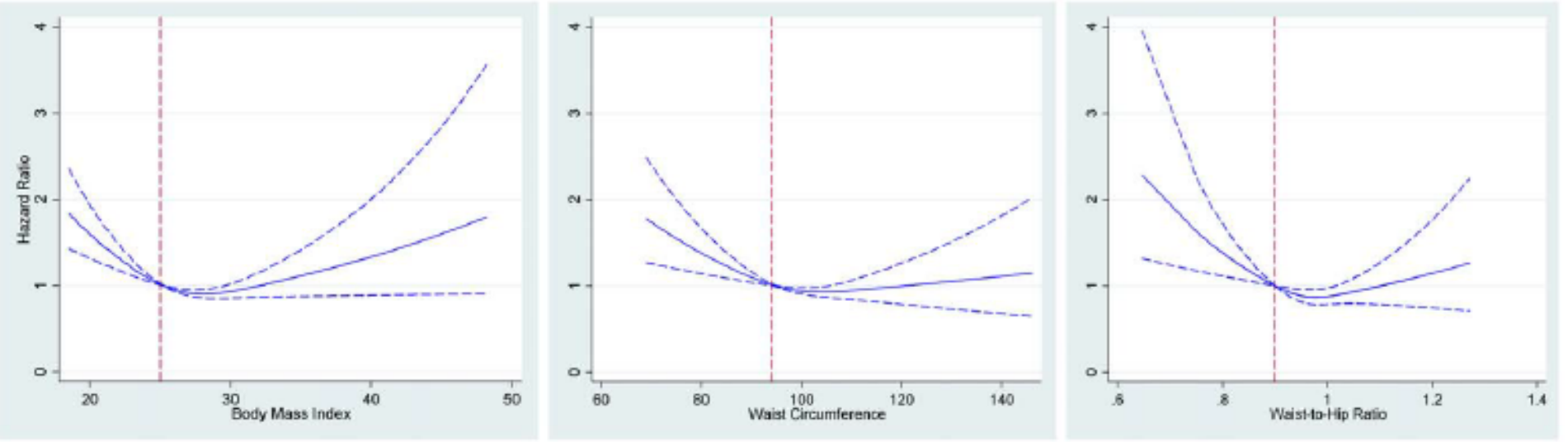
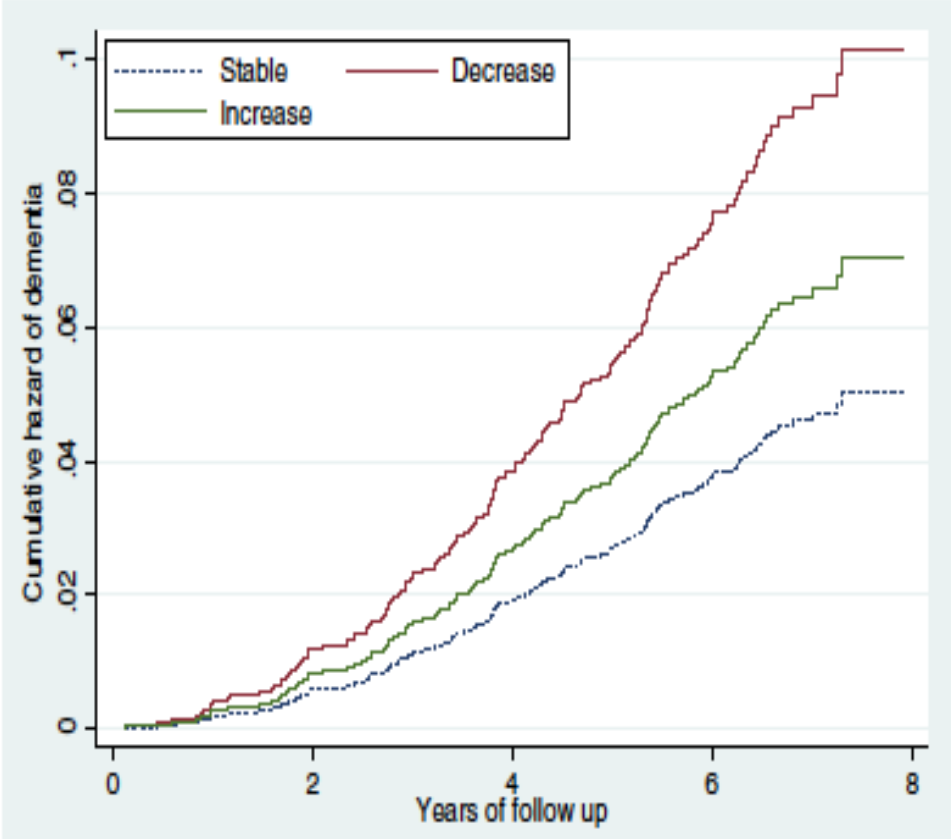


Figure 3. Average hazard of dementia (blue line) during follow-up according to the body mass index (BMI) (left panel), waist circumference (WC) (middle panel) and waist-to-hip ratio (WHR) (right panel). The vertical dashed red line represents the reference value for each indicator: 25 for BMI, 94 cm for WC, and 0.9 for WHR. The dashed blue lines represent the 95% confidence interval of the hazard ratio.

doi:10.1371/journal.pone.0017902.g003

Changes in body mass in later life and incident dementia

Brian D. Power,[1,2,3] Helman Alfonso,[2,3] Leon Flicker,[2,4,5] Graeme J. Hankey,[4,6] Bu B. Yeap[4,7] and Osvaldo P. Almeida[2,3,8]



Cumulative hazard of dementia over follow-up according to five-year change of 1 unit in the BMI of elderly men.

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Successful Mental Health Aging: Results From a Longitudinal Study of Older Australian Men

Am J Geriatr Psychiatry 2006; 14:27

Objective: *The authors investigated the associations of medical and lifestyle factors with the mental health of men in their 80s.* **Methods:** *This was a prospective study of a community-representative cohort of older men. Successful mental health aging was defined as reaching age 80 years with Mini-Mental State Examination score (MMSE) of 24 or more and Geriatric Depression Scale–15 items (GDS-15) score of 5 or less.* **Results:** *Of 601 men followed for 4.8 years, 76.0% enjoyed successful mental health aging. Successful mental health aging was inversely associated with age (hazard*

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Successful Mental Health Aging: Results From a Longitudinal Study of Older Australian Men

TABLE 4. Parsimonious Cox Regression Model for Successful Mental Health Aging According to Status at the Time of Enrollment

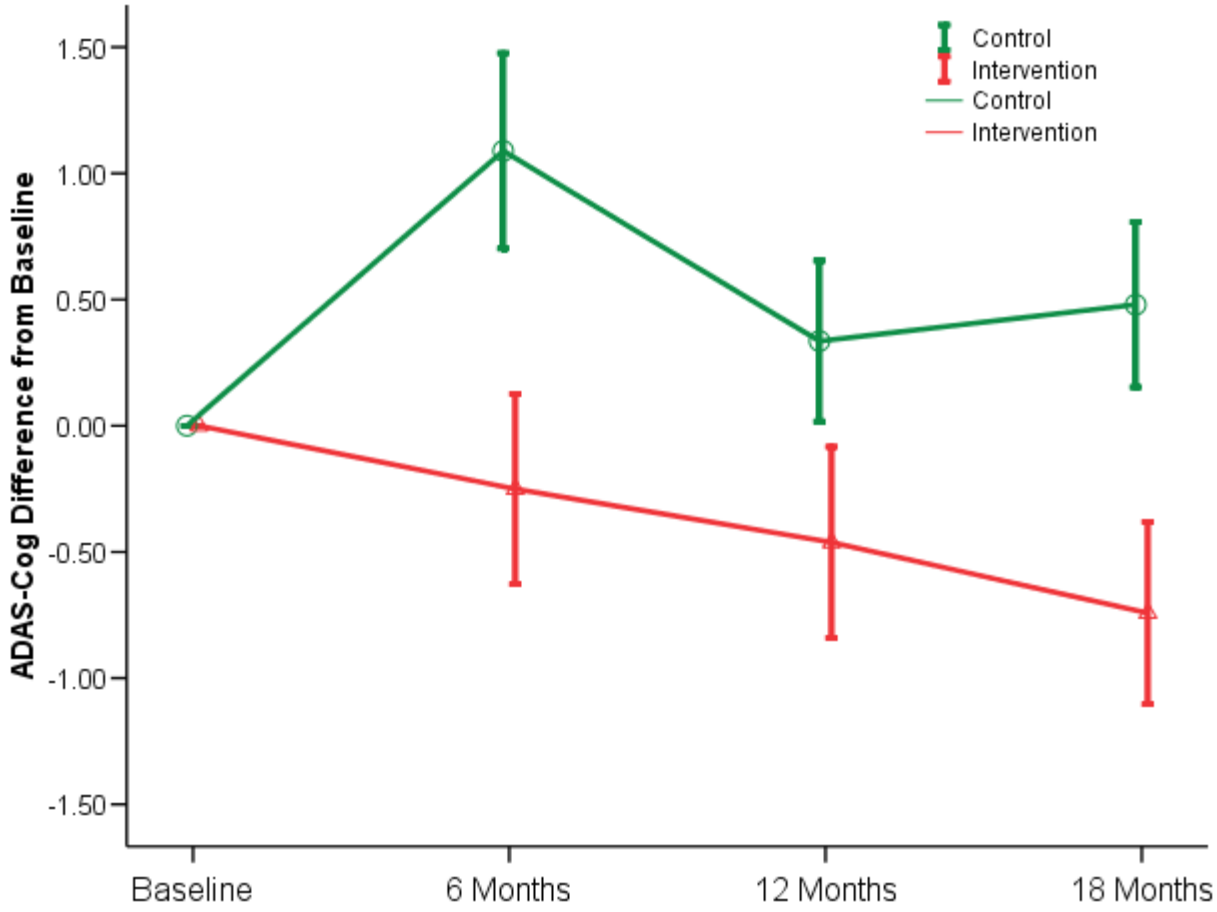
Status at Enrollment	Hazard Ratio	95% CI
Age in years	0.87	0.81–0.94
High school or university education	1.92	1.34–2.75
Non-English-speaking background	0.42	0.21–0.85
Consumed full-cream milk regularly	0.63	0.45–0.89
Vigorous physical activity	1.89	1.17–3.05
Nonvigorous physical activity	1.50	1.05–2.14

Note: Successful mental health aging was defined as MMSE ≥24 and GDS-15 ≤5.

CI: confidence interval.

Effect of Physical Activity on Cognitive Function in Older Adults at Risk for Alzheimer's Disease: Randomized Trial.

Lautenschlager et al JAMA 2008; 300:1027



N AUSTRALIAN CENTRE FOR LTH AGEING

Exercise is medicine, for the body and the brain

Lindsay S Nagamatsu,[1] Leon Flicker,[2] Arthur F Kramer,[3] Michelle W Voss,[4] Kirk I Erickson,[5] Chun Liang Hsu,[6] Teresa Liu-Ambrose[6,7,8]

Br J Sports Med 2014;48:943–944.

- The number of individuals with dementia will exponentially increase
- There is now a large and consistent pool of animal and human data demonstrating the cognitive benefit of exercise. Importantly, recent randomised studies show a convergence among behavioural, neuroimaging, and serum biomarker outcomes.
- Exercise has a multitude of established health benefits with minimal side effects and is cost-effective. Even in older adults, exercise increases the chance of survival and healthy ageing.
- Exercise significantly reduces the key vascular risk factors (eg, hypertension, diabetes, hypercholesterolaemia, etc) for Alzheimer's disease and vascular dementia

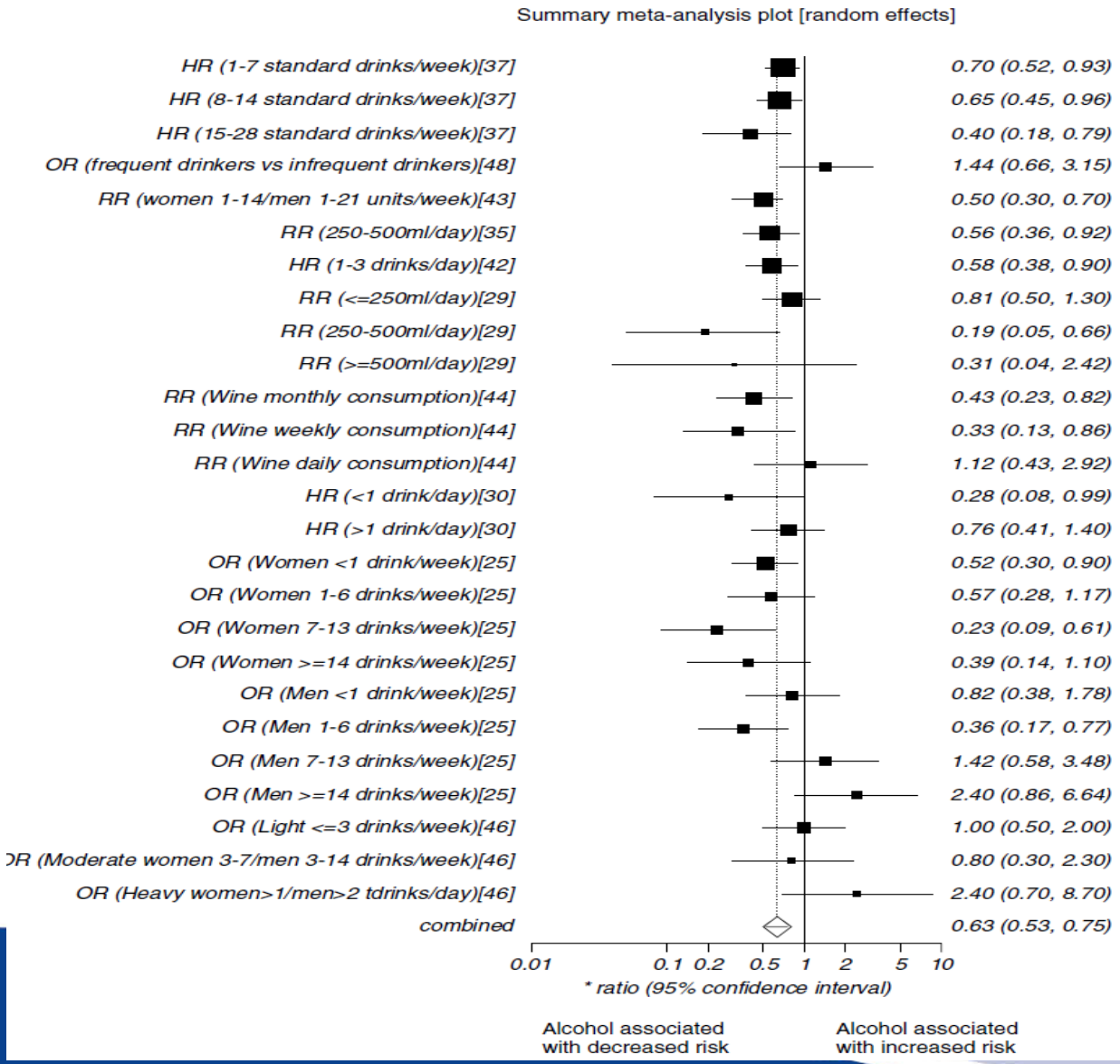
Relative risk of all-cause mortality adjusted for age and smoking for men for women for smoking

Drinking status	Men	Women
Non drinker	1.00	1.00
Rarely	1.18 1.00 - 1.39	0.78 0.71 - 0.86
< Once a week	0.94 0.80 - 1.11	0.61 0.52 - 0.73
Weekly	0.84 0.72 - 0.97	0.62 0.56 - 0.69

Older Men and Women and Alcohol

- The results of our study show that older women and men who consumed up to two and four alcoholic drinks respectively per day had a lower risk of all-cause mortality than abstainers or very occasional drinkers over 10 years.
- We also found that in older men this reduction in risk was further enhanced if consumption occurred three to six days of the week rather than every day.
- In older men, consumption of five to eight drinks per day was still associated with reduced mortality if consumed between three to six days of the week, Levels of consumption 9+ drinks per day were associated with an increased risk of mortality
- In older women, there was no strong evidence of an association between frequency and all-cause mortality.

Alcohol, dementia and cognitive decline in the elderly: A systematic review (Peters R et al Age and ageing 2008)



RALIAN CENTRE FOR AGEING

Alcohol consumption and cognitive impairment in older men

A mendelian randomization study

Objective: To determine whether alcohol consumption is causally associated with cognitive impairment in older men as predicted by mendelian randomization.

Methods: Retrospective analysis of a cohort study of 3,542 community-dwelling men aged 65 to 83 years followed for 6 years. Cognitive impairment was established by a Mini-Mental State Examination score of 23 or less. Participants provided detailed information about their use of alcohol during the preceding year and were classified as abstainers, occasional drinkers, and regular drinkers: mild (<15 drinks/wk), moderate (15–27 drinks/wk), heavy (28–34 drinks/wk), and abusers (≥35 drinks/wk). We genotyped the rs1229984 G→A variant of the alcohol dehydrogenase 1B (*ADH1B*) gene, which is associated with lower prevalence of alcohol abuse and dependence. Other measures included age, education, marital status, smoking and physical activity, body mass index, diabetes, hypertension, and cardiovascular diseases.

Results: At study entry, rs1229984 G→A polymorphism was associated with lower prevalence of regular use of alcohol and decreased consumption among regular users. Six years later, 502 men (14.2%) showed evidence of cognitive impairment. Abstainers and irregular drinkers had higher odds of cognitive impairment than regular drinkers (odds ratio [OR] = 1.23, 95% confidence interval [CI] = 1.00–1.51, after adjustment for other measured factors). The rs1229984 G→A polymorphism did not decrease the odds of cognitive impairment (AA/GG OR = 1.35, 95% CI = 0.29–6.27; GA/GG OR = 1.05, 95% CI = 0.71–1.55).

Conclusions: Alcohol consumption, including heavy regular drinking and abuse, is not a direct cause of cognitive impairment in later life. Our results are consistent with the possibility, but do not prove, that regular moderate drinking decreases the risk of cognitive impairment in older men. ***Neurology*® 2014;82:1038–1044**

WESTERN AUSTRALIAN CENTRE FOR HEALTH AGEING

Successful Ageing
MCCS

- The MCCS prospective cohort study comprising 17,045 men and 24,469 women, largely aged between 40-69 years, at baseline between 1990 and 1994
- Southern European migrants were deliberately over-sampled to extend the range of lifestyle exposures, especially diet.
- This analysis focused on people aged 50+ at baseline and who did not have any of the following conditions: angina, diabetes, cancer, heart attack or stroke leaving eligible n=22220, 65% n=14467 attended the follow-up between 2003 and 2007, and 13086 had data from the Kessler Psychological Distress Scale (K10).
- 12617 people were included in these analyses, with a median follow-up of 11.8 years.

Diet and Successful ageing
MCCS

- Dietary data self-administered 121-item food frequency questionnaire specifically developed for the MCCS.
- Alcohol intake
- A Mediterranean Diet Score (MDS) was computed based on that described by Trichopoulou et al (12). Goes from 0-9
- Factor analysis was also used to define two eating patterns. Only two factors were sought, with the expectation that eating patterns reflecting the habits of southern European and Australian participants would be identified.

Patterns of dietary intake and psychological distress in older Australians: benefits not just from a Mediterranean diet

Allison Hodge,[1] Osvaldo P. Almeida,[3,4,5] Dallas R. English,[1,2] Graham G. Giles[1,2] and Leon Flicker[3,6,7]

[1] *Cancer Epidemiology Centre, Cancer Council Victoria, Carlton, Victoria, Australia*
[2] *Centre for MEGA Epidemiology, School of Population Health, University of Melbourne, Melbourne, Victoria, Australia*

Conclusions: A Mediterranean-style diet was associated with less psychological distress, possibly through provision of a healthy nutrient profile. The Australian dietary pattern, which included some foods high in fat and sugar content along with whole foods, also showed a weak inverse association. Adherence to this pattern may reflect a feeling of belonging to the community associated with less psychological distress.

Successful Ageing and MCCS

- Anybody who had impairment, or perceived major difficulty with physical functioning also were deemed “unsuccessful”
- We did this in two ways – those subjects who answered the SF12, ADL or IADL as having a little or more limitation in moderate activities or PADL, or having a lot of limitation in IADL or strenuous activities
- Scored $\geq$ 20 on the K10
- Ageing well n=1425 (18%) Not ageing well n=5548 (70%) Died N=963 (12%) (total n = 7936)

Social connectedness and predictors of successful ageing

Allison M. Hodge[a,*], Dallas R. English[b], Graham G. Giles[a], Leon Flicker[c]

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[b] Centre for MEGA Epidemiology, Level 3, 207 Bouverie Street, The University of Melbourne, Victoria 3010, Australia
[c] Western Australian Centre for Health & Ageing – WACHA Western Australian Institute for Medical Research (WAIMR), University of Western Australia, Royal Perth Hospital, Box X2213, Perth, 6847, Australia

perceived major difficulty with physical functioning; and low risk of psychological distress.

Results: A body mass index in the healthy range, low waist/hip ratio, not smoking, being physically active, and not having arthritis, asthma, hypertension, or gallstones were associated prospectively with successful ageing. There was no evidence for an association of social connectedness with successful ageing.

Conclusions: A healthy lifestyle and maintenance of healthy weight, but not social connectedness, may improve the chances of ageing successfully by our definition. Social connectedness may be related to a perception of ageing well, but it does not appear to help avoid the usual conditions associated with ageing.

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Conclusions

- BMI in the 70s and beyond positively associated with survival
- BMI and Waist hip ratio in your early 60s inversely associated with successful ageing
- Smoking inversely associated, alcohol positively associated
- Physical activity positively associated
- Social factors are not clearly associated with healthy ageing