Nutrient recommendations for NCD prevention

Professor Pulani Lanerolle

Nutrient requirements and recommendations

- **Requirements** – aim to satisfy the minimum requirement needed to prevent deficiency. Based on requirement estimates and describes actual needs.
  - For energy it is the average
  - For nutrients it includes a safety factor in terms of standard deviation
  - Requirements are given as : EAR, RDA, RNI, DRV, NRV etc
  - For micronutrients a safe upper limit or a guidance levels (inadequate data for SUL)

dietary reference value

nutrient

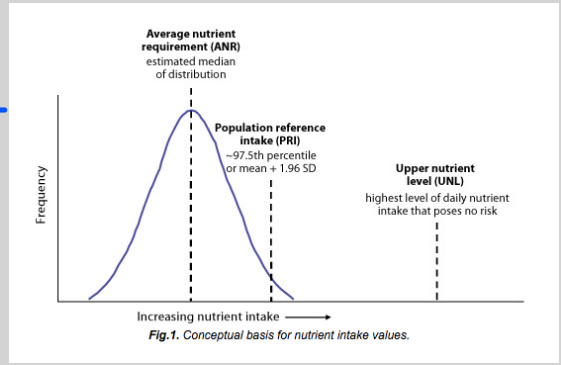


Fig.1. Conceptual basis for nutrient intake values.

2 SD away from mean

↑

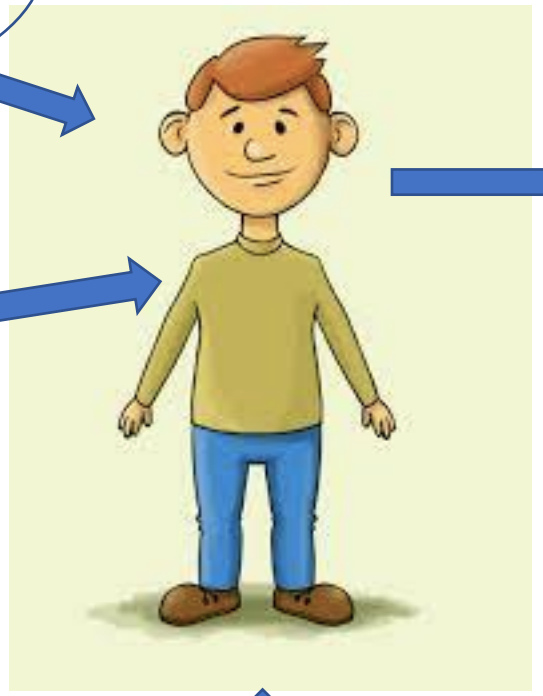
safe area

- **Recommendations for Intake goals** – describes desirable intakes for health outcomes, and satisfy(are within) the requirement estimates also
  - Given as population intake goals
  - Individual intake goals

Recall the principles of nutrition..

Energy requirement based on physiological need

Macro and micronutrient requirements based on physiological need



Also based on **recommendations for NCD prevention**

What and **how much**

- Eat
- Physical activity/Sleep

Assessment of current **nutritional status**

Enabling environment

Sustainable food

Application of requirements to individuals

Learning outcomes

For each stage of the Lifecyle, to be able to explain the physiological needs that will determine changes or differences in the requirements

Relate the physiological changes to the

- Corresponding requirements for the macro and micronutrients
- Corresponding special requirements

Adjust requirements based on an individuals nutritional assessment findings

Translate individual requirements to advice for each stage

There is **continuity in the influences** contributing to chronic disease development.
Also continuous opportunities for prevention.

Life course approach recognizes that both effects and intervention opportunities are a continuum

- Influences -during the womb are different from later in life - effect on subsequent manifestation of chronic disease
- Risk factors can be addressed from fetus throughout life and even during old age

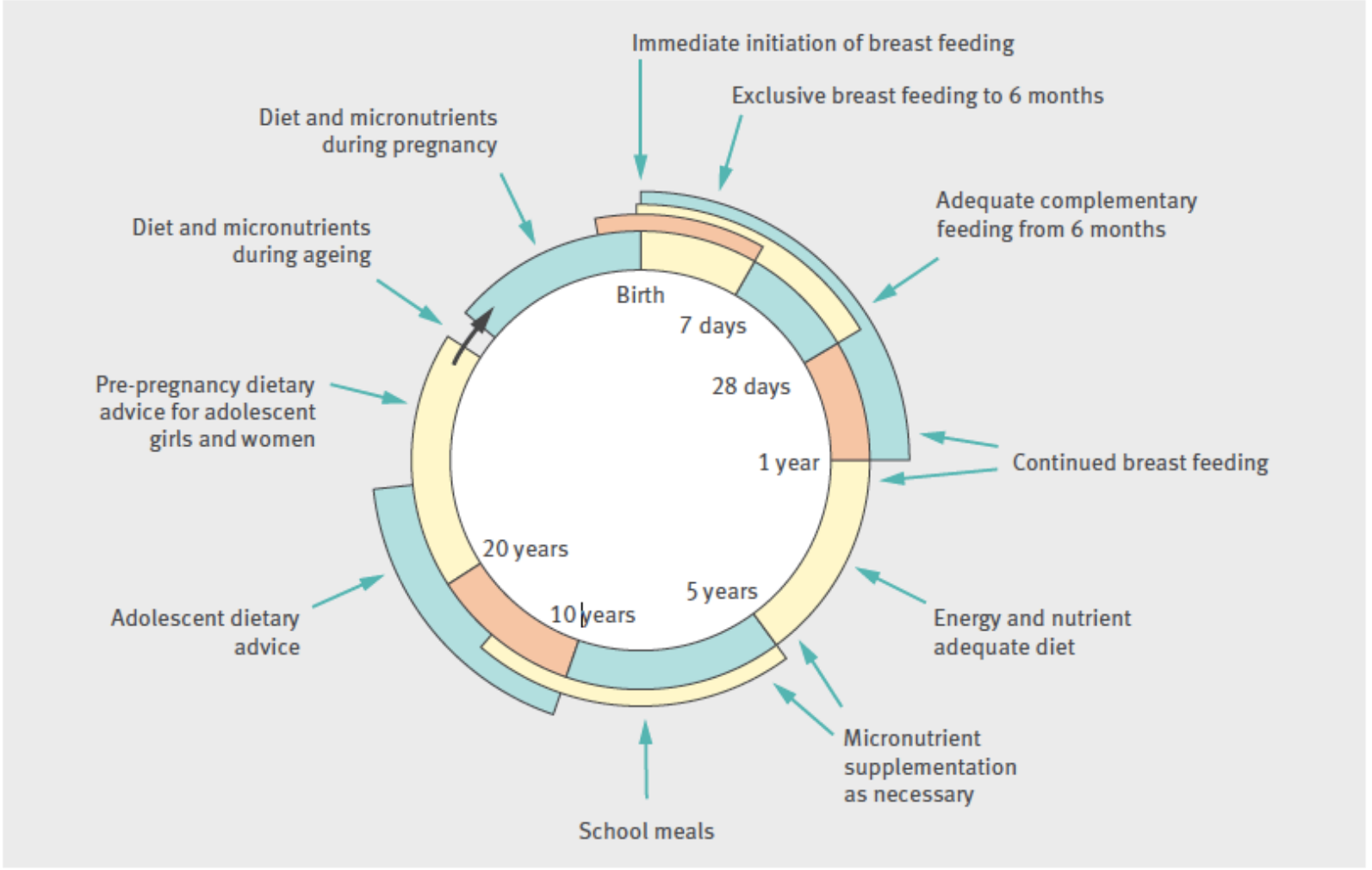


Fig 2 | Improving nutrition throughout the life course[15]

- **Requirements** of macro and micronutrients -

  are to prevent deficiency and through that achieve optimum health.
- Both undernutrition and overnutrition play a role in development of chronic disease
- Need to look beyond requirements, and think of intake goals that look at upper limits which are still within the safe limits

Man made and natural environment has effects – and can be addressed

Those most affected by double burden are disadvantaged people in affluent countries, as well as a mixture of people in developing and transitional countries

Nutrient recommendations for NCD prevention

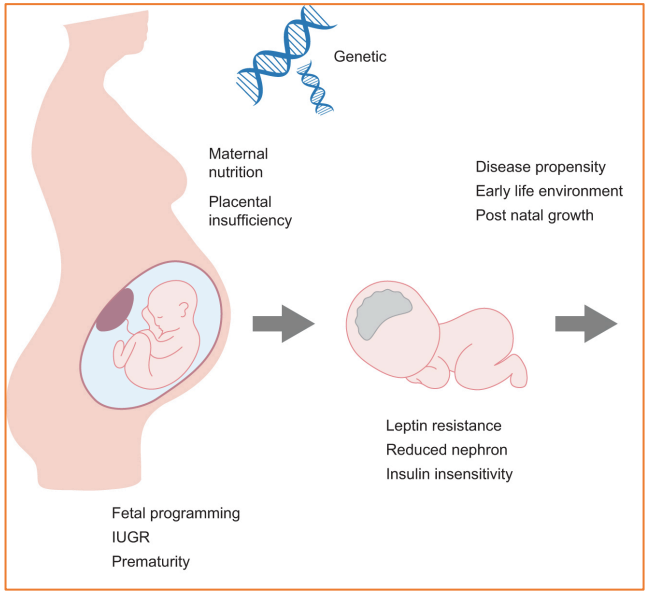
Learning outcomes

Recognise	Recognise that evidence informs the development of guidelines and the need for assessment of quality of data
Apply	Apply knowledge of evidence to draw links between exposure and disease across the life stages
Outline	Outline the guideline development process
Describe	Describe the background for the different guidelines
State	State the guidelines currently available
Apply	Apply guidelines to practice

Some evidence for effects of nutrition during lifecycle stages, in the development of NCD

Fetal development and maternal environment

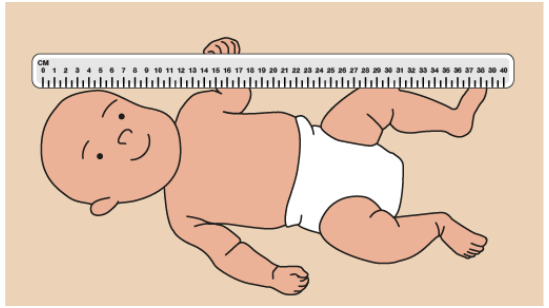
- Intra Uterine Growth Retardation



- is associated with increased risk of CHD, stroke, diabetes and raised BP

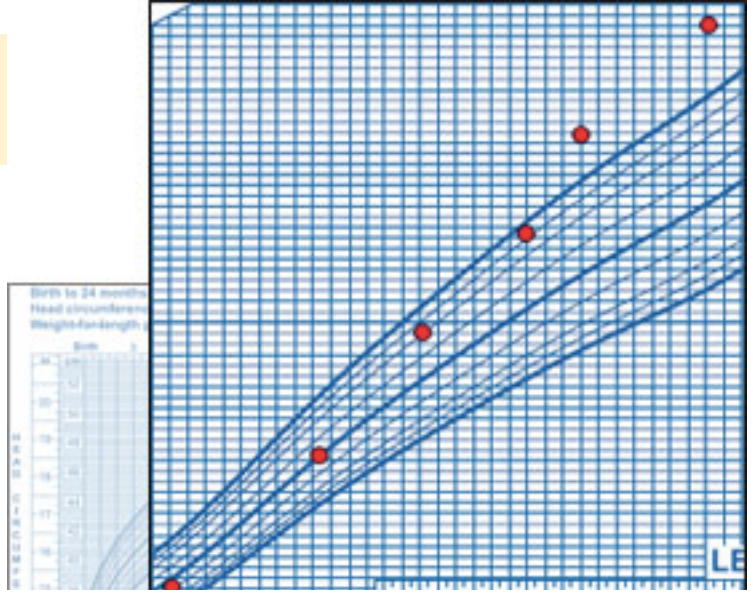
- Large size at birth — - is associated with increased risk of diabetes and CVD
- High birth weight — - related to increased risk of breast and other cancers

Optimal birth weight and length is important not only for immediate reduction of morbidity and mortality but also for reduction of long term risk of diet related chronic disease later in life

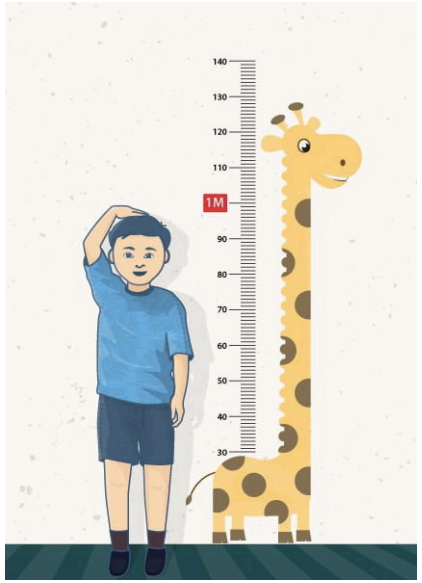


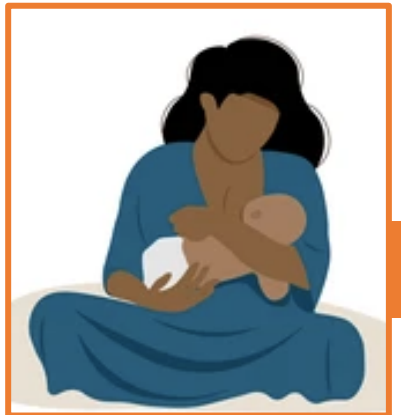
Infancy

Height and weight



- Crossing the centiles upwards indicating excessive weight gain - risk of chronic disease later in life (WHO TR 916)
- Low weight in the first year irrespective of birth weight – risk of CHD(WHO TR 916)
- Short stature - risk of CHD, stroke and to a lesser extent diabetes (WHO TR 916)
- When infants with low birth weight show accelerated weight gain – increased risk of fat deposition and risk of chronic disease





Breastfeeding has a protective effect.

Childhood and adolescence

- Irrespective of size at birth, low growth in childhood - is associated with increased risk of CHD
- Retarded early growth with greater weight gain between 7 and 11 years of age - - linked to higher blood pressure

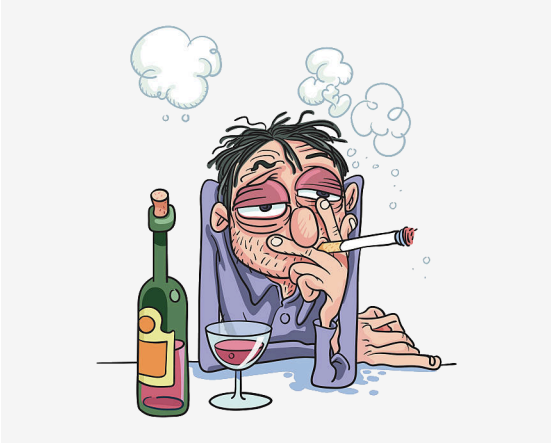
- There is a clear link between onset of obesity in early life and cancer risk (*International Agency for Research on Cancer (IARC) France)*
- High blood pressure in childhood tracks to adulthood and is associated with obesity and serum lipid profile and glucose intolerance

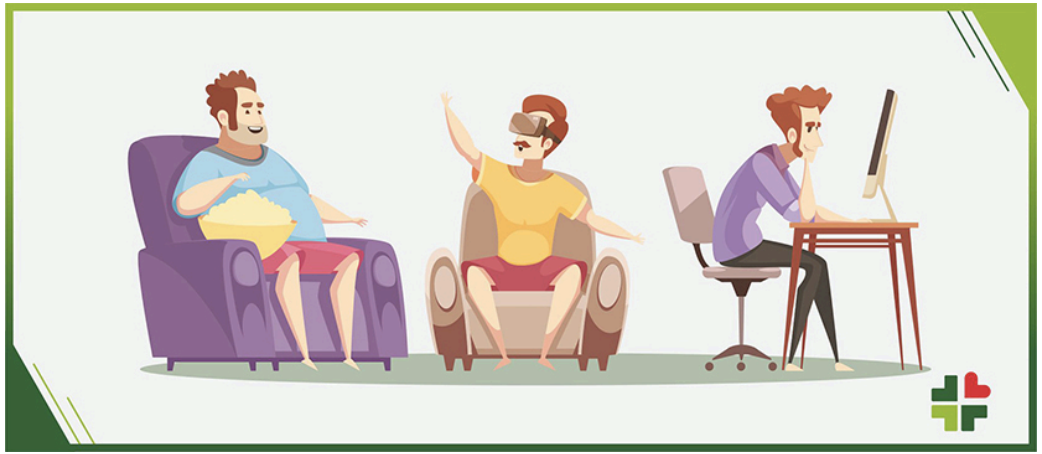
- High television viewing together with unsatisfactory diet is linked to high BP
- Many of these factors continue into adulthood and beyond

(WHO TR 916)

Adults

- CVD and diabetes - tobacco and alcohol, obesity, physical inactivity
- Coronary heart disease – high blood pressure, tobacco, obesity, P inactivity, heavy drinking
- Stroke– high blood pressure, heavy drinking, obesity, physical inactivity
- CVD and diabetes - low socioeconomic status (and in developing countries seen among higher socioeconomic groups as well)
- Habitual alcohol and tobacco contribute to raised blood pressure





Ageing /older people –
Concept of **healthy ageing**
Sri Lanka has a rapidly ageing population

Hanna chmurzyńska

- Most chronic diseases are observed during this age
- There is an absolute benefit in changing diet and PA
- Delaying or avoiding preventable disability by maximizing health – healthy ageing

- CVD, diabetes and some cancers peak during this age with a high burden

- **Older people are encouraged to eat a large and varied diet while maintaining weight and exercise**. Due to elderly having a higher CVD risk they benefit more from risk factor modification
- **Acceleration in decline can be reversed at any age and increases independence**

Iwona Walczak

Carbohydrate quality and human health: a series systematic reviews and meta-analyses

Andrew Reynolds, Jim Mann, John Cummings, Nicola Winter, Evelyn Mete, Lisa Te Morenga

Lancet 2019; 393: 434–45

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This online publication has been corrected. The corrected version first appeared at thelancet.com on January 31, 2019

See Comment page 384

Summary

Background Previous systematic reviews and meta-analyses explaining the relationship betwee and health have usually examined a single marker and a limited number of clinical outcom precisely quantify the predictive potential of several markers, to determine which markers a establish an evidence base for quantitative recommendations for intakes of dietary fibre.

Methods We did a series of systematic reviews and meta-analyses of prospective studies pu inception to April 30, 2017, and randomised controlled trials published from database ince which reported on indicators of carbohydrate quality and non-communicable disease incider factors. Studies were identified by searches in PubMed, Ovid MEDLINE, Embase, and the Coc

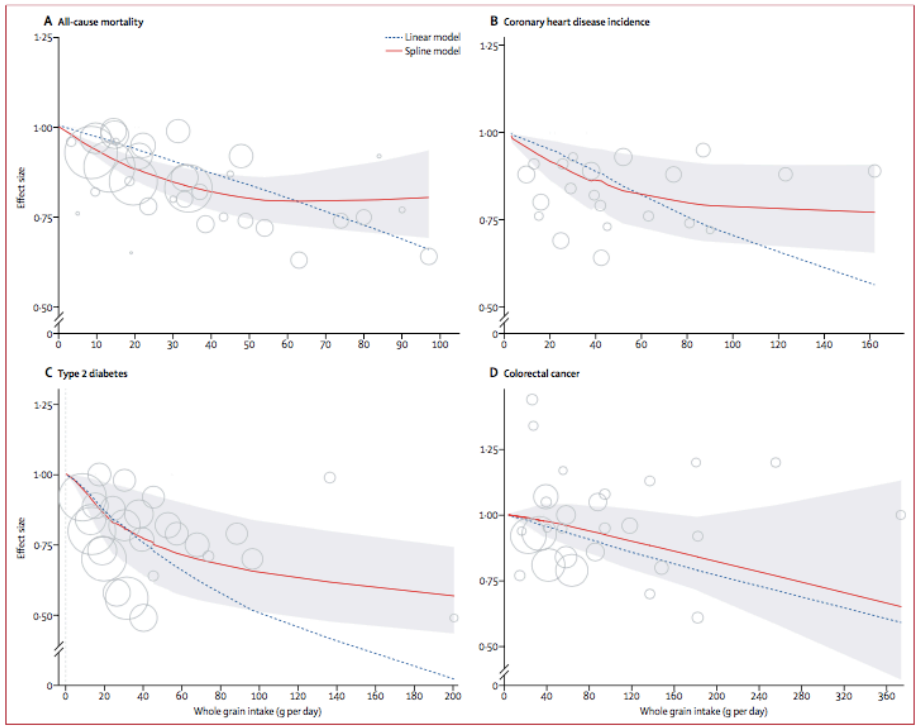


Figure 2: Dose-response relationships between whole grain intake and critical clinical outcomes based on data from prospective studies

- Largest and most current systematic review studying carbohydrate quality in relation to human health
- Higher intakes of total dietary fibre or whole grain is associated with reduced risk of many NCD's
- **No less than 25 to 29g per day of fiber intake** was associated with reduced risk
- Striking dose response was observed

International Journal of Epidemiology, 2017, 1029–1056
doi: 10.1093/ije/dyw319
Advance Access Publication Date: 22 February 2017
Original article

Miscellaneous

Fruit and vegetable intake and the risk of cardiovascular disease, total cancer and all-cause mortality—a systematic review and dose-response meta-analysis of prospective studies

Dagfinn Aune[1,2,3]*, Edward Giovannucci[4,5,6], Paolo Boffetta[7], Lars T Fadnes[8], NaNa Keum[5,6], Teresa Norat[2], Darren C Greenwood[9], Elio Riboli[2], Lars J Vatten[1] and Serena Tonstad[10]

- **Fruit and vegetable intakes were associated with reduced risk of cardiovascular disease, cancer and all-cause mortality.**
- *"These results support public health recommendations to increase fruit and vegetable intake for the prevention of cardiovascular disease, cancer, and premature mortality"*
- Reductions in risk of cardiovascular disease, all-cause mortality (up to an intake of 800 g/day)and cancer (600g/day) were observed in a dose response manner

Evidence Summary:

There are interactions/effects between early factors and later factors and disease throughout the life cycle

Factors can be inadequate nutrients, inappropriate nutrients/ excess nutrients
physiological and genetic factors
lifestyle and environmental factors

Body of evidence exists for diet disease relationships –
systematic reviews of randomised control trials and observational studies

Clustering of health related risk factors

Explain why?

- Impaired glucose tolerance and adverse lipid profile in childhood and adolescence
- Higher blood pressure and obesity/central obesity
- Unhealthy lifestyles and diets : high saturated fat, cholesterol and salt and inadequate fibre
- Lack of exercise and increased television viewing

Intergenerational effects

- Parental obesity
- Maternal gestational diabetes
- Maternal birth weight

-- are risk factors for higher blood pressure in the offspring Independent of the infants own factors.

Gene-nutrient interactions and genetic susceptibility

- Nutrients and physical activity influence gene expression
- Genes define – and environment determines ….which susceptible individual becomes ill

  – easier to address environment than genes…..

Recommendations for NCD prevention are in the context of:

- Early life studies show - while our genes have evolved a certain way (over a long period of time), the current food and lifestyle environment in developed and transition countries do not support this.
- Long term - the food environment needs to be changed *(next lecture)*
- Shorter term - individual and population nutrient guidelines are required to advise people what to select/choose/eat
- WHO nutrient intake goals for NCD prevention were updated to address this in 2023
- These goals can be used to develop
  - national guidelines for what people should eat, and
  - how governments should change the food environments

What are guidelines for?

How are they made?

Who makes them?

Evidence-informed health decision-making

Guideline development is a process : rigor in development methods

By organizations like UN organizations (WHO) or professional organizations and academic colleges(specialties)

What is a guideline?

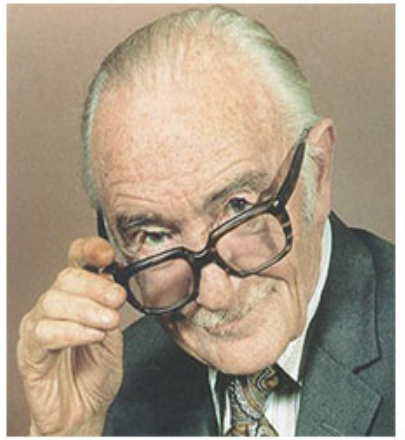
- A document that provides a recommendation regarding health interventions:
  - Clinical practice
  - Public health
  - Policy
- In situations where there is a choice between
  - Possible interventions
  - Impact on health

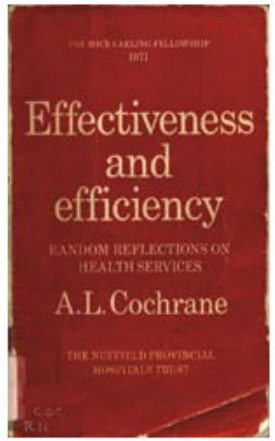
How is a guideline developed?

- Using systematic review of the literature (randomised controlled trials and longitudinal observational studies)
- And a grading process to assess quality of the evidence: GRADE

Second World War observations

Dr. Archie Cochrane & others worked in the 2nd world war: was dissatisfied with the lack of use of evidence to inform clinical management decisions





Evidence informed clinical practice

Improving research quality

Grading of evidence GRADE

Generation of better quality evidence – Randomised Control Trials

Systematic reviews of RCT
eg: Cochrane reviews

WHO Guidelines Incorporating
- GRADE
- Systematic reviews

Population

Intervention

Comparison

Outcome

Time

P I C O T

Formulate questions → Select outcomes → Rate importance → Outcomes across studies → Create evidence profile → Rate evidence quality for each outcome

Systematic review

Outcome — Critical

Outcome — Critical

Outcome — Important

Outcome — Not important

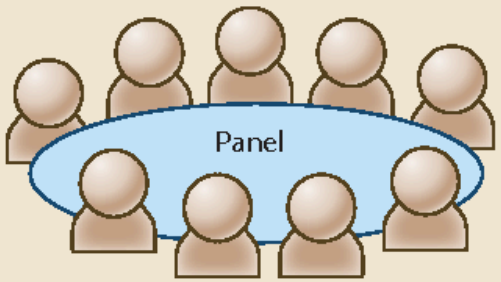
Summary of findings and estimate of effect for each outcome

High
Moderate
Low
Very low

Grade down
1. Risk of bias
2. Inconsistency
3. Indirectness
4. Imprecision
5. Publication bias

Grade up
1. Large effect
2. Dose response
3. Confounders

Rate
Overall quality of evidence across outcomes based on lowest quality of **critical** outcomes



Guideline development

- For or against (direction)
- Strong or weak (strength)

By considering:
- Quality of evidence
- Balance benefits/harms
- Values and preferences

Treatment recommendations

- "We recommend using..."
- "We suggest using..."
- "We recommend against using..."
- "We suggest against using..."

(Scheunemann H et al. Guideline development using GRADE. 2011)

Current practice in most Low-Middle Income Countries and Low Income Countries

- Use global guidelines directly
- Adapt global guidelines as seen fit by experts in the area ……..
- *Use local data without following guideline development methodology……?? – this is not advisable*

Each guideline :

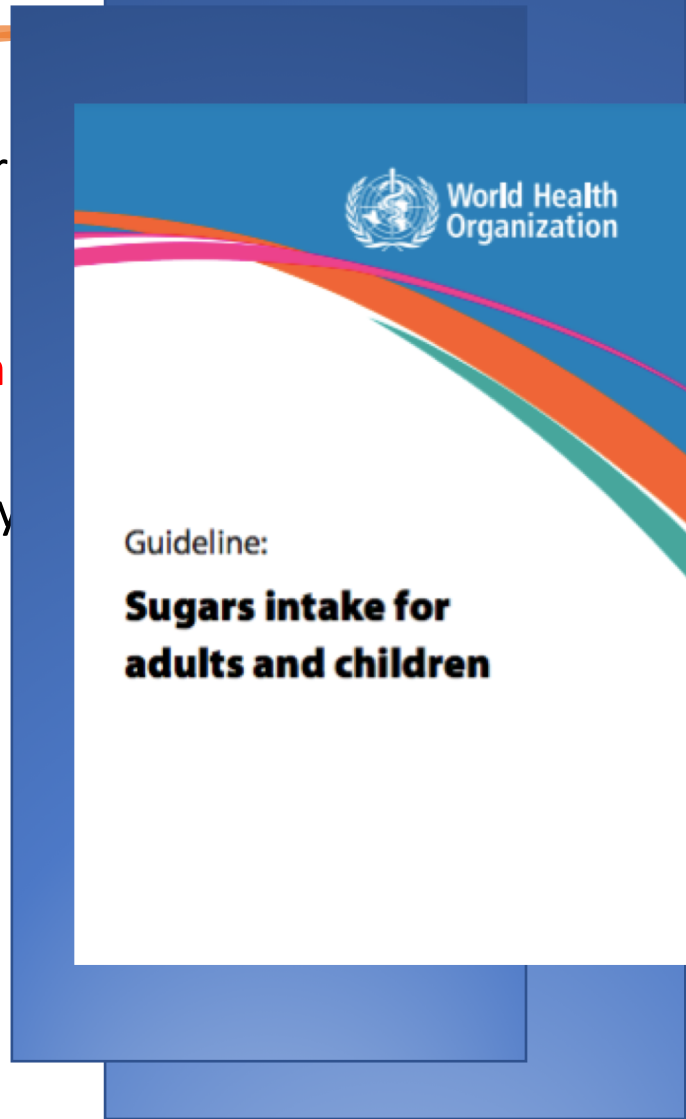
States **who** it includes and **how** it maybe used
Details the **body of evidence** from which it was drawn

WHO guideline: **sugars** intake for adults and children

Background:

- A high level of free sugars intake is of concern because of its association with poor dietary quality obesity and risk of NCD's
- "Free sugars include monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates".
- Free sugars contribute to energy density of diets and may promote positive energy balance.
- Free sugars particularly as sugar sweetened beverages increases overall energy intake and may reduce food containing more nutritionally adequate calories and lead to unhealthy diet, weight gain and increased risk of NCD
- Free sugars increase dental caries; health, social and financial burden

Objective: recommendation to reduce risk of NCD's in adults and children with particular focus on prevention and control of unhealthy weight gain and dental caries.



States who it includes and how it maybe used
Details the body of evidence from which it was drawn

WHO guideline: **sugars** intake for adults and children

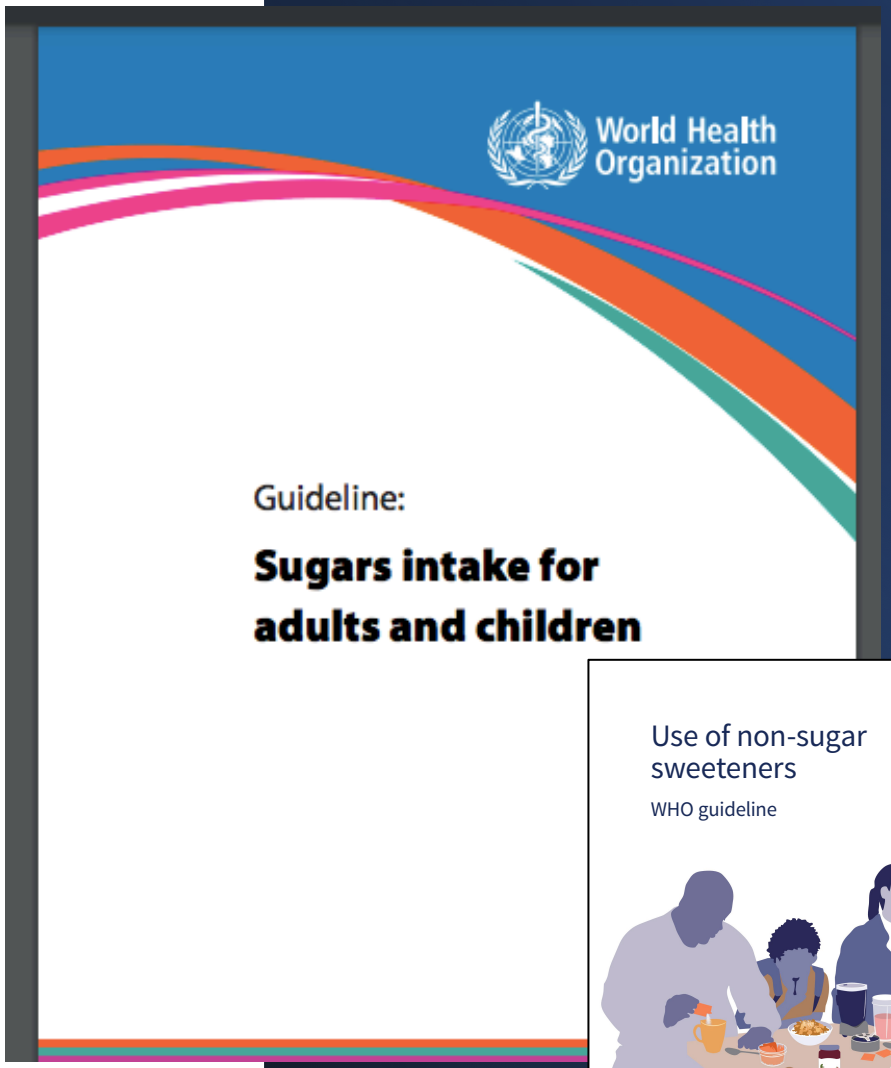
Guideline:

- **WHO recommends a reduced intake of free sugars throughout the life course** (strong recommendation).

  - In both adults and children, WHO recommends reducing the intake of free sugars to

    less than 10% of total energy intake (strong recommendation).

  - WHO suggests a further reduction of the intake of free sugars to **below 5% of total energy intake** (conditional recommendation).



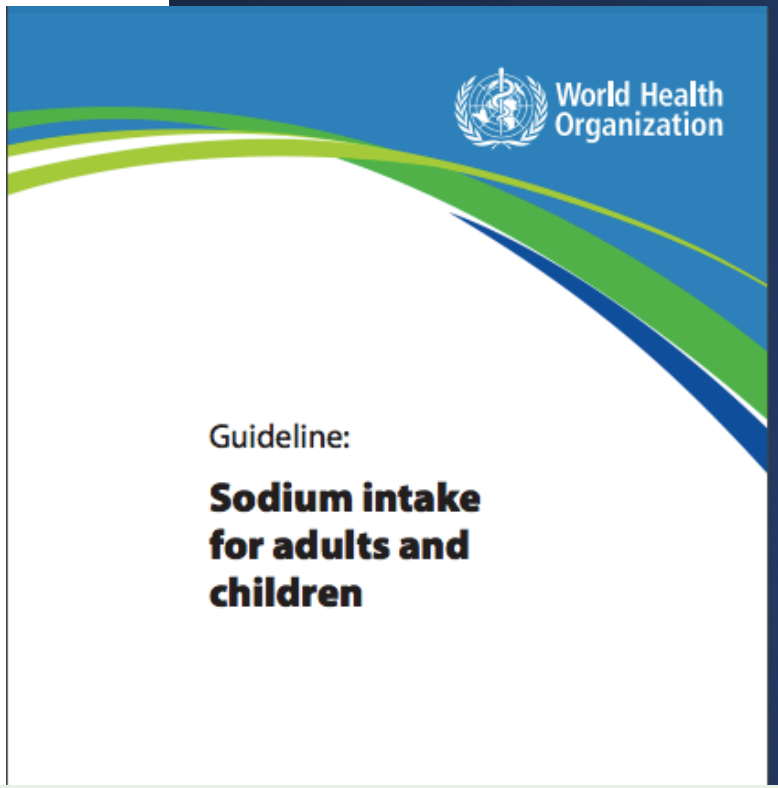
Guideline:
WHO suggests that non-sugar sweeteners not be used as a means of achieving weight control or reducing the risk of noncommunicable diseases (*conditional recommendation*).

WHO guideline: **sodium** intake for adults and children

Background:

- Elevated sodium intake is associated with hypertension, CVD, and stroke
- Decreasing sodium intake may reduce blood pressure and the risk of associated NCDs
- Evidence shows that populations consume much more sodium than is physiologically necessary and also more than the 2g sodium per day recommended

Objective: provide recommendations on the consumption of sodium to reduce NCD's in most adults and children



Guideline:

- WHO recommends a reduction in sodium intake to reduce blood pressure and risk of cardiovascular disease, stroke and coronary heart disease in adults (strong recommendation). **WHO recommends a reduction to <2g/day sodium (5g/day salt in adults(strong recommendation)**
- WHO recommends a reduction in sodium intake to control blood pressure in children (strong recommendation) The recommended maximum level of intake of 2g/day sodium in adults should be adjusted downward based on the energy requirements of children relative to those of adults.

WHO guideline: **Potassium** intake for adults and children

Background:

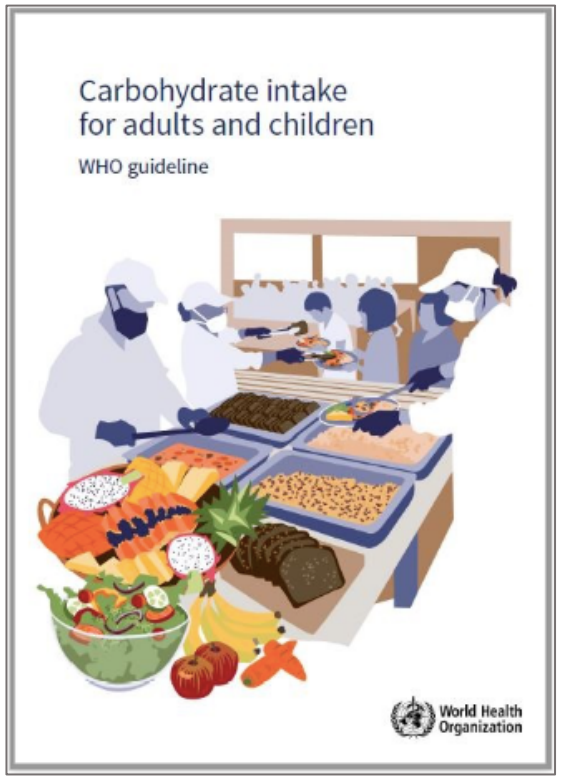
- Low potassium intake is associated with hypertension, CVD, chronic kidney stone formation and low bone-mineral density.
- Increased potassium intake may reduce blood pressure, decrease risk of CVD, have beneficial effects on bone-mineral density and mitigate negative consequences of high sodium consumption.

Objective: provide recommendations on the consumption of potassium to reduce NCD's in adults and children.

Guideline:

WHO recommends an increase in potassium intake from food to reduce blood pressure and risk of cardiovascular disease, stroke and coronary heart disease in adults (strong recommendation). **WHO suggests a potassium intake of at least 90 mmol/day (3510 mg/day) for adults** (conditional recommendation).

WHO suggests an increase in potassium intake from food to control blood pressure in children (conditional recommendation). The recommended potassium intake of at least 90 mmol/day should be adjusted downward for children, based on the energy requirements of children relative to those of adults



Evidence - systematic reviews of randomized controlled trials (RCTs) and prospective observational studies in adults :

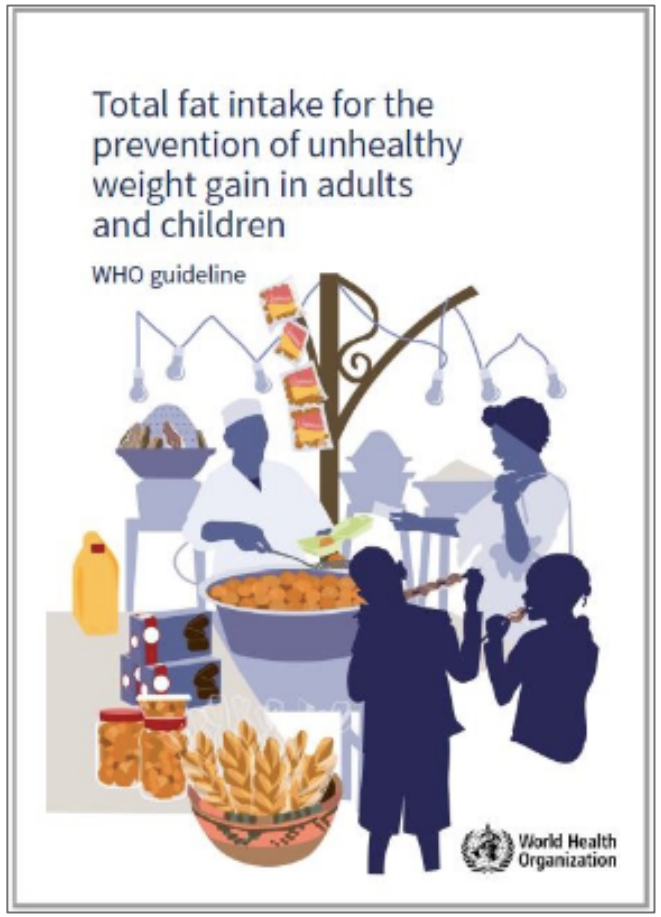
- Higher dietary fibre intake - small reductions in measures of body fatness (*moderate* to *high* certainty evidence),associated with reduced risk of developing and/or dying from CVDs, type 2 diabetes and cancer (all *moderate* certainty evidence).
- Higher whole grains, vegetables, fruits and pulses intake - associated with reduced risk of developing and/or dying from CVDs (*moderate* certainty evidence).
- Higher whole grains, vegetables and fruits intake - associated with reduced risk of developing and/or dying from cancer (*moderate* certainty evidence).
- Higher whole grains (*moderate* certainty evidence) and pulses intakes(*very low* certainty evidence) associated with reduced risk of developing type 2 diabetes.
- Effects or associations of low glycaemic index and/ or low glycaemic load foods and diets was reviewed, little consistency was seen in benefit on mortality or NCDs

WHO guideline:

- WHO recommends that carbohydrate intake should come primarily from **whole grains, vegetables, fruits and pulses** ***(strong recommendation)*** (relevant for all individuals 2 years of age and older).

- In adults, WHO recommends an intake of at least **400 g of vegetables and fruits** per day (*strong recommendation*). Proportionately less for children.

- In adults, WHO recommends an intake of **at least 25 g per day of naturally occurring dietary fibre** as consumed in foods (*strong recommendation*). Proportionately less for children



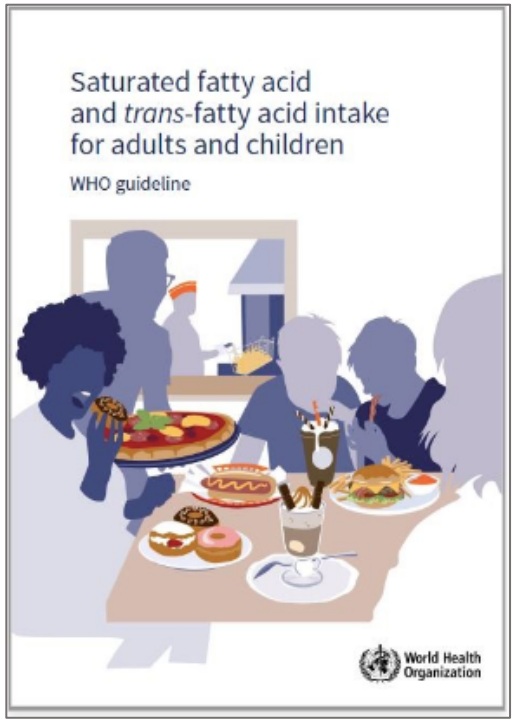
Evidence - a systematic review of randomized controlled trials (RCTs) in non-dieting adults

- Reducing intake of total fat led to lower body weight, body mass index (BMI), waist circumference and percentage of body fat (*high* certainty evidence overall).

WHO guideline:

- To reduce the risk of unhealthy weight gain, WHO suggests that adults **limit total fat intake to 30% of total energy intake or less** (*conditional recommendation*)

- Fat consumed should be **primarily unsaturated fatty acids**, with no more than 10% of total energy intake coming from saturated fatty acids and no more than 1% of total energy intake coming from *trans*-fatty acids (*strong recommendation*)

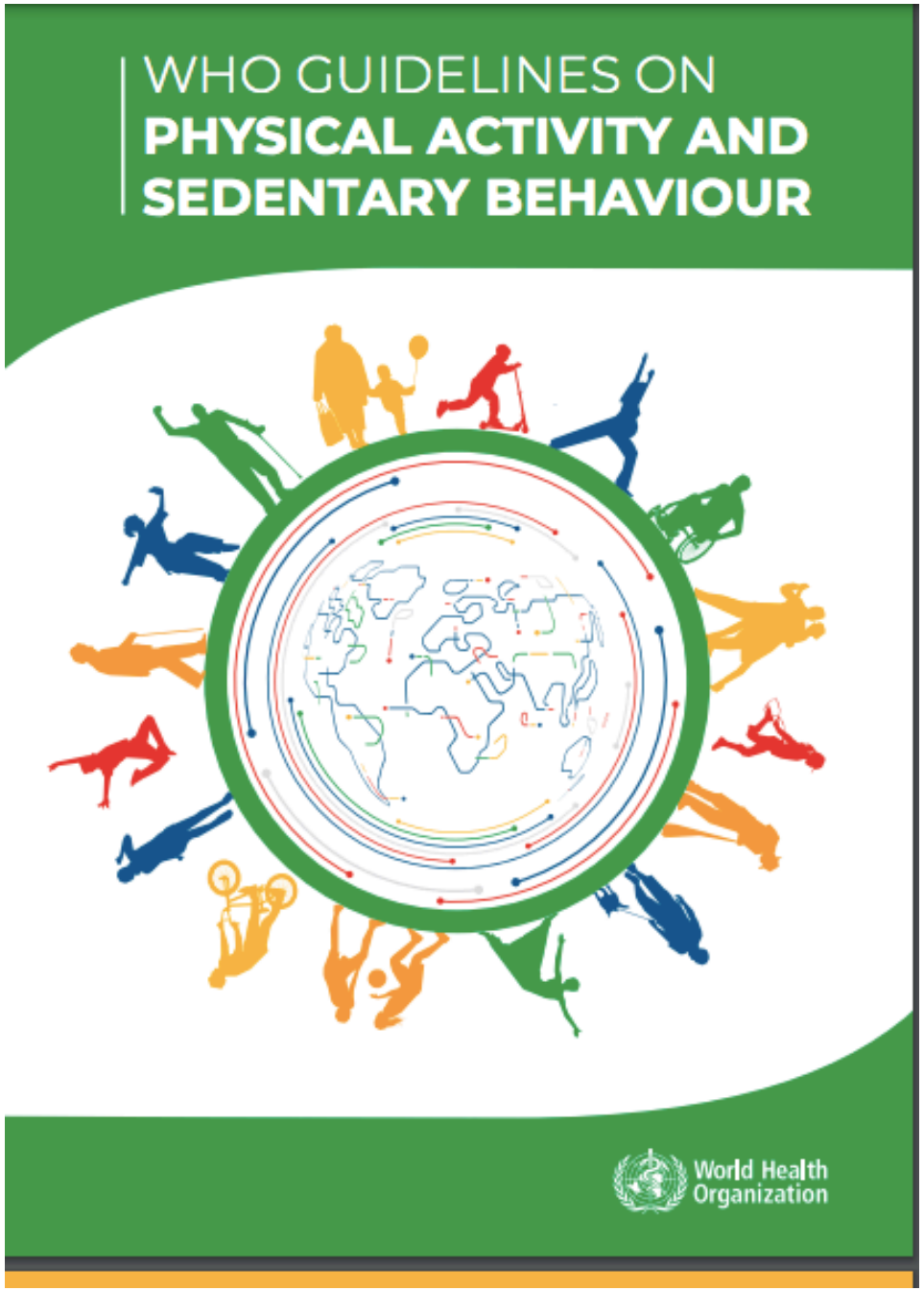


Evidence – systematic reviews of randomized controlled trials (RCTs) and prospective observa- tional studies

- Consuming 10% or less of daily calories (i.e. total energy intake) as SFA reduces LDL cholesterol (*high* certainty evidence),
- Consuming 1% or less of total energy intake as TFA reduces LDL cholesterol (*high* certainty evidence), is associated with reduced risk of CVDs and coronary heart disease (*low* certainty evidence)

WHO guideline:

- WHO recommends that adults and children reduce saturated fatty acid intake to 10% of total energy intake (*strong recommendation*).
- WHO recommends replacing saturated fatty acids in the diet with polyunsaturated fatty acids (*strong recommendation*), monounsaturated fatty acids from plant sources (*conditional recommendation*), or carbohydrates from foods containing naturally occurring dietary fibre, such as whole grains, vegetables, fruits and pulses (*conditional recommendation*)
- WHO recommends that adults and children reduce *trans*-fatty acid intake to 1% of total energy intake (*strong recommendation*).



Every step counts!

Physical activity – inactivity

Sedentary behaviour

Life stage specific

Children and adolescents

It is recommended that:

› **Children and adolescents should do at least an average of 60 minutes per day of moderate- to vigorous-intensity, mostly aerobic, physical activity, across the week.**

Strong recommendation, moderate certainty evidence

› **Vigorous-intensity aerobic activities, as well as those that strengthen muscle and bone, should be incorporated at least 3 days a week.**

Strong recommendation, moderate certainty evidence

It is recommended that:

› **Children and adolescents should limit the amount of time spent being sedentary, particularly the amount of recreational screen time.**

Strong recommendation, low certainty evidence

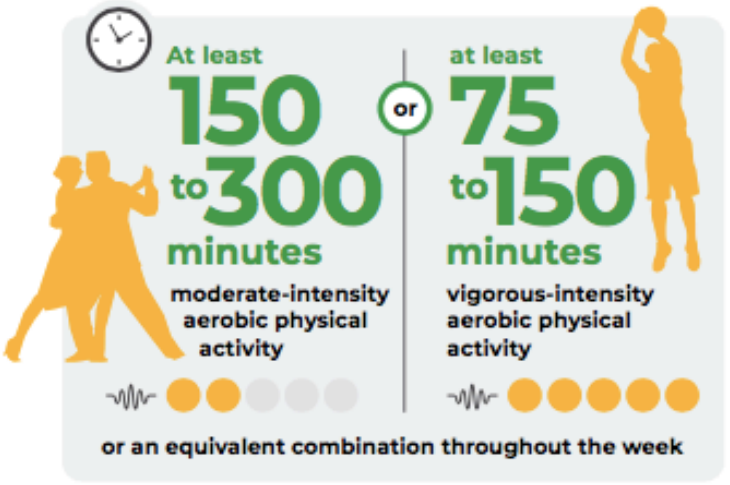
Adults

› **All adults should undertake regular physical activity.**

Strong recommendation, moderate certainty evidence

› **Adults should do at least 150–300 minutes of moderate-intensity aerobic physical activity; or at least 75–150 minutes of vigorous-intensity aerobic physical activity; or an equivalent combination of moderate- and vigorous-intensity activity throughout the week, for substantial health benefits.**

Strong recommendation, moderate certainty evidence



For additional health benefits:

On at least **2 days** a week muscle-strengthening activities at moderate or greater intensity that involve all major muscle groups.

› **Adults should also do muscle-strengthening activities at moderate or greater intensity that involve all major muscle groups on 2 or more days a week, as these provide additional health benefits.**

Strong recommendation, moderate certainty evidence

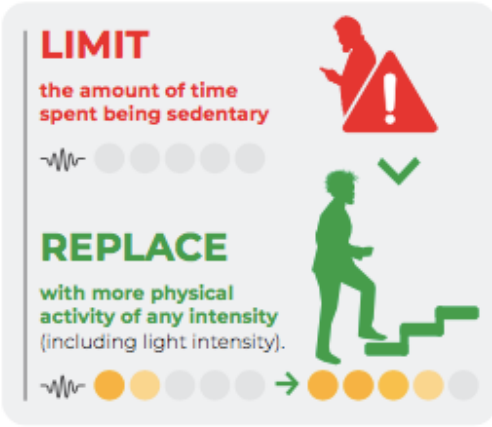
It is recommended that:

› **Adults should limit the amount of time spent being sedentary. Replacing sedentary time with physical activity of any intensity (including light intensity) provides health benefits.**

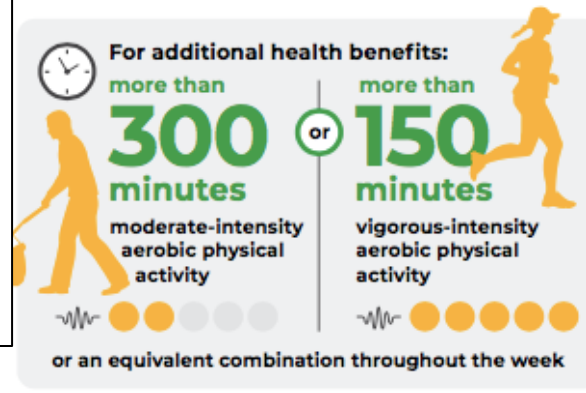
Strong recommendation, moderate certainty evidence

› **To help reduce the detrimental effects of high levels of sedentary behaviour on health, adults should aim to do more than the recommended levels of moderate- to vigorous-intensity physical activity.**

Strong recommendation, moderate certainty evidence



For additional health benefits:



› **Adults may increase moderate-intensity aerobic physical activity to more than 300 minutes; or do more than 150 minutes of vigorous-intensity aerobic physical activity; or an equivalent combination of moderate- and vigorous-intensity activity throughout the week for additional health benefits.**

Conditional recommendation, moderate certainty evidence

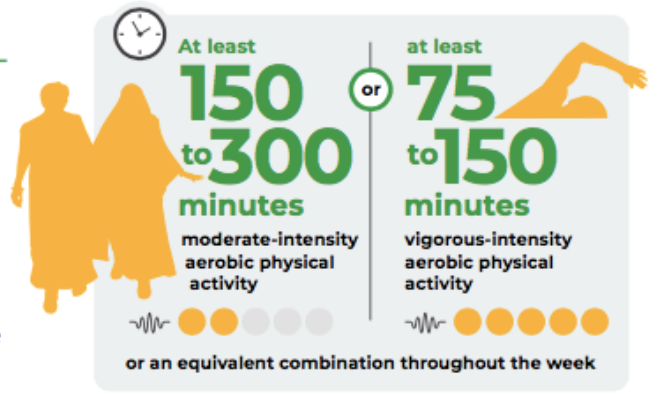
Older adults

› All older adults should undertake regular physical activity.

Strong recommendation, moderate certainty evidence

› Older adults should do at least 150–300 minutes of moderate-intensity aerobic physical activity; or at least 75–150 minutes of vigorous-intensity aerobic physical activity; or an equivalent combination of moderate- and vigorous-intensity activity throughout the week, for substantial health benefits.

Strong recommendation, moderate certainty evidence



For additional health benefits:

On at least **2** days a week muscle-strengthening activities at moderate or greater intensity that involve all major muscle groups.

› Older adults should also do muscle-strengthening activities at moderate or greater intensity that involve all major muscle groups on 2 or more days a week, as these provide additional health benefits.

Strong recommendation, moderate certainty evidence

On at least **3** days a week varied multicomponent physical activity that emphasizes functional balance and strength training at moderate or greater intensity.

› As part of their weekly physical activity, older adults should do varied multicomponent physical activity that emphasizes functional balance and strength training at moderate or greater intensity, on 3 or more days a week, to enhance functional capacity and to prevent falls.

Strong recommendation, moderate certainty evidence

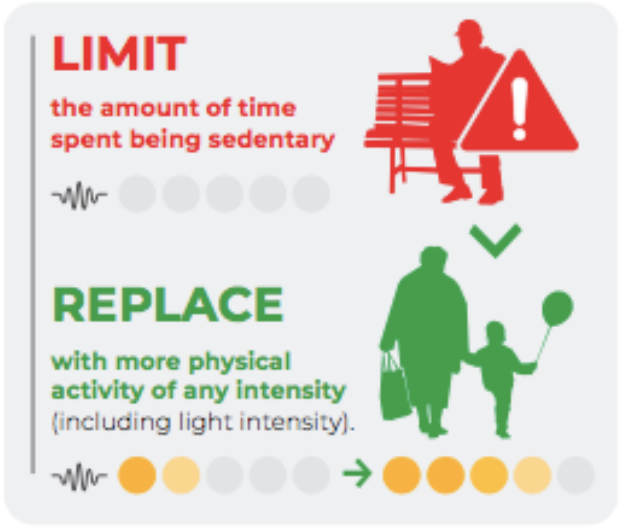
It is recommended that:

› Older adults should limit the amount of time spent being sedentary. Replacing sedentary time with physical activity of any intensity (including light intensity) provides health benefits.

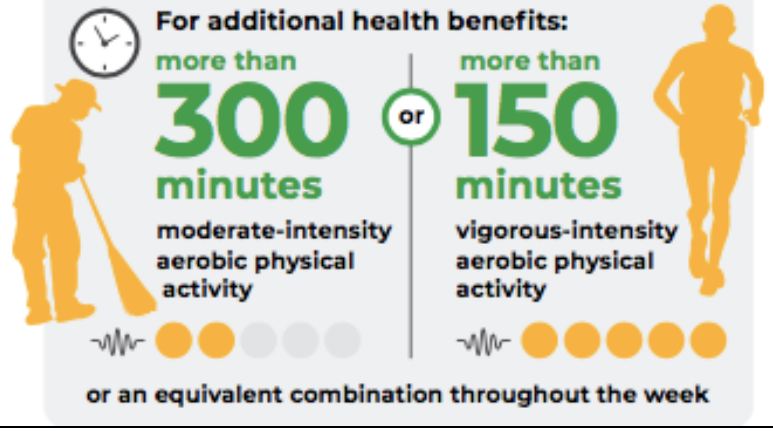
Strong recommendation, moderate certainty evidence

› To help reduce the detrimental effects of high levels of sedentary behaviour on health, older adults should aim to do more than the recommended levels of moderate- to vigorous-intensity physical activity.

Strong recommendation, moderate certainty evidence



For additional health benefits:



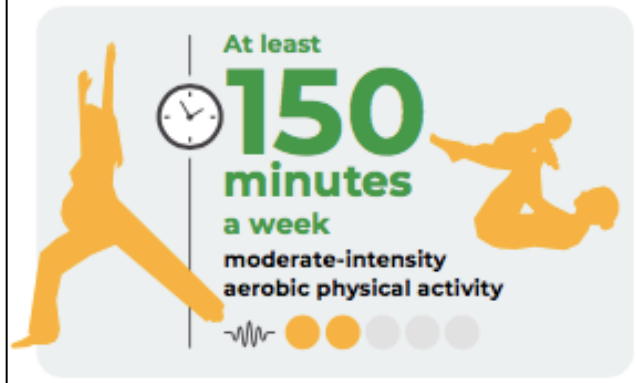
› Older adults may increase moderate-intensity aerobic physical activity to more than 300 minutes; or do more than 150 minutes of vigorous-intensity aerobic physical activity; or an equivalent combination of moderate- and vigorous-intensity activity throughout the week, for additional health benefits.

Conditional recommendation, moderate certainty evidence

Pregnancy and post-partum

› **Undertake regular physical activity throughout pregnancy and postpartum.**

Strong recommendation, moderate certainty evidence



› **Do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week for substantial health benefits.**

Strong recommendation, moderate certainty evidence

› **Incorporate a variety of aerobic and muscle-strengthening activities. Adding gentle stretching may also be beneficial.**

Strong recommendation, moderate certainty evidence

In addition:

› **Women who, before pregnancy, habitually engaged in vigorous-intensity aerobic activity, or who were physically active, can continue these activities during pregnancy and the postpartum period.**

Strong recommendation, moderate certainty evidence

It is recommended that:

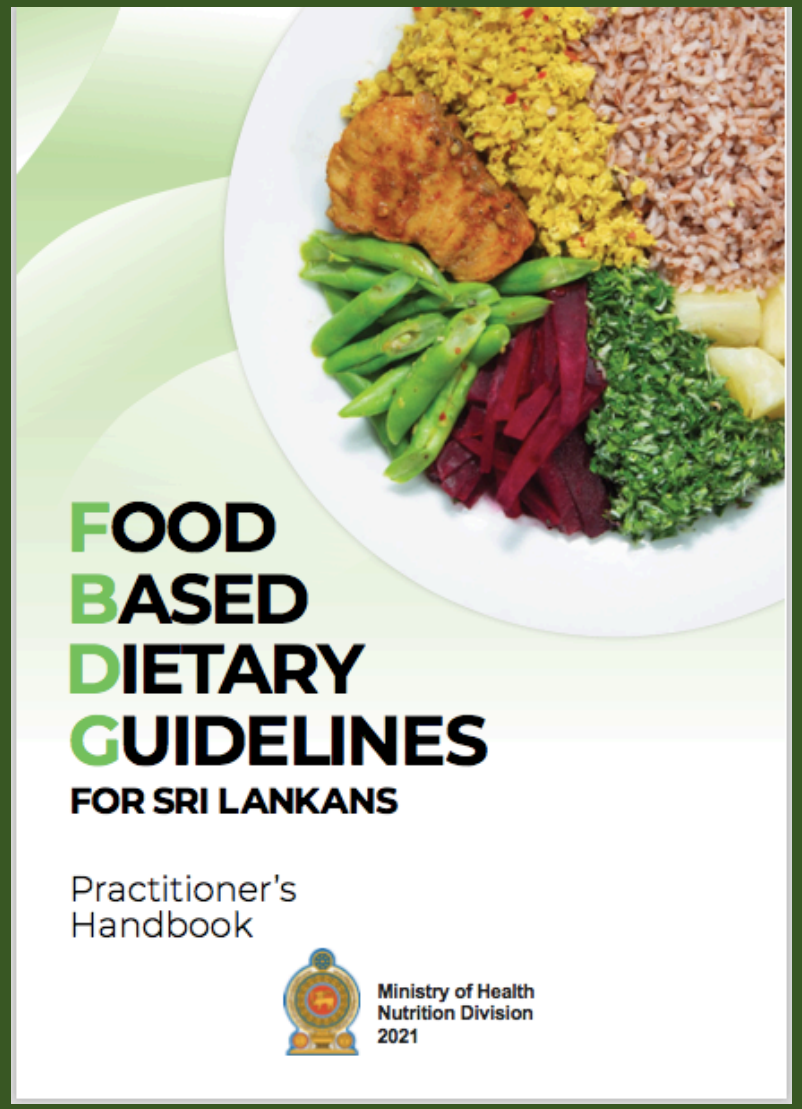
› **Pregnant and postpartum women should limit the amount of time spent being sedentary. Replacing sedentary time with physical activity of any intensity (including light intensity) provides health benefits.**

Strong recommendation, low certainty evidence

Sleep guidelines: Center for Disease Control USA

How much sleep you need changes as you age.

Age Group		Recommended Hours of Sleep Per Day
Newborn	0–3 months	14–17 hours (National Sleep Foundation)[1] No recommendation (American Academy of Sleep Medicine)[2]
Infant	4–12 months	12–16 hours per 24 hours (including naps)[2]
Toddler	1–2 years	11–14 hours per 24 hours (including naps)[2]
Preschool	3–5 years	10–13 hours per 24 hours (including naps)[2]
School Age	6–12 years	9–12 hours per 24 hours[2]
Teen	13–18 years	8–10 hours per 24 hours[2]
Adult	18–60 years	7 or more hours per night[3]
	61–64 years	7–9 hours[1]
	65 years and older	7–8 hours[1]



Food based dietary guidelines for Sri Lankans (2021)

- Converts the macro and micronutrient requirements for each age group into foods and beverages – number of servings and serving size.
- Additionally ensures that the foods recommended are inline with recommendations for NCD prevention in terms of macronutrients and selected food types
- Eat a variety of food every day
- Introduces the food groups which ensures that the recommendations are met
- Eat plenty of vegetables and fruits
- Servings from each food group to ensure adequacy as well as restrict as needed
- Exclusive breastfeeding for 6 months and complementary feeding after that
- Discouraging processed foods and encouraging natural and whole foods
- Food safety