# Overview of Nutrition with an Emphasis on Ageing

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# What We Are Going to Cover

- Overview of nutrition and diet
- Overview of ageing healthily
- Changing nutrient requirements with ageing
- Malnutrition and ageing
- Approaches to meet changed nutritional requirements with age
- What is the “best” diet?

# What is Nutrition?

- Science of food and nutrients and their actions within the body
- Food consists of chemical compounds, many of which are nutrients
- **Nutrients** are needed for maintenance of life and growth
- **Diet** is the kinds of food usually eaten

# What is Nutrition (cont)?

- **Essential nutrients** – must obtain from food because can't make in sufficient quantity
  - about 40 of them

- Some nutrients needed in large amounts and some in tiny amounts
  - e.g. need about 200 million times more water than Vitamin B12!

# Spectrum of Nutritional Requirements

| Essential Nutrient | Adult Daily Requirements |
|---|---|
| Vitamin $B_{12}$, Vitamin D, Vitamin K, chromium | 1-10 µg |
| Biotin, iodine, selenium | ~ 100 µg |
| Folate, molybdenum | 200 µg |
| Vitamin A, thiamin, riboflavin, Vitamin $B_6$, fluoride, copper | 1-2 mg |
| Pantothenate, manganese | 5-10 mg |
| Niacin, Vitamin E, zinc, iron | ~ 15 mg |
| Vitamin C | ~ 50 mg |
| Magnesium | 300 mg |
| Calcium, phosphorus | ~ 1 g |
| Sodium, chloride, potassium, essential fatty acids | 1–5 g |
| Protein (essential amino acids) | ~ 50 g |
| Carbohydrate | 50–100 g |
| Water | 1,000 g |


"Today I ate two bowls of dog food, a sandwich crust, some spaghetti that fell on the floor, half of your cat food, a wet tea bag, three bugs and the inside of a sneaker. How many grams of fat is that?"

# Why Don't We Usually Worry About Nutrients When We Eat?

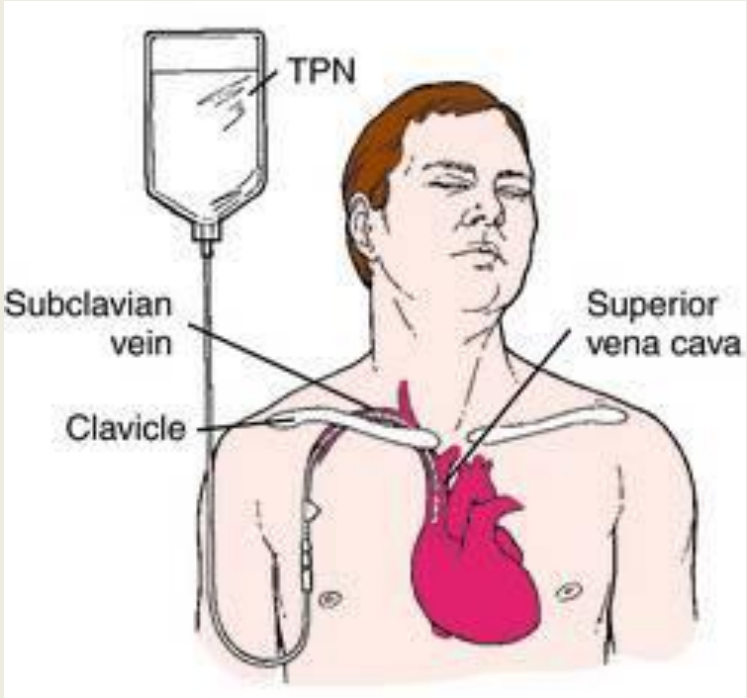
- We eat food not nutrients!
- Plants and animals are made of the same "nutrients" that we are so usually OK if we eat "wholefoods" rather than the "Western" diet

# Why Don't We Usually Worry About Nutrients When We Eat (cont)?

- Humans are very adaptable to different diets – e.g. Inuit diet vs. Traditional Chinese "peasant" diet
- So why do we need the science of nutrition – isn't it all common sense?

# Proposition – We Know a Lot About Human Nutrition

- Through research mainly in the 20th century, we know all the essential nutrients
- Nutrient deficiency disease is now rare in Developed world
- With Total Parenteral Nutrition (TPN – feeding through the veins) we can keep people alive and prevent nutritional deficiencies



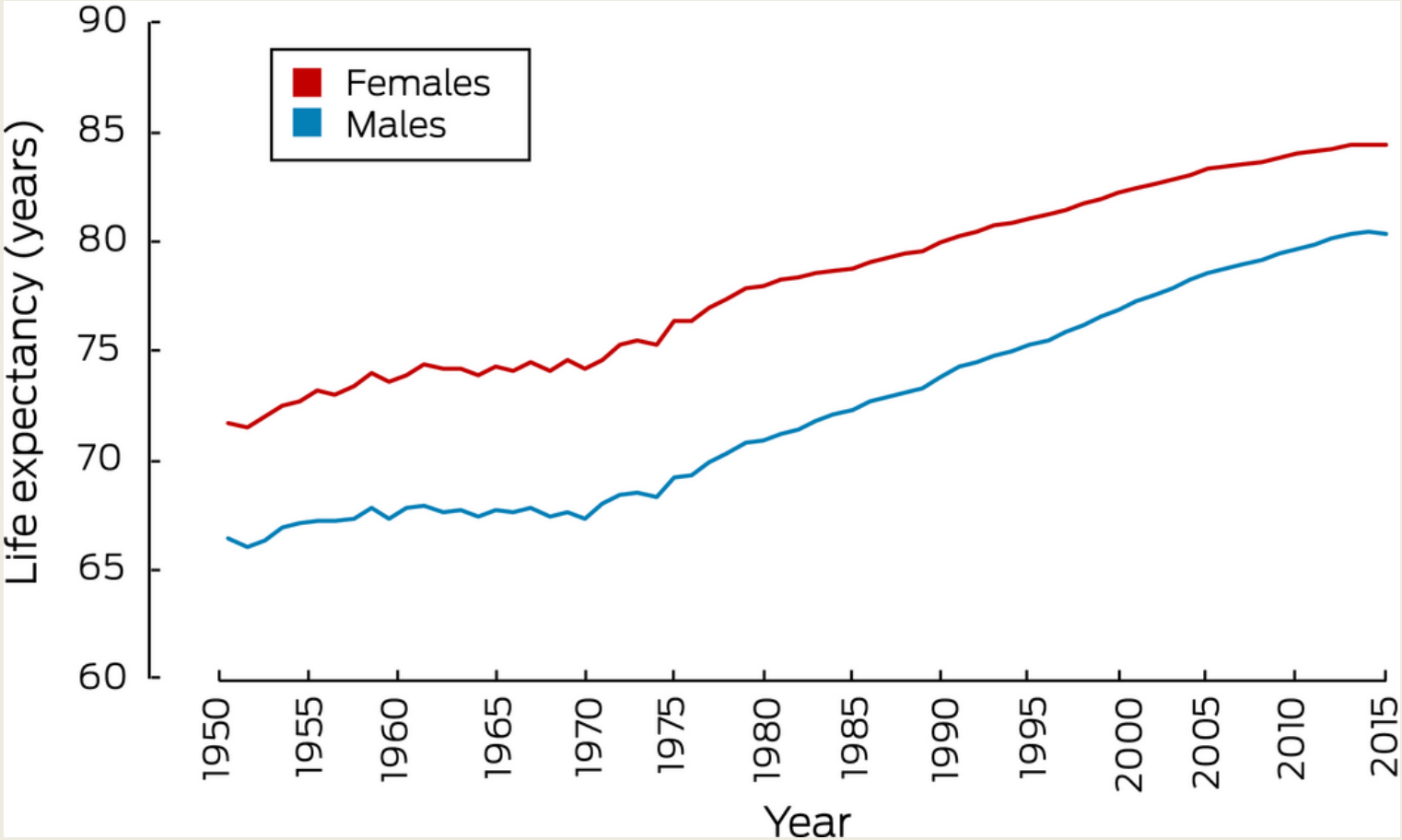
# Proposition – We Don't Know a Lot About Human Nutrition

- We know how to prevent nutrient deficiencies, we **don't** know the "best" diet
  - i.e. survival vs. optimal

- Optimal for what?
  - Living the longest
  - Quality of life
  - Preventing chronic disease (e.g. cancer, heart disease)
  - Brain function (cognition)
  - Staying thin

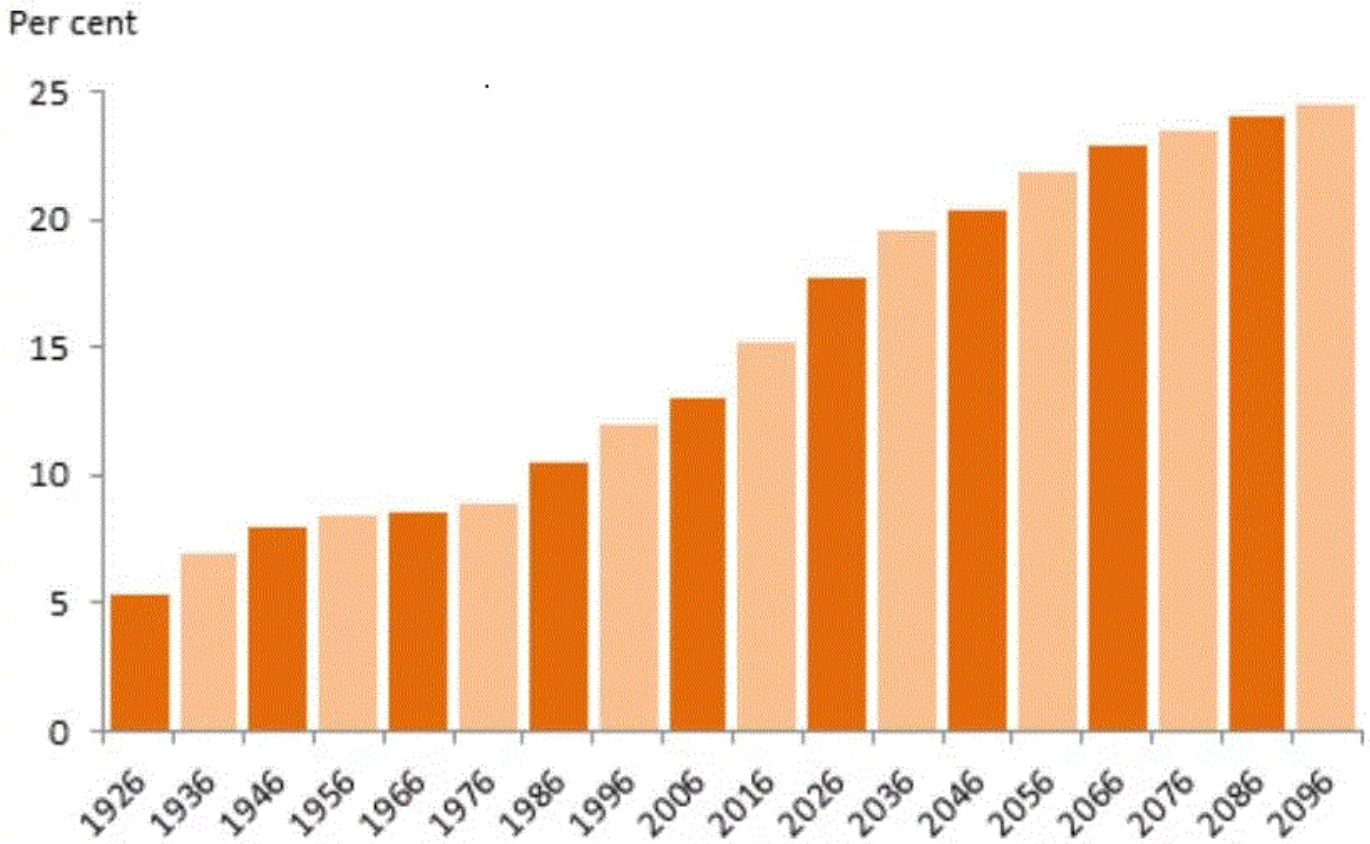

*"Hundreds of years of medical progress, and all you can tell me to do is eat less?"*

# Ageing – We Are Living Longer



# Ageing – There are More and More of Us Over 65

**Figure 1: Australian population aged 65 and over, at 30 June, over time (per cent)**




*Sources:* ABS [1, 2].

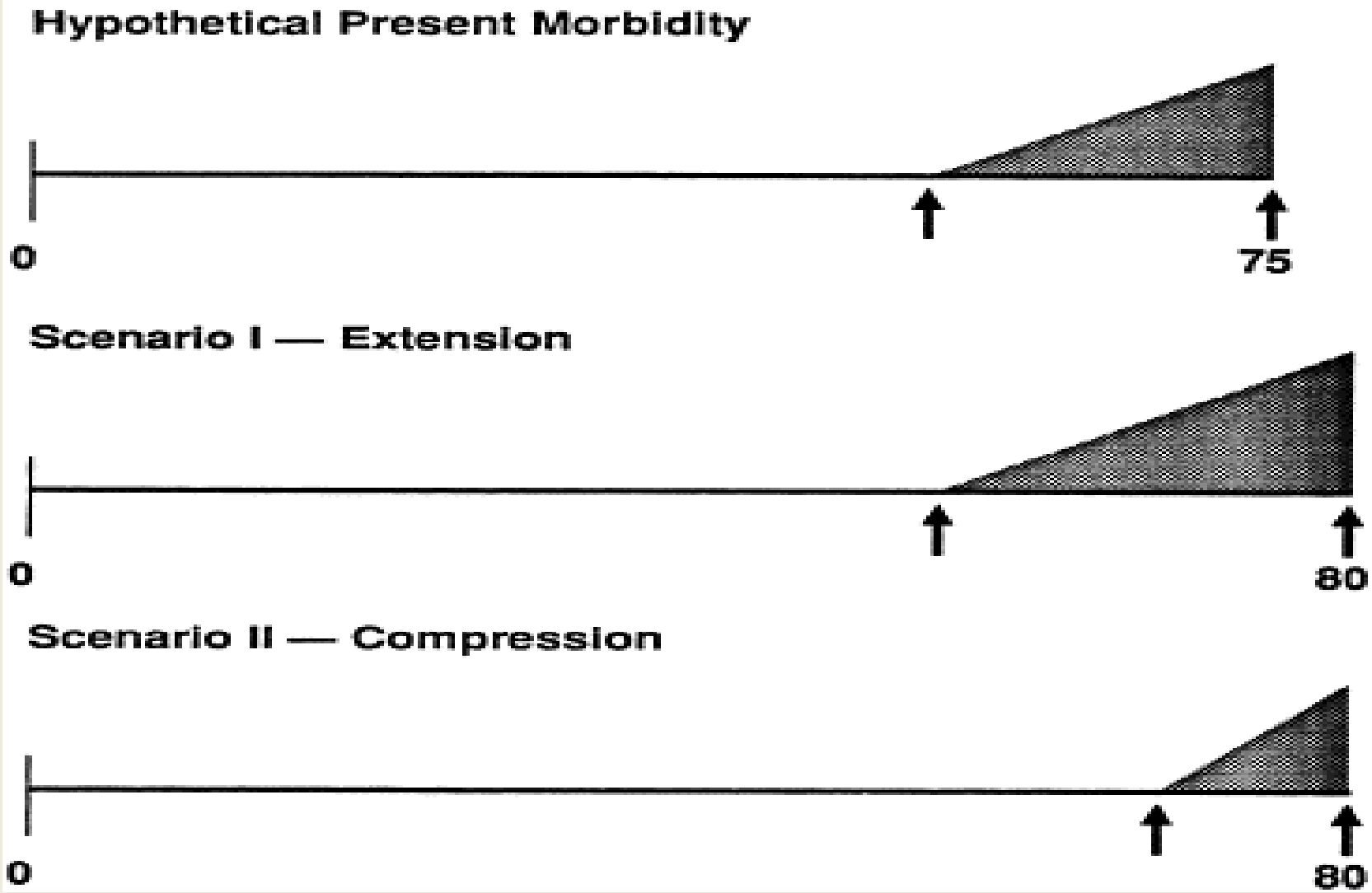
# Do We Want to Live Longer or Healthier?

- Chronological vs. Biological Age (cognitive age?)
- 70-80% of longevity is healthy behaviour and 20-30% is genes
- Most predictive is:
  - Regular physical activity
  - Not smoking
  - “Good” eating habits
  - Healthy body weight
  - Social activity

# Do We Want to Live Longer or Healthier (cont)?

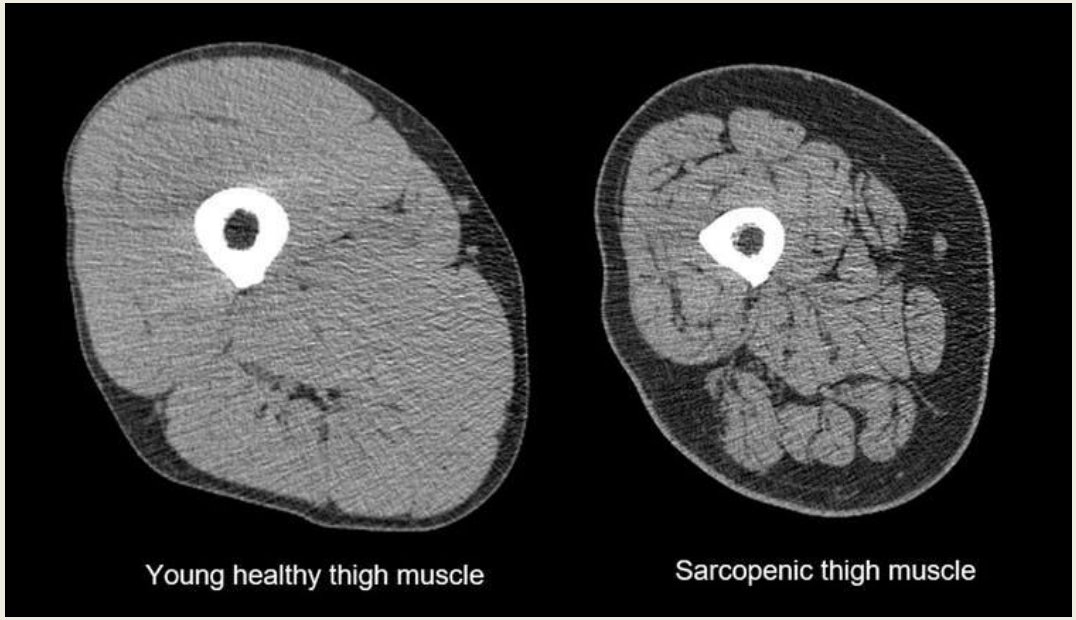
- Biologically we are unlikely to live past 120
  - However, we want to be as healthy and functional as possible
  - Try to have disability/disease for shortest period before we die
  - Can affect this with diet/physical activity/social environment
- Compression of morbidity (illness)

# Compression or Extension of Morbidity



# Physiological Changes with Age Related to Nutrition

- Body Composition - tendency to lose bone and muscle and gain body fat; thought to be due to changes in hormones regulating appetite and metabolism
- Muscle loss **(sarcopenia)** can increase risk of falls
  - Partially preventable with diet and physical activity




# Physiological Changes with Age Related to Nutrition (cont)

Immune function

- Immune system declines with age
  - So increased risk of infection
  - May slow decline with increased physical activity
- Also can be affected by nutrient deficiencies

# Physiological Changes with Age Related to Nutrition (cont)

Gastrointestinal tract

- Gut “slows” so more constipation
- Appetite hormones reduced
  - can lead to weight loss
- Stomach function changes and is less efficient at breaking down food into nutrients

# Other Factors Affecting Nutritional Status with Age

- Tooth loss (harder to chew)
- Sensory losses
  - reduced smell (affects taste and appetite)
  - eyesight issues may lead to isolation (e.g. stopping driving) and difficulty in reading labels
  - hearing loss may lead to social isolation
- Disability
  - cooking, cleaning, and shopping may be difficult
- Social and economic factors

# Do Our Nutritional **Requirements** Change as We Age?

- Reduced **energy** (calories/kilojoules) required
  - Metabolism slows, have less lean mass (muscle/ organs), need less energy to maintain body weight
  - Fat needs less energy to maintain than muscle!

- Similar or higher **protein** intake required
  - Some evidence that higher protein intake related to ↑muscle (↓ sarcopenia), ↑strength, ↓ falls, and ↓ frailty
  - Especially if together with resistance exercise

**Table 27.6 Recommended dietary intakes for seniors compared with their younger counterparts**

| | RDI >70 yrs | RDI 31–50 yrs |
|---|---|---|
| Protein | | |
| Men | 81 g | 64 g |
| Women | 57 g | 46 g |
| Vitamin B2 mg | 1.6 | 1.3 |
| Vitamin B6 mg | 1.7 | 1.3 |
| Vitamin B12 mg | 2.4 | 2.4 |
| Calcium mg | 1300 | 1000 |
| Vitamin D µg | 15 | 5 |

*Source:* NH&MRC May 2006: <www.nhmrc.gov.au/publications/>.

# Do Our Nutritional Requirements Change as We Age (cont)?

- More of some **vitamins** and **minerals** required
  - Changes in vitamin/mineral requirements mainly related to reduced absorption but also changes in metabolism
  - Most important are probably **Vitamin B12** and **Vitamin D**

# What Is So Important About Vitamin B12?

- Only found in animal foods
- Vitamin B12 in food needs stomach acid to be useable by the body
  - About 30% of those over 60 have stomach issues (**atrophic gastritis**) so can't absorb B12 from food
  - U.S. recommends that most B12 come from supplements or fortified foods (B12 added) for those over 50
- We have stores, so deficiency takes time

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# What Is So Important About Vitamin B12 (cont)?

- Some signs of deficiency are:
  - Poor cognition (concentration and memory)
  - Eventual irreversible nerve damage
- Best way to detect is blood test
- Fortified foods??
  - Not many in Australia (e.g. soymilk, “fake” meat)
- Multivitamin usually have more than enough

# What Is So Important About Vitamin D?

- Mainly synthesised from sunlight and efficiency of conversion is reduced as we age (skin cancer?)
- Housebound and institutionalised older people at particularly high risk
- Vitamin D deficiency linked to osteoporosis (calcium), sarcopenia (muscle wasting), and increased falls in older people BUT extra Vitamin D NOT useful
- Around 20% of >75 years low in Vitamin D and 4% very low in Australia, based on blood tests

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# What Is So Important About Vitamin D (cont)?

- Best source is sunlight (UV)
- 15 µg recommended from food? Need to eat **every day:**
  - 165g salmon OR
  - 12 cups fortified milk OR
  - 18 slices of Kraft sliced cheese
- Most multivitamins are fine but need to check
- More is NOT better necessarily

# What About Water?

- Thirst mechanism less effective with age
- Also lower body water, less efficient kidney function, drugs
- So dehydration more common
  - can lead to increased risk of pneumonia, urinary tract infections, confusion, and disorientation
- Aus Recommendations for fluid intake (>70 yo)
  - Men 2.6 L (about 10 cups)
  - Women 2.1 L (about 8 cups)

# How Should I Eat Differently as I Age?

- The closest to a magic pill is **exercise** – both aerobic and resistance
- Addresses:
  - reduced energy requirement
  - prevention of sarcopenia
  - immune dysfunction
  - chronic disease
  - cognitive decline

# How Should I Eat Differently as I Age (cont)?

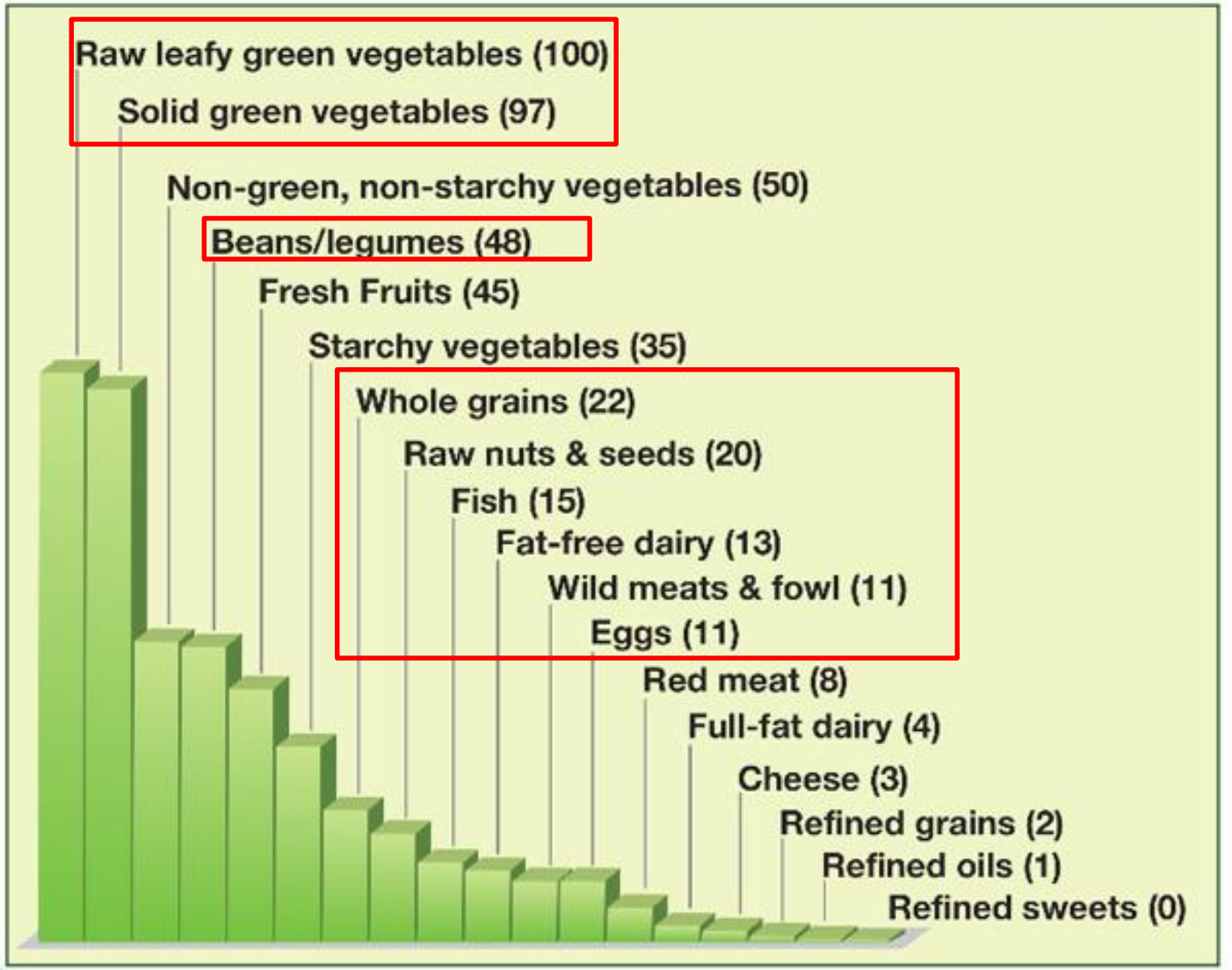
- Lower energy requirements
- Increased protein and some vitamin/mineral requirements

Best solution is:

- ⇩ nutrient-poor, energy-dense foods
- ⇧ nutrient-dense, energy-poor foods

# ⬆Nutrient and ⬇Energy Density Foods

( high in protein)



# What About Supplements and Fortified Foods?

# What About Supplements and Fortified Foods (cont)?

- No evidence that **individual** nutritional supplements generally beneficial to **healthy** people in preventing disease
- However, difficult to meet dietary **Vitamin D** recommendations from food
- Problem with obtaining **Vitamin B12** from food for 30% with atrophic gastritis – need supplements or fortified food

# What About Supplements and Fortified Foods (cont)?

How do you know if you are deficient for vitamins D and B12?

- A blood test is the best way

How do you make sure that you have enough Vitamins D and B12?

- A daily multivitamin
  OR
- Fortified foods (not yet practical in Australia)

# What to Look For in a Multivitamin

Australian RDI for >70: Vit B12, 2.5 mcg and Vit. D, 15mcg

| | |
|---|---|
| Vitamin A (As Retinyl Acetate) | 300mcg R.E. |
| Lutein | 500mcg |
| Lycopene | 600mcg |
| Betacarotene | 1.8mg |
| Vitamin B1 (Thiamine Nitrate) | 2.18mg |
| Vitamin B2 (Riboflavin) | 3.2mg |
| Nicotinamide | 15mg |
| Vitamin B6 (Pyridoxine Hydrochloride) | 9.7mg |
| Vitamin B12 (Cyanocobalamin) | 25mcg |
| Vitamin C (Ascorbic Acid) | 90mg |
| Vitamin D3 (Cholecalciferol) | 15mcg |
| Zinc (As Oxide) | 7.5mg |
| Selenium (As Sodium Selenate) | 55mcg |

| | |
|---|---|
| Vitamin E (dl-alpha-Tocopheryl acetate) | 75mg |
| Vitamin K1 (Phytomenadione) | 25mcg |
| Biotin | 45mcg |
| Folic Acid | 300mcg |
| Calcium Pantothenate | 10.8mg |
| Calcium (As Carbonate) | 200mg |
| Potassium (As Sulfate) | 80mg |
| Chromium (As Chloride) | 100mcg |
| Copper (As Sulfate) | 1mg |
| Iodine (As Potassium Iodide) | 150mcg |
| Iron (As Ferrous Fumarate) | 4mg |
| Magnesium (As Oxide) | 50mg |
| Manganese (As Sulfate) | 5mg |

*R.E. = Retinol Equivalents*

This is Centrum Advance 50+

# Nutrition-Related Health Problems with Increasing Age
## (compression of morbidity)

- Arthritis
- Cataracts and macular degeneration
- Diabetes
- Cardiovacular Disease (heart disease/stroke)
- Cancer
- Osteoporosis/ fractures
- Sarcoponia (muscle weakness)/falls/frailty
- Cognitive impairment/dementia (Alzheimer's)

# What is the “Best” Diet for Prevention?

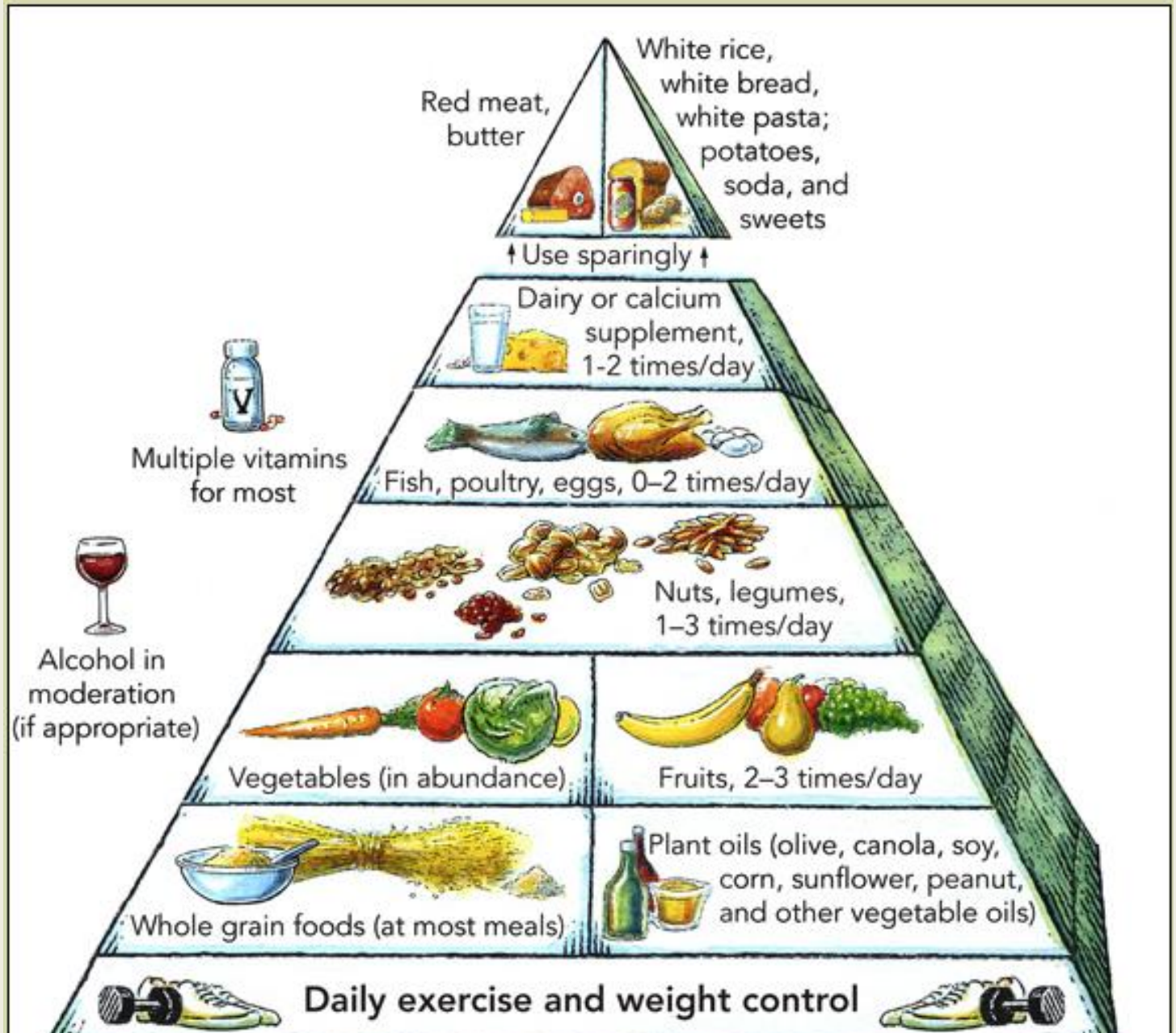
## Popular Diets

- Low fat (e.g. Pritikin, Ornish)
- High fibre
- Low glycemic index (GI) (e.g. Brand-Miller)
- Low carbohydrate/ Keto (e.g. Atkins)
- Paleolithic
- High protein (e.g. CSIRO, Zone)
- Flexitarian/Vegetarian/Vegan/Raw
- Fasting (intermittent)/low calorie
- Mediterranean

# What is the “Best” Diet According to Current Evidence?

- Lots of vegetables (including legumes) and fruit
- Fish/seafood rather than red meat/animal fat
- Grains/Cereals/Breads/Pasta are healthier if wholemeal/unprocessed
- Minimal processed foods (usually high in sugar and fat, low in fibre)
- Most evidence for Mediterranean diet pattern

# Mediterranean Diet Pattern



# How Well Are Older People Currently Eating in Australia?

Based on ABS  Dietary Survey 2011-2012 (>71 years)

| | Vegetables | Fruit |
|---|---|---|
| Recommended (serves/day) | 5 | 2 |
| Average intake (serves per day) | 2.8 | 1.7 |
| Reaching recommendation | 9% | 68% |

# Summary

- In some ways we know a lot about nutrition, in others less (especially “optimal” diet)
- There is evidence that healthy behaviours (especially exercise and diet) can lead to increased longevity, less chronic disease, and compressed morbidity
- As we age, we require less energy and more protein and more of some vitamins/minerals
- Can mostly meet this need by focusing on low-energy, nutrient-rich foods (high protein)
- A daily multivitamin may be good insurance but does NOT compensate for a poor quality diet

# What about Malnutrition in Older People?

- What is it?
  - Low energy (calorie) intake
  - Unplanned weight loss (fat or muscle)
- Leads to:
  - Illness ↑ (immune function↓, wound healing ↓, muscle weakness/falls↑)
  - Death ↑
- Can be overweight and malnourished

# How Common Is Malnutrition in Older People in Australia?

- Perhaps 5-8% in the community
- Much higher (?50%) in institutional care

# Which Older People Are at Risk of Malnutrition?

- Institutionalised
- Older men, living alone
- Low socio-economic status groups
- Recently bereaved
- Depressed/cognitively impaired
- Disabled and/or with chronic disease
- Physically and socially inactive
- Sensory impairment
- Digestive issues