

Malnutrition in Older People

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May 16, 2016



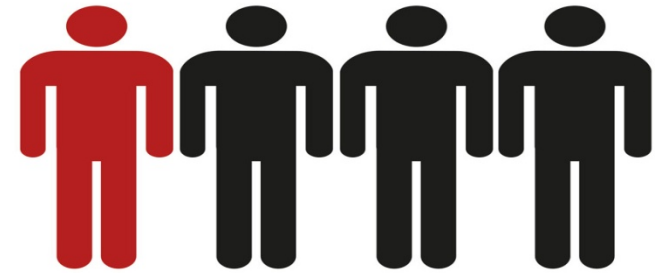
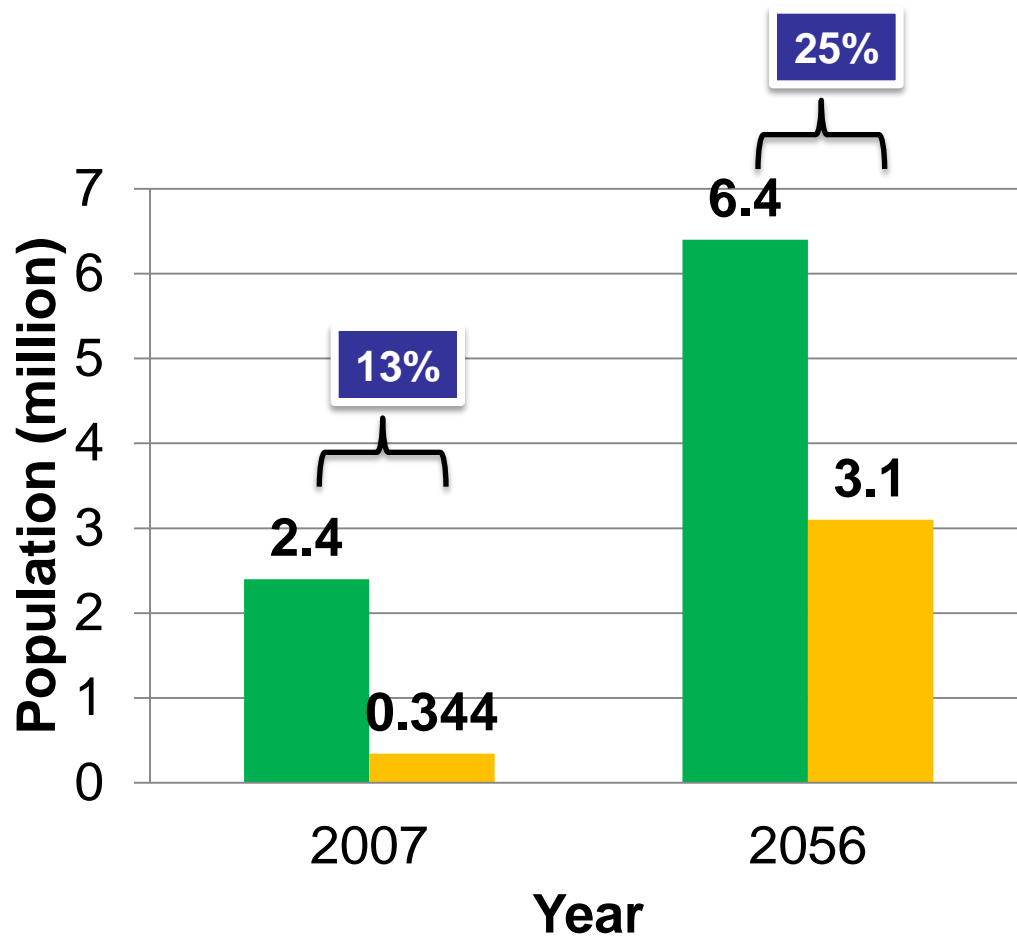
ROYAL ADELAIDE HOSPITAL

**NHMRC Centre for Research
Excellence in Translating Nutritional
Science to Good Health**

Outline of Talk

- **Physiological changes of “normal” ageing**
- **Under-nutrition in older people**
- **Over-nutrition/obesity in older people**
- **Some other nutritional problems in older people**

Elderly Population in Australia



- 65 - 84 years
- ≥ 85 years

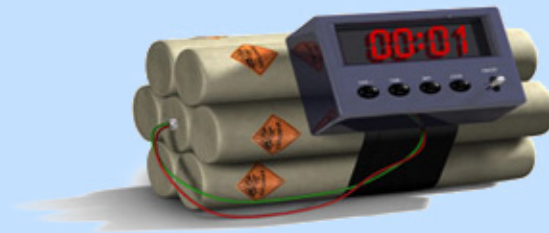
(Australian Bureau of Statistics, 2009)

Jamie Oliver: “We're heading for obesity horror show”. Nov 2008



OBESITY TIMEBOMB

Tick tick tick tick tick tick BOOM!



**Many older people eat well and
are well-nourished**



? Conventional Wisdom

- **Body weight increases with increasing age**
- **There is an obesity epidemic → dramatic increases in morbidity and mortality**
- **Obesity due to nutritional excess is the only nutritional problem that matters in developed countries in people of all ages**
- **BMI categories (kg/m²)**
 - 20-25 normal (associated with maximum life expectancy)**
 - 25-30 overweight**
 - > 30 obese**

Visual Analogue Questionnaire

Name (Initials):

Visit:

Time:

Please indicate how you are feeling at this moment by placing a vertical mark at the appropriate point on each scale below. Furthest LEFT means you do not feel the sensation in question, furthest RIGHT means you feel it very much. Please, mark all scales.

I feel nauseated

Not at all

Very much

A horizontal line with vertical end caps. A vertical tick mark is placed on the line, approximately 10% of the way from the left end.

I feel drowsy

Not at all

Very much

A horizontal line with vertical end caps. A vertical tick mark is placed on the line, approximately 80% of the way from the left end.

I feel bloated

Not at all

Very much

A horizontal line with vertical end caps. A vertical tick mark is placed on the line, approximately 90% of the way from the left end.

I feel anxious

Not at all

Very much

A horizontal line with vertical end caps. A vertical tick mark is placed on the line, approximately 85% of the way from the left end.

I feel hungry

Not at all

Very much

A horizontal line with vertical end caps. A vertical tick mark is placed on the line, approximately 15% of the way from the left end.

I feel full

Not at all

Very much

A horizontal line with vertical end caps. A vertical tick mark is placed on the line, approximately 85% of the way from the left end.

I feel happy

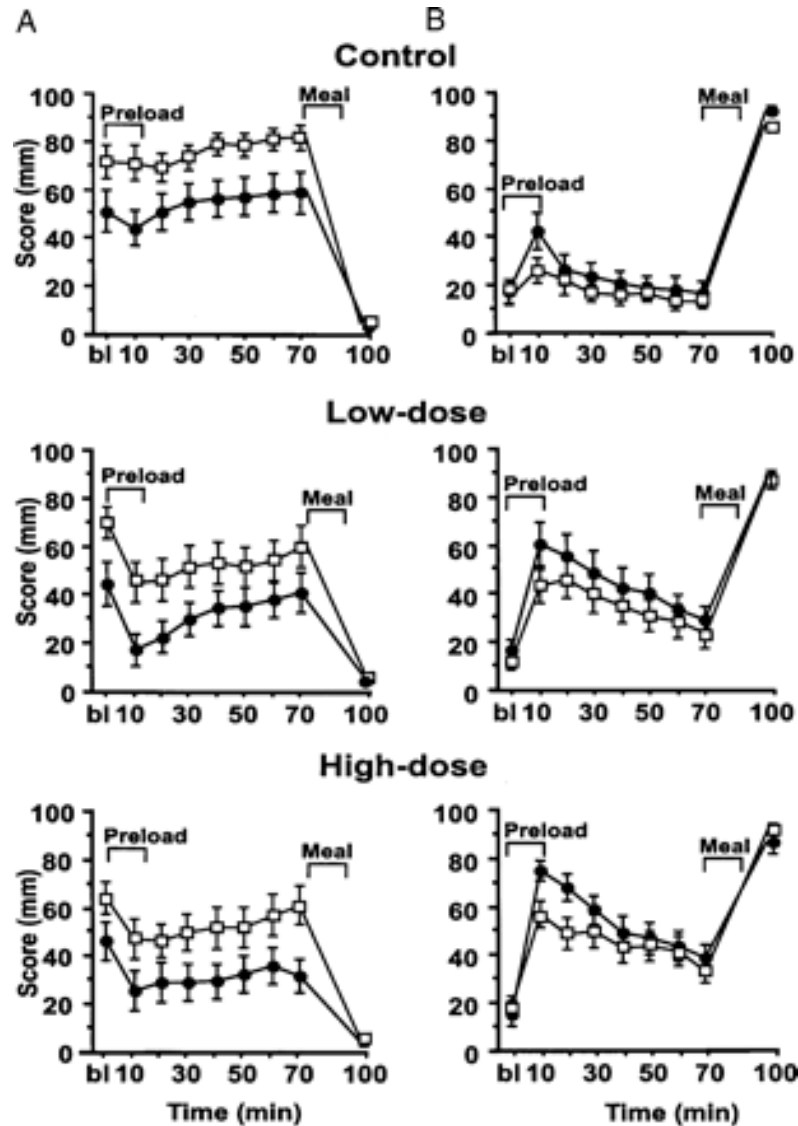
Not at all

Very much

A horizontal line with vertical end caps. A vertical tick mark is placed on the line, approximately 85% of the way from the left end.

Hunger

Fullness



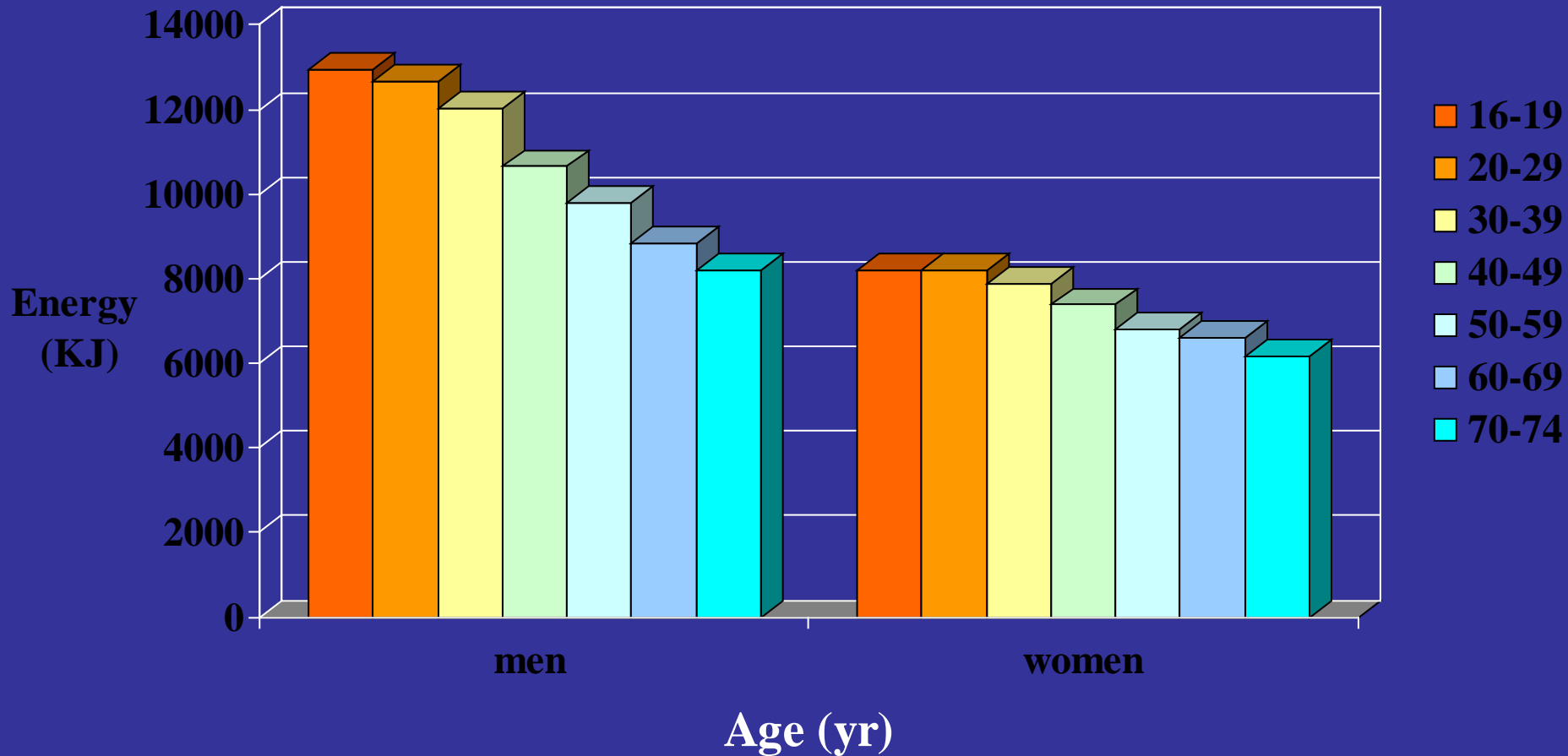
Young (n = 12, □) and older (n = 12, •) subjects who received preloads of either water, 250 kcal or 750 kcal.

Sturm et al: Am J Clin Nutr. 2004 80:656-67.

Energy intake decreases with age

~ 30% between 20-80 yr

NHANES III (1988-1991)



Aging and Eating: a summary

Compared to young adults, the elderly

- **are less hungry**
- **are more full**
- **eat less food (consume less energy) overall**
- **eat less often and less often between meals**
- **are less responsive to hunger signals**
- **are less thirsty**
- **? eat different foods**

This has been called the “anorexia of aging”

“Causes” of the Anorexia of Aging

Multifactorial

Changes in gut function and motility

Inflammation

Depression

impaired homeostasis

Social

Medical conditions

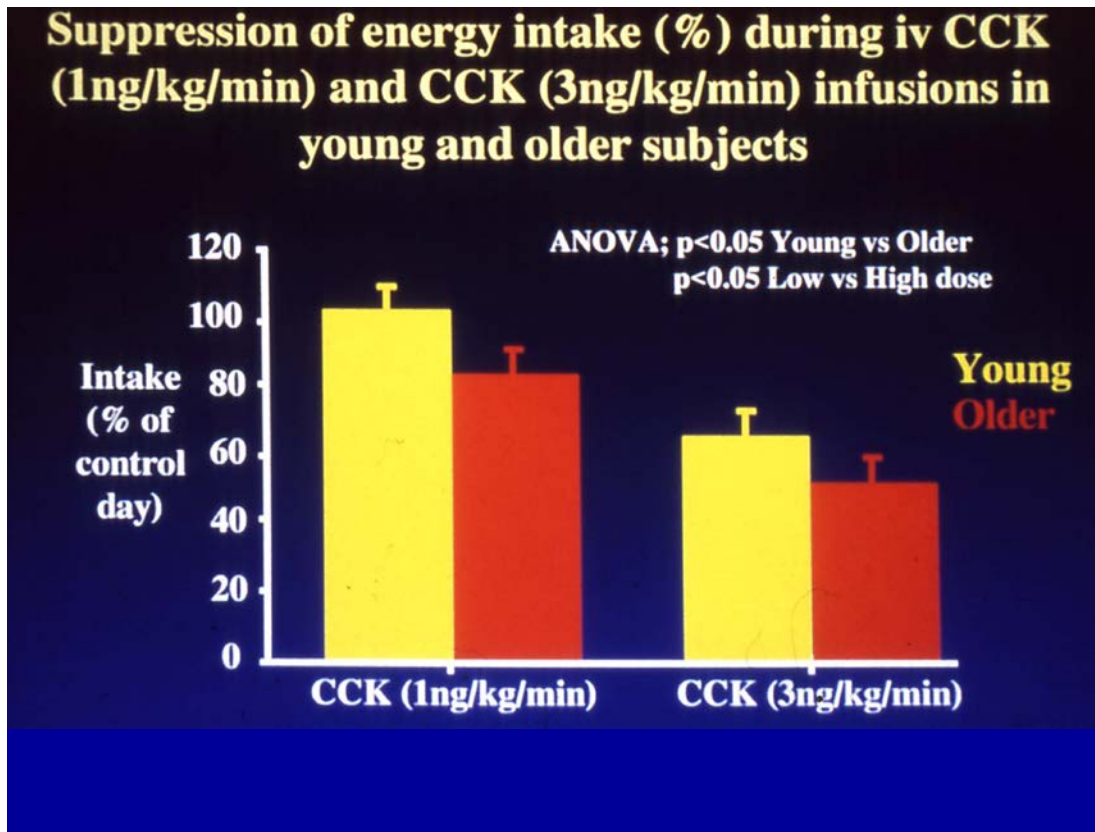
hormonal ↑ CCK action

↓ action anabolic hormones

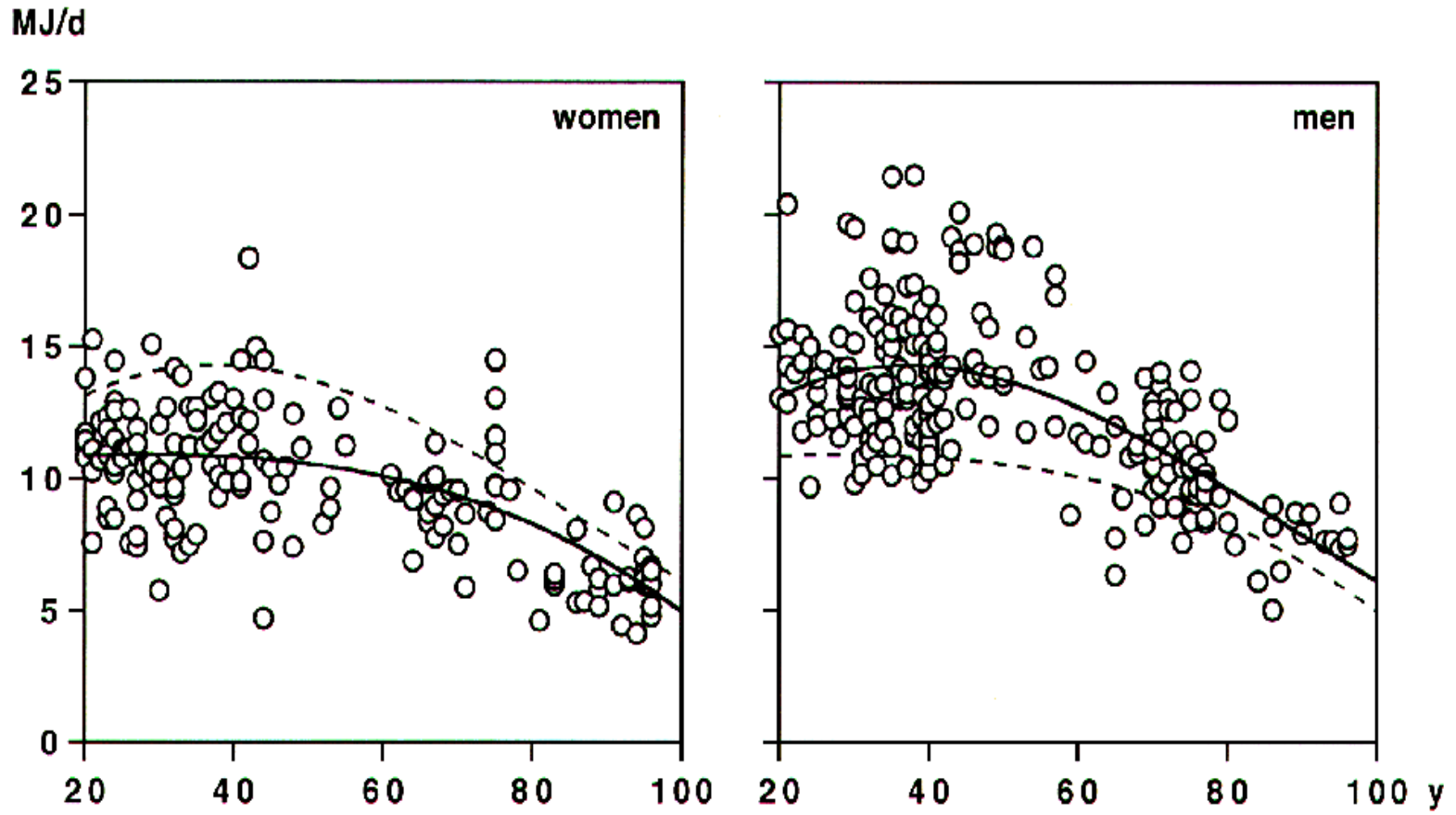
sarcopaenia

Older humans have ↑ sensitivity to satiating effects of CCK

MacIntosh CG et al J Clin Endocrinol Metab. 2001 Dec;86(12):5830-7.

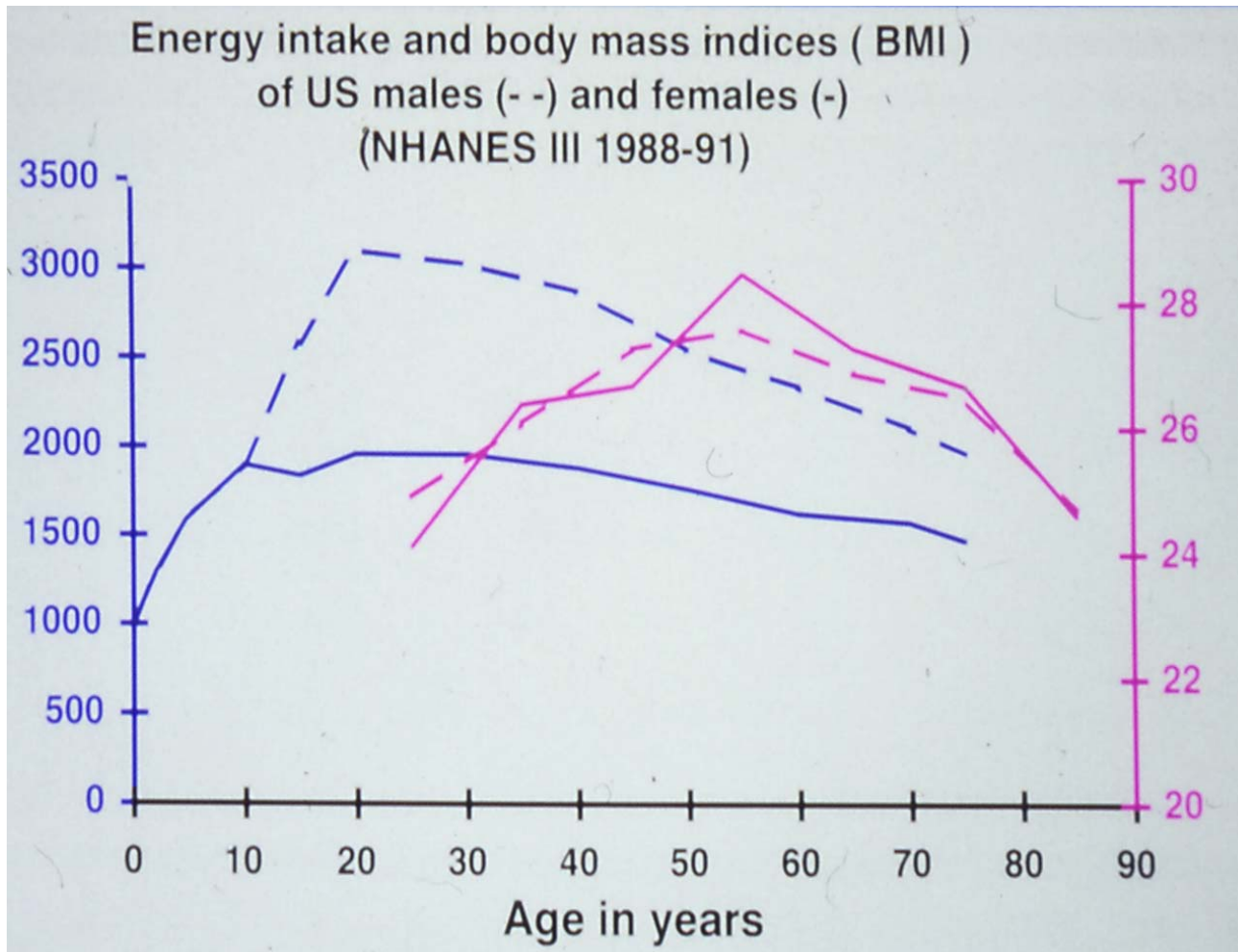


Energy Expenditure Also Declines During Ageing



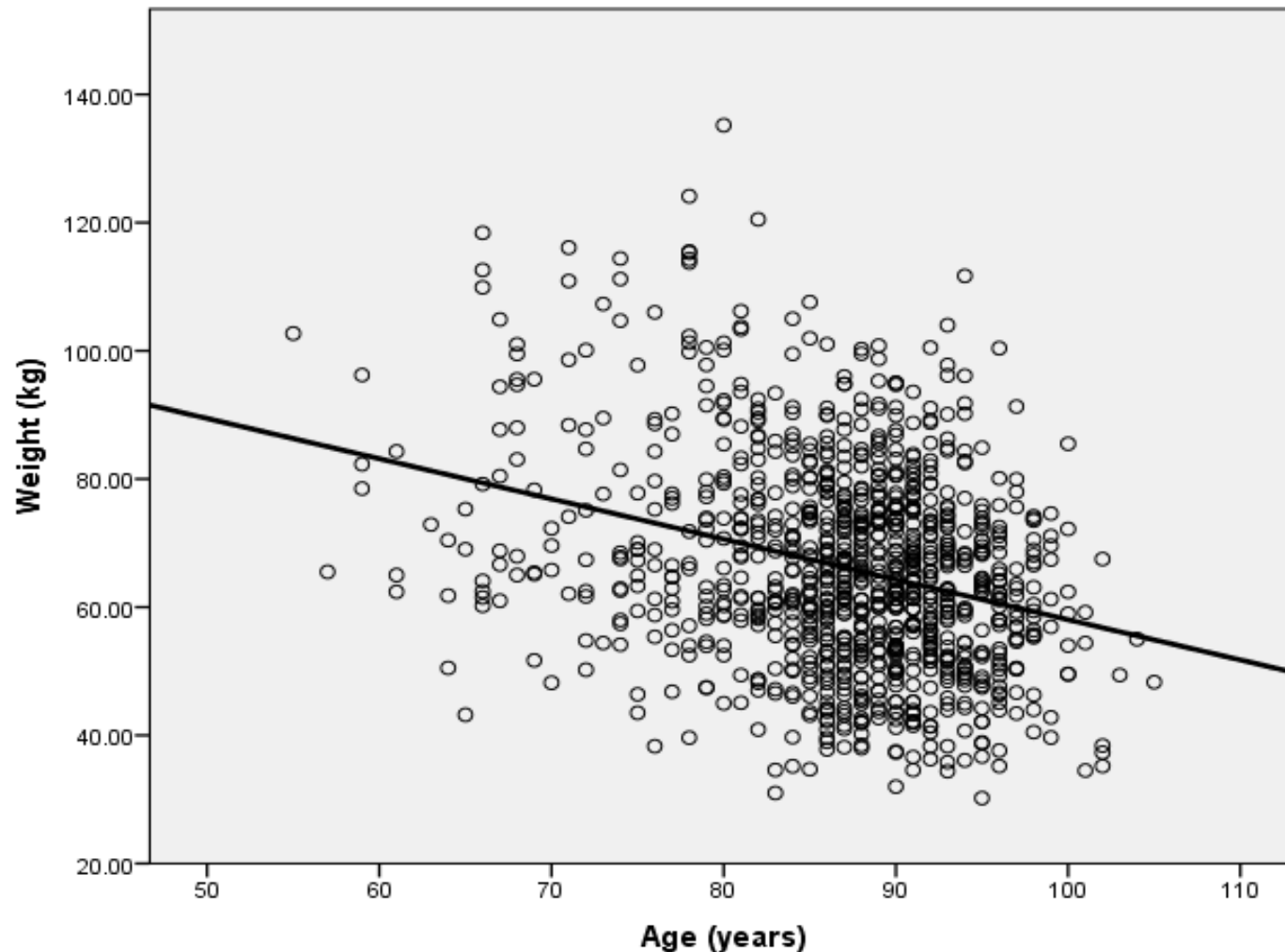
Weight loss more likely than weight gain after ~ mid 60s

Older people weight less than young, fewer are obese



Southern Cross Nursing Home Residents: weight according to age (n = 1020)

Arjuna et al submitted for publication



Weight decreases 0.5-1% per year on average after age 65 years in prospective studies

Substantial weight changes up and down are common in older people

Particularly among those in nursing homes

46% lost or gained > 5% over 12/12 in Adelaide NH study (28%↓, 18% ↑)

Arjuna et al.

29% ↑ or ↓ ≥ 10% over 6/12 in US NH study

Rigler et al J Am Ger Soc 2001 49:49

Large weight fluctuations up or down associated with poor outcomes in older people

Corrada et al Am J Epidemiol 2006 163:938

Weight loss and low body weight are associated with bad outcomes in older people

Weight loss is usually bad in older people

Cardiovascular Health Study (n = 4714 ≥ 65 yr)

Newman et al JAGS 2001:1309

Followed prospectively for 7 years

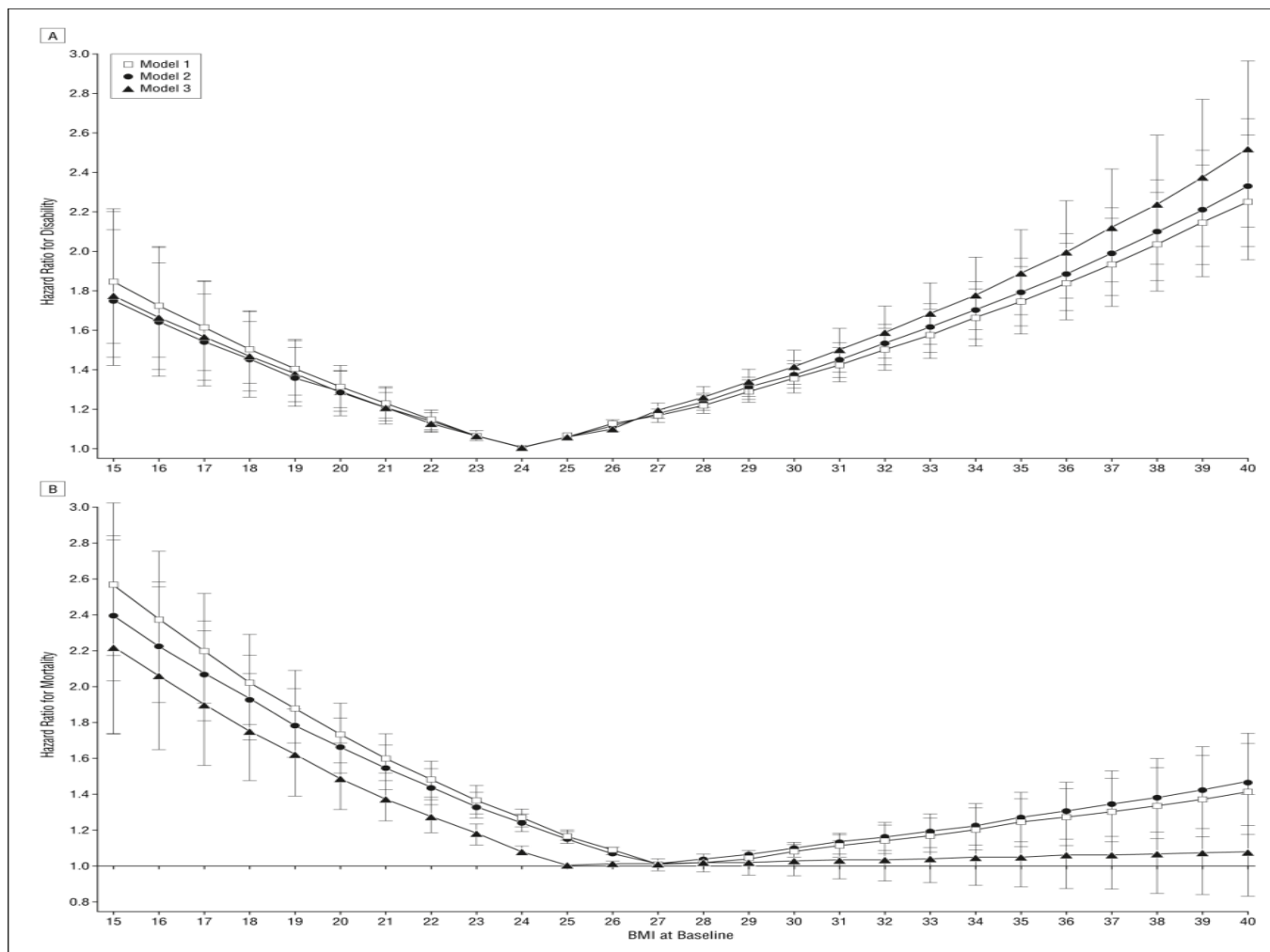
In first 3 years 17% lost > 5%, 13% gained > 5% body weight

**In the following 4 years mortality in weight loss group
2.09 x ↑ (1.67-2.62)**

Mortality with weight loss irrespective of

- **starting weight**
- **whether weight loss intentional or non-intentional**

Live longest ≥ 65 years if BMI 27-28 kg/m² little survival reduction above this, major reduction below



8359 Americans ≥ 65 yr, followed for 7 years

Al Snih et al. Arch Int Med 2007; 167:774

Excess deaths associated with Underweight, Overweight and Obesity

Flegal KM et al JAMA 2005 293:1861
(NHANES 1971-2000, N = 36,000)

Table 2. Relative Risks by Age Group and BMI Level From the Combined NHANES I, II, and III Data Set

BMI Level	Relative Risk (95% Confidence Interval) by Age Category		
	25-59 y	60-69 y	≥70 y
	Overall		
<18.5	1.38 (0.82-2.32)	2.30 (1.70-3.13)	1.69 (1.38-2.07)
18.5 to <25	1.00	1.00	1.00
25 to <30	0.83 (0.65-1.06)	0.95 (0.80-1.13)	0.91 (0.83-1.01)
30 to <35	1.20 (0.84-1.72)	1.13 (0.89-1.42)	1.03 (0.91-1.17)
≥35	1.83 (1.27-2.62)	1.63 (1.16-2.30)	1.17 (0.94-1.47)
	Never-Smokers Only		
<18.5	1.25 (0.29-5.49)	2.97 (1.17-7.54)	1.50 (1.11-2.02)
18.5 to <25	1.00	1.00	1.00
25 to <30	0.66 (0.38-1.16)	0.81 (0.56-1.16)	0.90 (0.79-1.04)
30 to <35	0.77 (0.46-1.28)	1.21 (0.83-1.77)	1.13 (0.96-1.31)
≥35	1.25 (0.76-2.06)	2.30 (1.47-3.59)	1.12 (0.87-1.45)

Abbreviations: BMI, body mass index (measured as weight in kilograms divided by the square of height in meters); NHANES, National Health and Nutrition Examination Survey.

Being underweight and under-nourished is bad for older people

In people > 60 years BMI < 22 associated with

- **↑ biochemical markers of malnutrition**
- **↓ Activities of daily living**
- **↓ Functional status**
- **↑ mortality**

Roberts S et al J Gerontol Med Sci 2005 60A:613

If over 60 years, ideal BMI \approx 27-28 kg/m²

Predictors of Poor Outcome in Older People

- Weight loss $\geq 5\%$

Particularly if involuntary and/or low starting weight (BMI $< 22 \text{ kg/m}^2$)

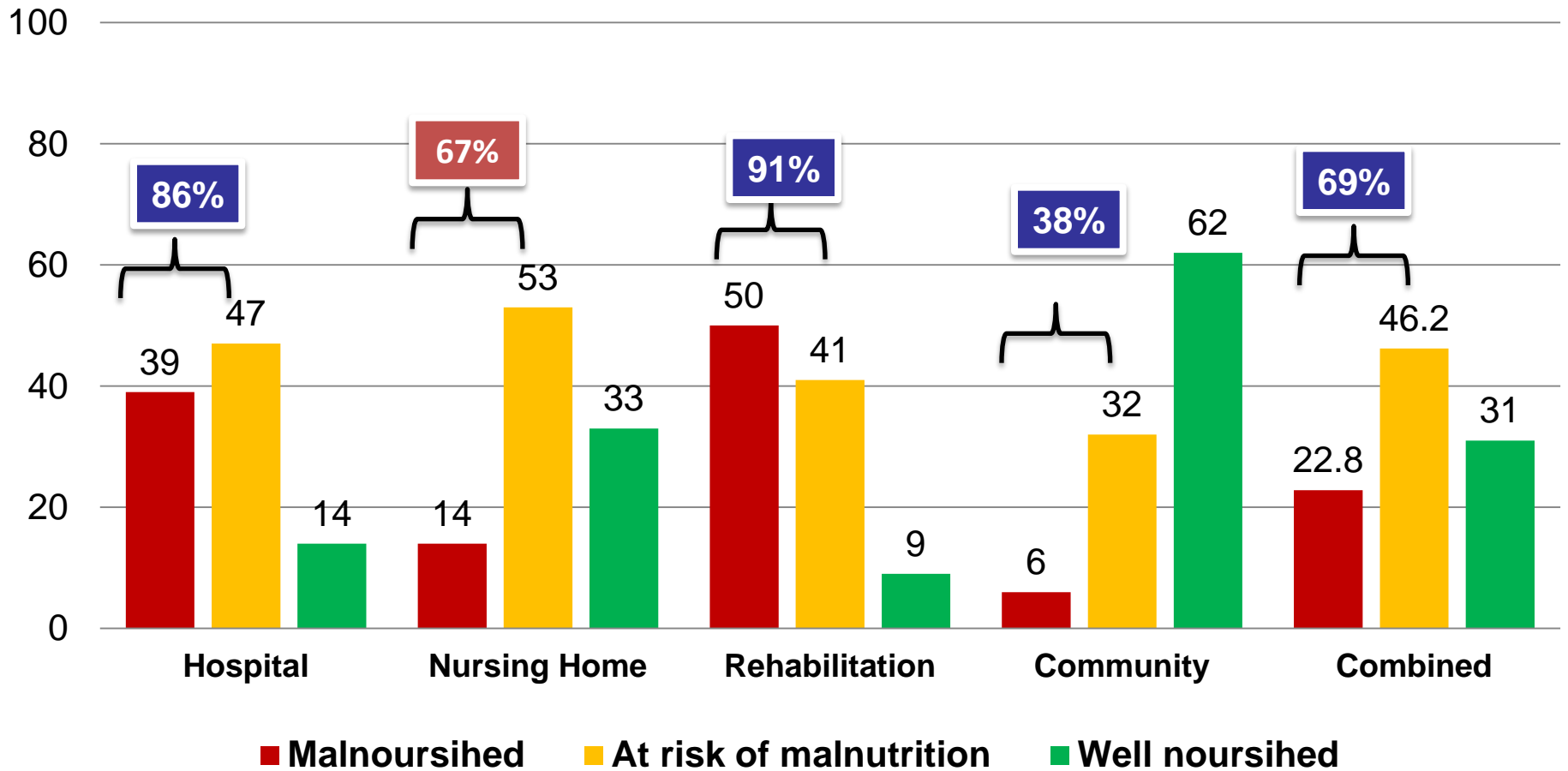
- BMI $< 22 \text{ kg/m}^2$

Those with initial low weight probably more likely to lose weight (*Arjuna et al*)

- Weight fluctuation, gain or loss $> 5\%$

Corrada et al. Am J Epidemiol 2006 163:938

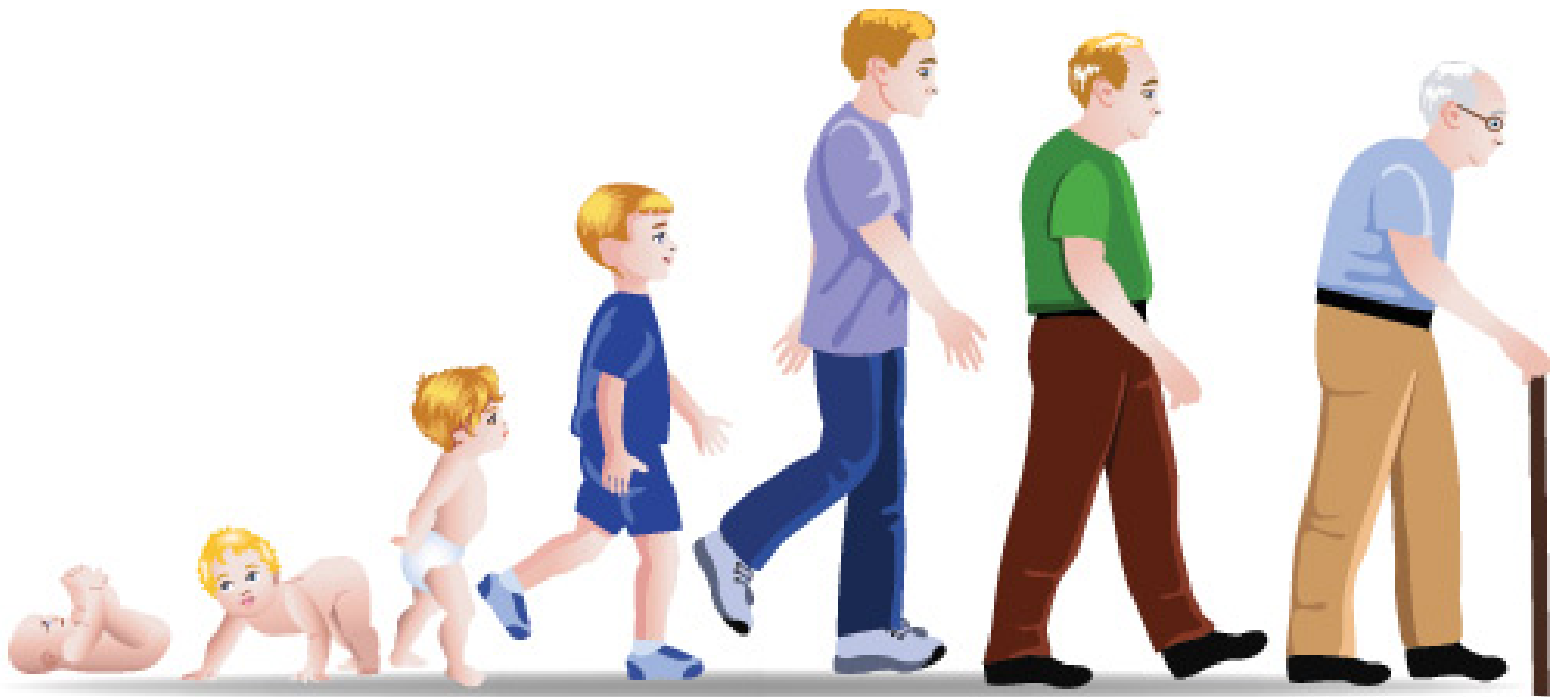
Under-nutrition is common in older people



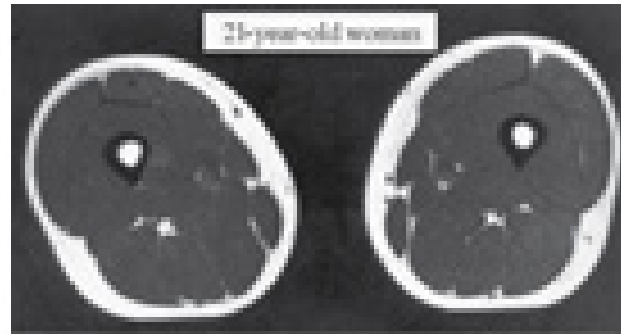
(Kaiser et al. 2010)

- High rates of under-nutrition and associated poor outcome are related to
- Weight loss
- Weight fluctuations
- Preferential loss of lean (muscle tissue) →
↑ frailty

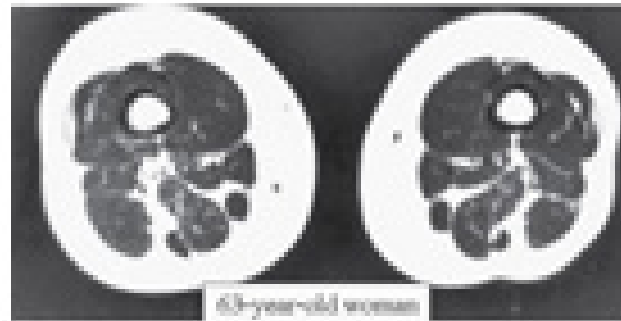
Body composition changes with age



Muscle mass decreases and fat increases



23 year old



63 year old

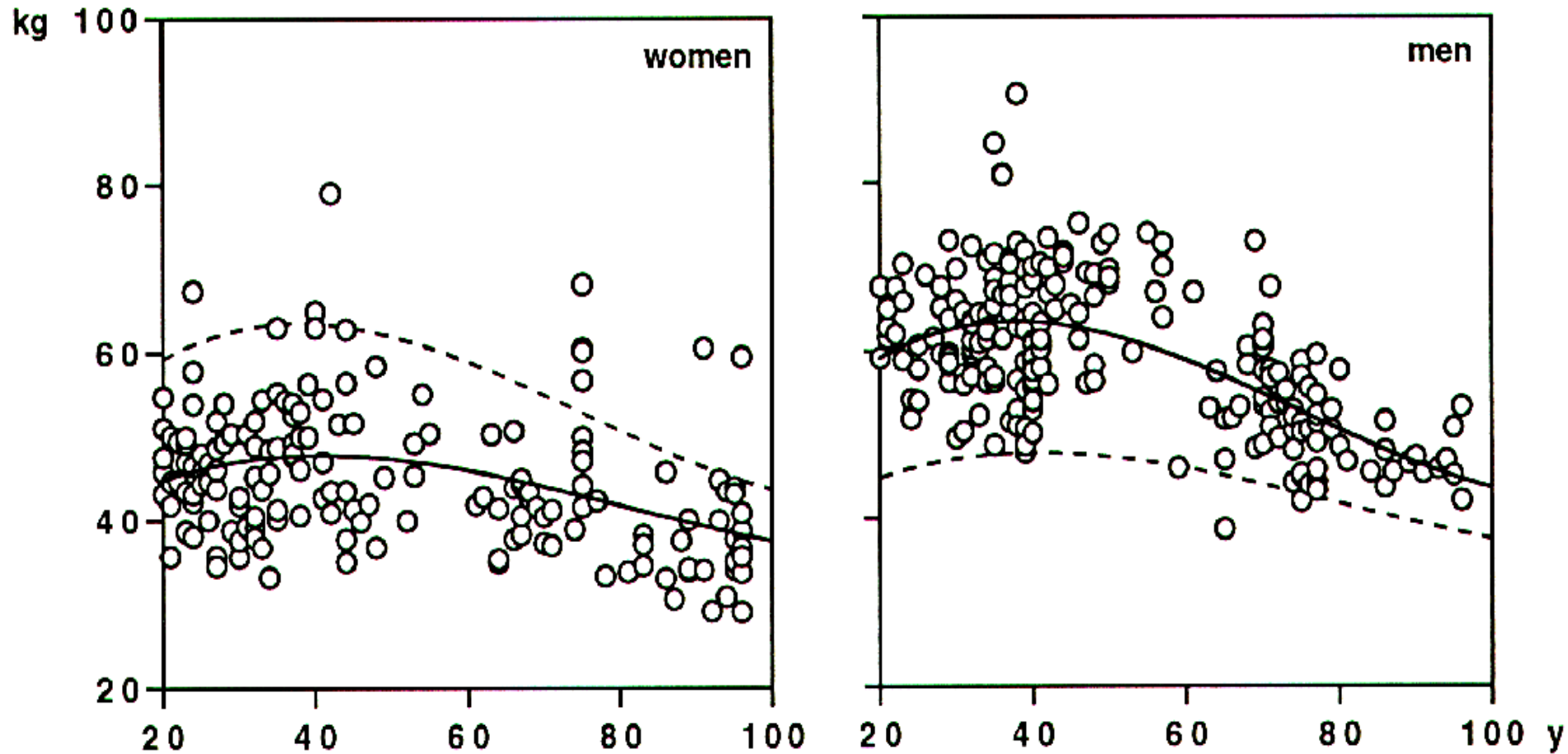
Ageing and ↑ body fat

- Average 80 year old woman is 50% fat
- Body fat increases with age, even if weight does not

	men 20 yrs	men 75 years
Body weight	80 kg	80 kg
Mean % body fat	15%	29%

Prentice, A.M. & Jebb, S.A. Beyond body mass index. Obes Rev 2, 141-147 (2001)..

Lean mass declines with ageing



Age-related ↓ skeletal muscle mass

Muscle mass and x-sectional area

↓ $\approx 40\%$ 20-80 yr

↓ ~ 3 kg/decade from age 45 yr

As a result

Muscle strength ↓ 1-2%/yr age 40-90yr

Sarcopaenia

(excessive loss of lean tissue)

Muscle mass and x-sectional area $\downarrow \approx 40\%$ 20 - 80 yr

Skeletal muscle mass more than 2SD below young adult mean

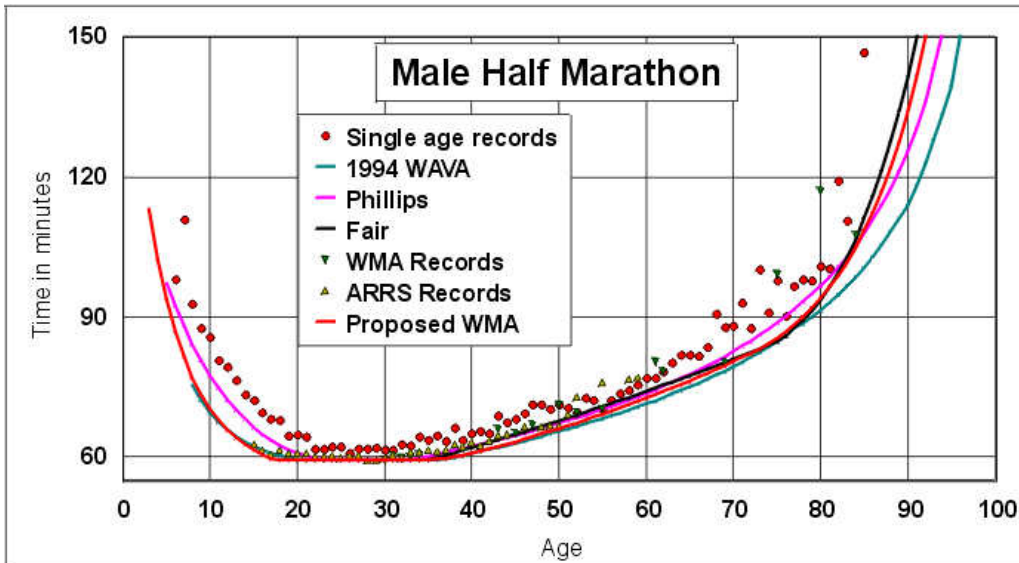
15% < 70 yr \rightarrow 50% > 80 yrs

Muscle loss associated with \downarrow muscle function

Muscle strength \downarrow 1-2%/yr age 40-90yr

Function and performance declines with age even if maintain activity levels

↓ Physical activity accounts for about 1/2 age-related loss of physical capacity



Sarcopenia

Sarcopaenia is associated with

- **↓ function**
- **Falls**
- **Frailty**
- **Disability**

**Sarcopenia associated with ↑risk disability in NHANES 111
3.3 x ↑ (women) and 4.7 x ↑ (men)**

Janssen et al. Am J Epidemiol 2004 159:413

Assessment

There are many ways of diagnosing under-nutrition in older people, but the simplest and most effective is to detect and further address those who

- are of low body weight (BMI < 22 kg/m²)**
- Are losing weight, particularly if > 5% and involuntary**

There are also standardised tools to detect those at risk eg MUST, MNA

Malnutrition Universal Screening Tool (MUST)

BMI (kg/m ²)	unplanned weight loss last 3-6 months	acute disease effect if unwell and no nutrient intake > 5 days:
score	%	score
>20	<5	0
18.5-20	5-10	1
<18.5	>10	2

Add scores up

Low risk = 0

Medium risk = 1 (observe)

Mini Nutritional Assessment (MNA)

Mini Nutritional Assessment

MNA[®]

Nestlé
Nutrition Institute

Last name:		First name:		
Sex:	Age:	Weight, kg:	Height, cm:	Date:

Complete the screen by filling in the boxes with the appropriate numbers. Total the numbers for the final screening score.

Screening

A Has food intake declined over the past 3 months due to loss of appetite, digestive problems, chewing or swallowing difficulties?
 0 = severe decrease in food intake
 1 = moderate decrease in food intake
 2 = no decrease in food intake

B Weight loss during the last 3 months
 0 = weight loss greater than 3 kg (6.6 lbs)
 1 = does not know
 2 = weight loss between 1 and 3 kg (2.2 and 6.6 lbs)
 3 = no weight loss

C Mobility
 0 = bed or chair bound
 1 = able to get out of bed / chair but does not go out
 2 = goes out

D Has suffered psychological stress or acute disease in the past 3 months?
 0 = yes 2 = no

E Neuropsychological problems
 0 = severe dementia or depression
 1 = mild dementia
 2 = no psychological problems

F1 Body Mass Index (BMI) (weight in kg) / (height in m²)
 0 = BMI less than 19
 1 = BMI 19 to less than 21
 2 = BMI 21 to less than 23
 3 = BMI 23 or greater

IF BMI IS NOT AVAILABLE, REPLACE QUESTION F1 WITH QUESTION F2.
 DO NOT ANSWER QUESTION F2 IF QUESTION F1 IS ALREADY COMPLETED.

F2 Calf circumference (CC) in cm
 0 = CC less than 31
 3 = CC 31 or greater

Screening score (max. 14 points)

12-14 points: Normal nutritional status
8-11 points: At risk of malnutrition
0-7 points: Malnourished

Ref. Velaz S, Villar M, Abellan G, et al. Overview of the MNA® - its history and Challenges. *J Nutr Health Aging* 2006; 10:466-468.
 Rubenstein LZ, Hanker JO, Salva A, Guigoz Y, Velaz S. Screening for Undernutrition in Geriatric Practice: Developing the Short-Form Mini Nutritional Assessment (MNA-SF). *J Geront* 2001;56A: M366-377.
 Guigoz Y. The Mini-Nutritional Assessment (MNA®) Review of the Literature - What does it tell us? *J Nutr Health Aging* 2006; 10:466-487.

Management of Nutritional Frailty in older people

Recognition/Diagnosis – often deficient

Needs awareness of problem – THINK OF IT
specific screening measures in place

Non-nutritional therapies

Identify and treat cause if possible

↑ Exercise – particularly resistance

Remove harmful medications

Medications/drugs to ↑ appetite and food intake ??

Nutritional therapies

Food

Strategies to optimise intake

Supplements

Nutritional supplementation probably reduces mortality in older people (but not by enough)

1. Stratton et al. 7630 participants, 166 trials

Cited: Ann Int Med 2006 144:37

2. Cochrane meta-analysis. 3017 participants, 32 trials

Relative risk of death [0.74](#) (0.59-0.92)

Milne et al Cochrane Database Syst Rev 2005 1 CD003288. Pub2.DOI

3. Potter JM et al, 18 trials

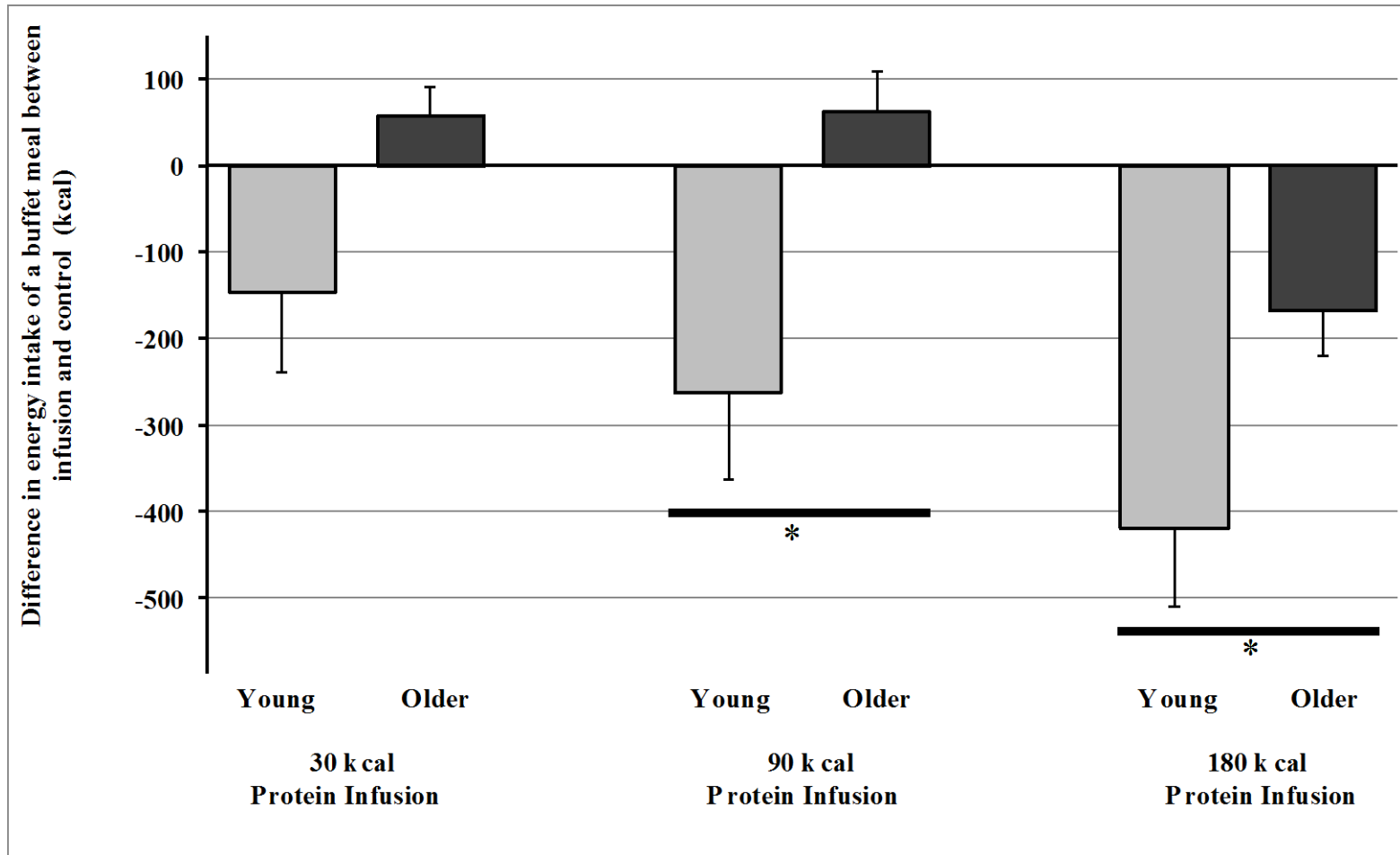
Relative risk of death [0.61](#) (0.45-0.82)

Curr Opin Clin Nutr Metab Care 2001 4:21

Protein probably less appetite-suppressant in older than young people

Soenen, Chapman et al unpublished data

Energy intake of the meal after saline infusion: Young: 1211±490 kcal
Older: 1022±317 kcal



Exercise



Exercise for Older People

- **↑ Muscle size**
- **↑ Muscle strength**
- **↑ Physical activity**
- **Improves sleep and balance**
- **↓ depression**
- **↑ glucose tolerance**
- **↓ falls**
- **Functional improvements (stair climbing, 6 min walk, disability etc)**

Fiatarone M et al. NEJM 1994 330:1819

Baker MK et al. Age and Ageing 2007 36:375

Singh N et al Sleep 1997 20:95

Singh N et al J Gerontol A Biol Med Sci 1997 52:M27

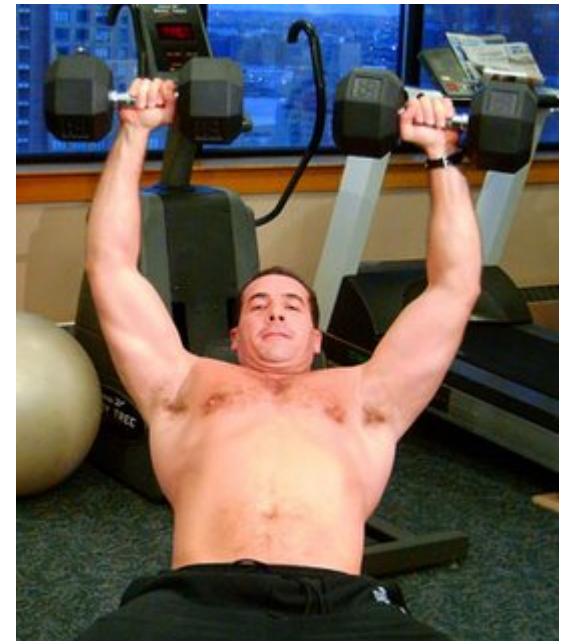
Seynnes O et al. J Gerontol A Biol Med Sci 2004 59:503

Orr R et al J Gerontol A Biol Med Sci 2006 61:78

Exercise Prescription for Sarcopaenia Prevention

- **Exercise 30-45 min at a time, 3-5 x per week**
- **Mixture of aerobic and resistance exercise**
- **Resistance exercise ideally at least half**
eg minimum of 30 min per week, 2 x per week at $\geq 50\%$ of maximum capacity

Visvanathan R Maturitas 2010



Obesity in Older People

High and increasing prevalence in Australia using “standard” criteria (BMI > 30 kg/m²)

	2000		2008
65-74 yr	25%	→	31%
74 yr	15%	→	23%

↑ is mainly due to ↑ numbers entering old age already obese.

The causes of obesity in older people are largely the causes of obesity in younger people

Ageing Modifies the Effects of Obesity (for good and bad)

- **Absolute and relative increases in morbidity and mortality**
- **Adverse effects amplified by interactions with conditions that become more prevalent with age: eg diabetes, certain cancers, OA**
- **Associated with ↑ rates of nursing home admissions: those already overweight or obese who experience further significant weight gain 2x more likely to be admitted to a nursing home than those who do not gain weight.**
- **In older people a BMI ≥ 30 kg/m², particularly if morbid obesity associated with loss of functional independence, increased demand for health care services, significant increases in rates of adverse events, and increased mortality.**

BUT

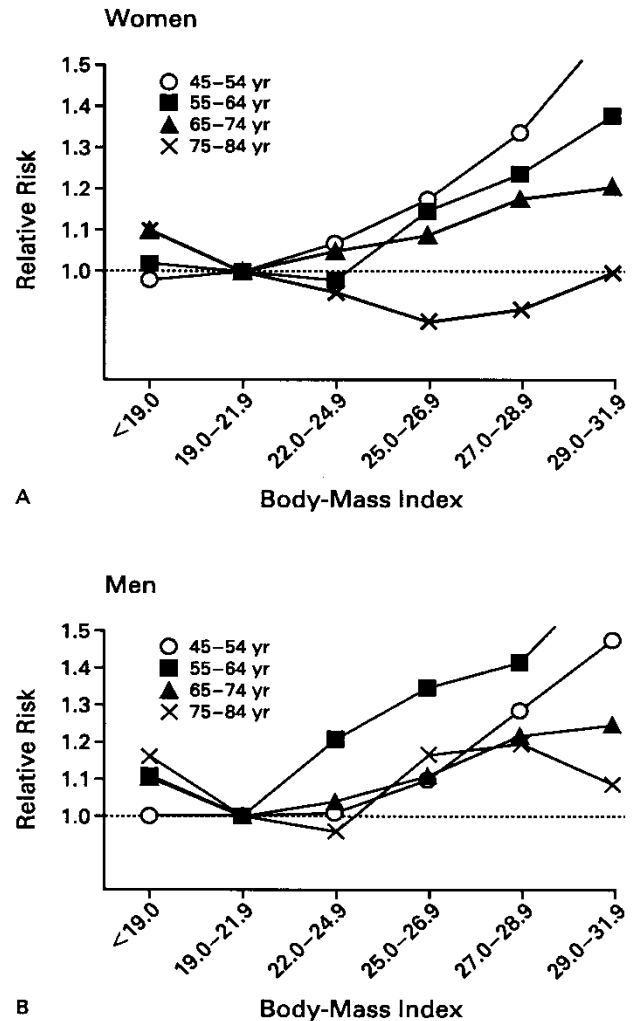
If you are old being “overweight” is not as bad for you as for younger adults

Be very careful about recommending weight loss in the elderly unless there are likely to be clearcut functional benefits

Relative risk of death associated with obesity diminishes with age

from: Guidelines for healthy weight *Willett et al NEJM 1999 341:427*

Relative
Risk of
death

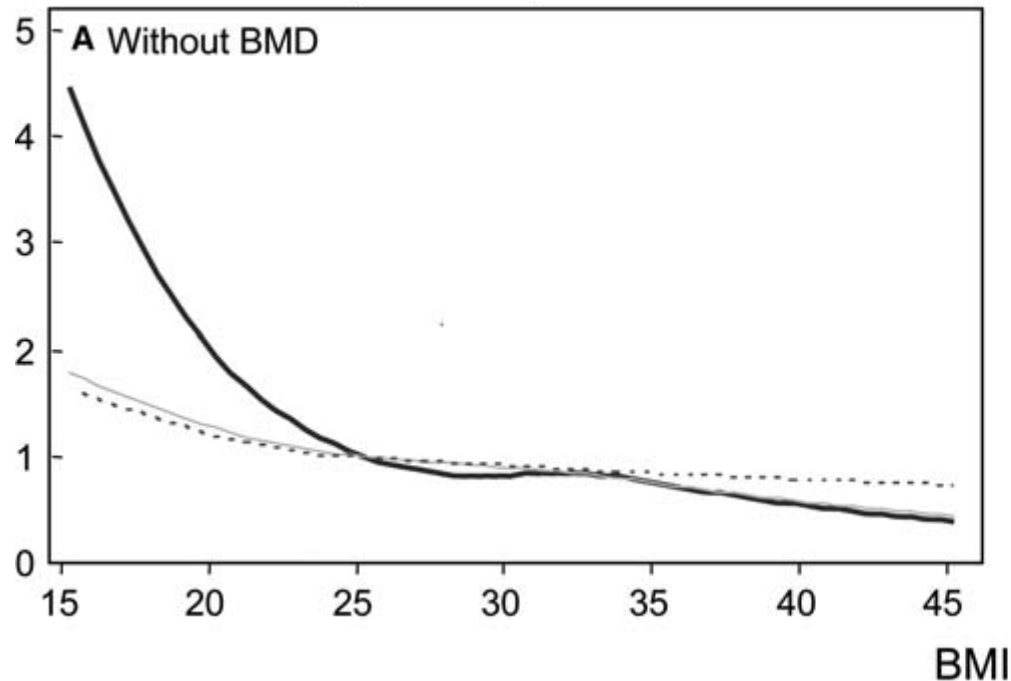


Increased weight protects against fractures

Negative association between body weight and fracture rates

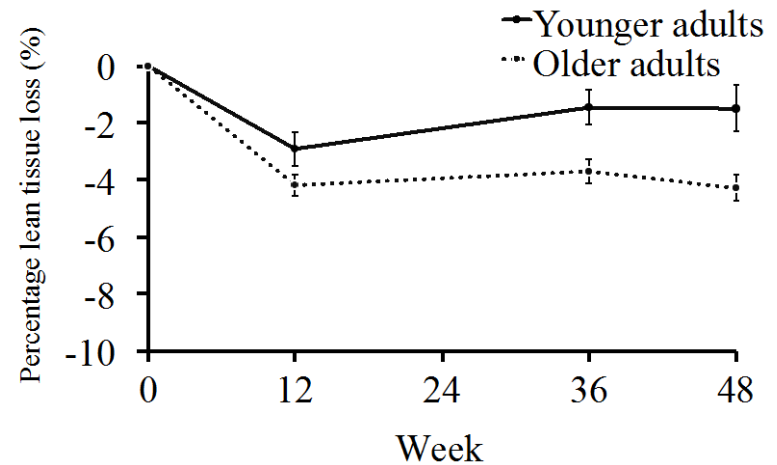
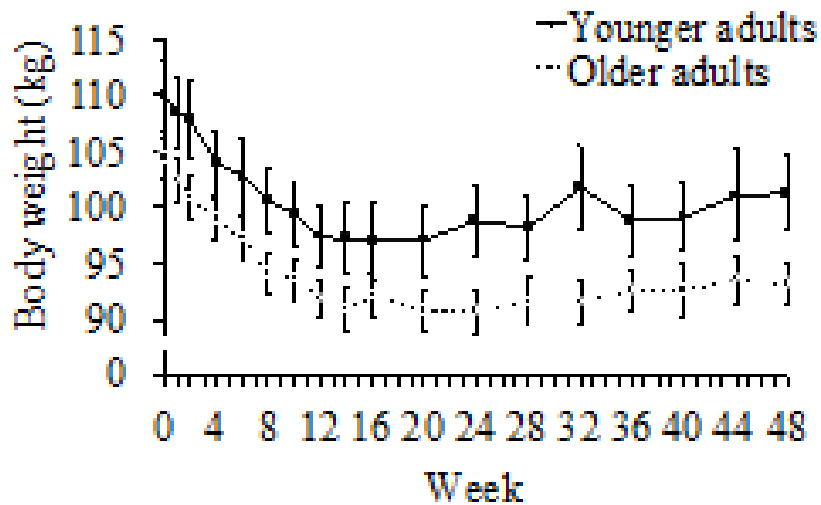
Recent decline in # rates has been attributed to ↑ rates obesity

Relative fracture risk (vs BMI=25)



Lowest fracture rates in women are at body weight 80 kg (176 lb) \approx BMI 30.1 kg/m²

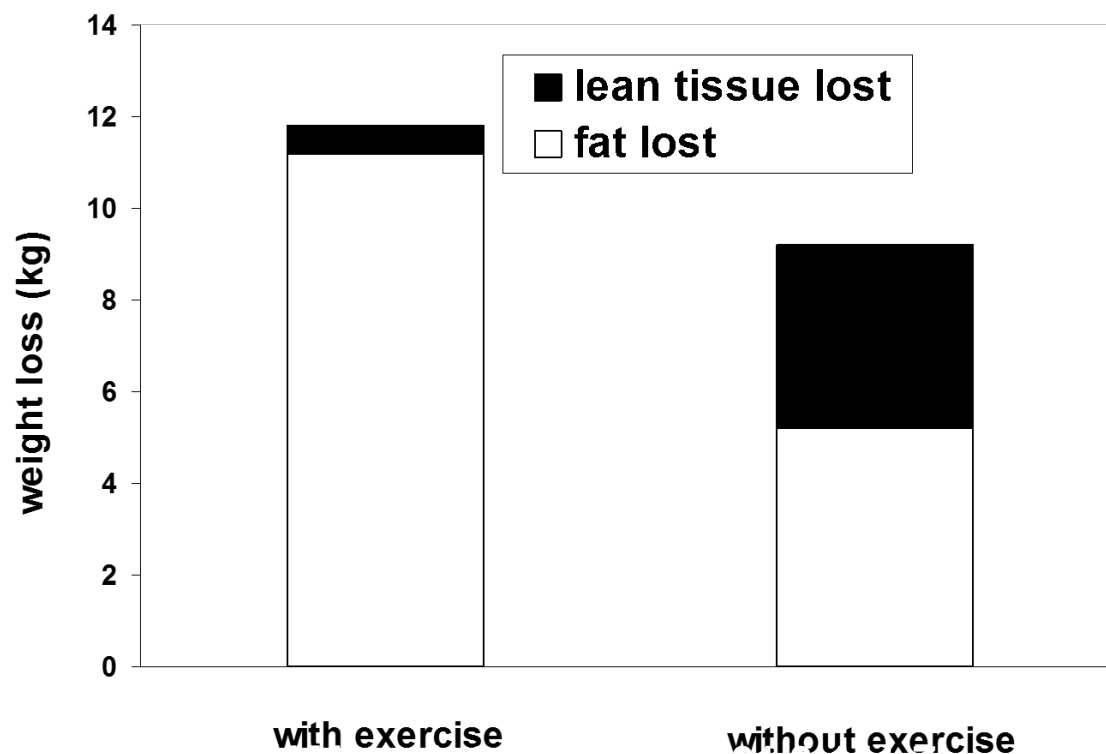
Older People lose more lean tissue on weight loss diets



Management of Obesity in Older People

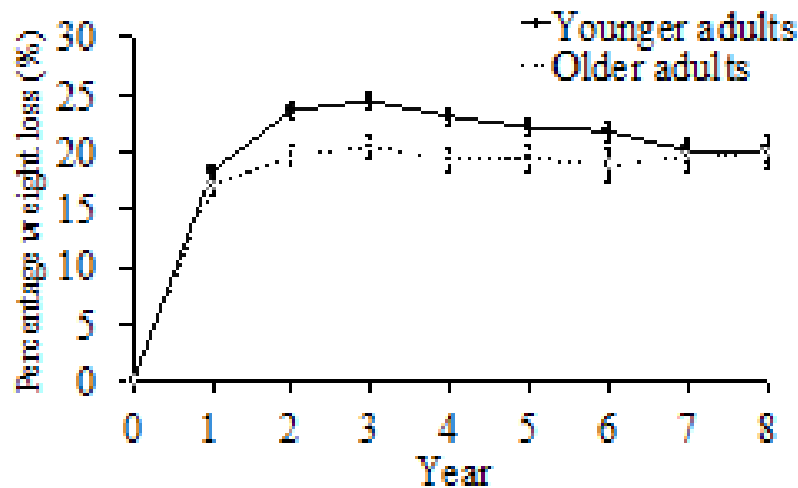
- It may not need management at all
- Combine diets with exercise to preserve important muscle mass
- ?bariatric surgery

Muscle preserving effect of exercise during a weight loss diet: the effect on type of tissue lost during an 8 week weight loss program, in 72 mildly obese men, randomly assigned to exercise or no exercise.



Similar Weight Loss after Bariatric Surgery in Older vs Young adults

?different effects on body composition



Other forms of malnutrition in older people

Common problems include

- **Vitamin D insufficiency/deficiency**
- **Iron deficiency**
- **Suboptimal calcium intake**
- **B12 deficiency** (*11% vs 5% < 260 pmol/L in Framingham Study*)

Take Home Messages

- The problem of underweight/under-nutrition in older people is under-recognized and under-appreciated
- Weigh your patients regularly and take note
- Red flags weight loss $> 5\%$, BMI $< 22 \text{ kg/m}^2$
- Body weight and composition targets that apply to young and middle aged adults probably not applicable to older adults, particularly > 75 years
- Older people should not be encouraged to lose weight unless suffering functional adverse effects. Long-term outcomes of weight loss (by any means) not yet known

Questions?

