



Launch of the public consultation on the WHO draft guideline on carbohydrate intake

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7 October 2022



Opening remarks

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Background

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Summary history of WHO's guidance development on CHO intake

Since the 1950s, FAO/WHO have regularly held joint expert meetings to:

- review the state of scientific knowledge on the role of various nutrients in the human diet
- provide guidance on their requirements and recommended intakes

Summary history of WHO's guidance development on CHO intake

1979 Joint FAO/WHO Expert Meeting on Carbohydrates in Human Nutrition (FAO 1980)

- 1st to focus on the topic of CHO
- Reviewed the role of CHO as determinants of human health and diseases:
 1. As sources of energy contributing to improve nutritional status
 2. As determinants of sensory qualities of foods (i.e. flavour, texture and acceptability of foods)
 3. Influence on physiology and pathology of large intestine (i.e. the role of dietary fibre)
 4. As potential determinants of dental caries, obesity, CVD and diabetes
 5. As they relate to the nutrition of infants and young children (i.e. the role of lactose and its inclusion in complementary foods)
- Inappropriate to focus on nutritional effects of a single dietary component due to wide range of CHO consumed in the diet – Integration of a wide range of interactive effects.
- Further studies needed to understand interactions between CHO and other components of the diet

Summary history of WHO's guidance development on CHO intake

1997 Joint FAO/WHO Expert Consultation on Carbohydrates in Human Nutrition (FAO, 1998)

- Much progress in understanding the role of CHO in human nutrition/health, including:
 1. Role of dietary fibre (i.e. role in moderating the process of digestion in small intestine and potential as a major substrate for fermentation in the colon)
 2. Diverse physiological roles (i.e. dependent upon the site, rate and extent of digestion, fermentation in the gut)
 3. Potential in enhancing physical performance through glycogen loading
 4. Relationship between diet and NCDs (including obesity, type 2 diabetes, CHD, and some forms of cancer)
- Confirmed CHO are not only an energy source, but also have important impacts on the maintenance of health
- Recommendations were made:
 1. Terminology of dietary CHO should be based on molecular size (degree of polymerization or DP) with additional terms to define nutritional groupings based on physiological properties
 2. Total CHO in the diet should be measured as the sum of the individual CHO rather than “by difference”
 3. Analysis and labelling of dietary CHO should be based on chemical divisions
 4. At least 55% of total energy should be provided from a variety of CHO sources, regardless of the nature of the dietary pattern
 5. glycaemic index (GI) – measures the impact of foods on the integrated response of blood glucose – be used to compare foods of similar composition within food groups



Summary history of WHO's guidance development on CHO intake

2002 Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases (WHO, 2003)

- Recommended 55 - 75% of total energy – based on protein and fat requirements
- Recommended to increase intake of minimally-processed CHO and decrease intake of free sugars (< 10% of energy intake).
- Indicated that regular consumption of whole-grain cereals, fruits and vegetables was likely to reduce risk of diet-related NCDs.
- Best definition of dietary fibre remains to be established, given the potential benefits of resistant starch



2002 Technical Workshop on Food Energy – Methods of Analysis and Conversion Factors (FAO, 2003)

- Held as follow-up to 2001 Joint FAO/WHO/UNU Expert Consultation on Human Energy Requirements (FAO, 2004) to review issues of how best to match energy requirements with food intakes (as new energy requirement values were established based on energy expenditure)
- Addressed request by CCNFSDU for harmonizing energy conversion factors (to enable uniformity in labelling and information provided to consumers)
- Reviewed commonly used analytical methods for protein, fat and CHO, and made recommendations on preferred then the “state-of-the-art” methods and most appropriate technology and existing acceptable methods used in absence of preferred methods



Summary history of WHO's guidance development on CHO intake

FAO/WHO Scientific Update on carbohydrates in human nutrition (2005 – 2006) (EJCN 2007)

- FAO and WHO agreed to undertake a scientific "update" on key issues related to CHO in human nutrition.
- The key issues identified:
 - terminology and classification
 - measurement
 - physiology
 - carbohydrates and diseases (i.e. obesity, diabetes mellitus, cardiovascular diseases, and cancer)
 - glycemic index and glycemic load



Summary history of WHO's guidance development on CHO intake

WHO guideline on carbohydrate intake in adults and children (2022)

- **WHO Nutrition Guidance Expert Advisory Group (NUGAG) Subgroup on Diet and Health**
 - Started to work in 2015 following the WHO guideline process
- **Systematic reviews:**
 - ❑ Carbohydrate quality and human health: a series of systematic reviews and meta-analyses (The Lancet 2019) – Reynolds, A et al
 - ❑ Dietary fibre intake in childhood or adolescence and subsequent health outcomes: A systematic review of prospective observational studies (Diabetes Obes Metab 2020) – Reynolds, A et al
 - ❑ Effects of Starch on Oral Health: Systematic Review to Inform WHO Guideline (J Dent Res 2019) – Halvorsrud K et al



WHO guideline development

Ms Rebekah Thomas

Technical Officer

WHO Guidelines Review Committee

World Health Organization

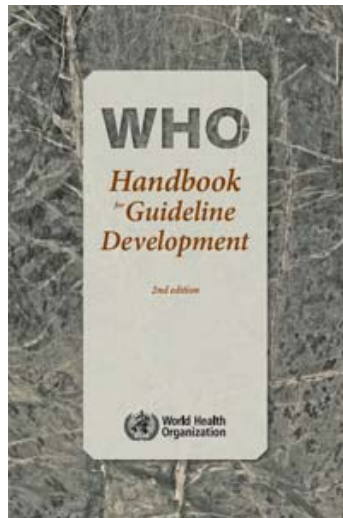
Pre-2007: Use of evidence in WHO recommendations...GOBSAT

“....Systematic reviews and concise summaries of findings are rarely used. Processes for developing recommendations typically rely heavily on experts in a particular content area and not on representatives of those who will have to live with the recommendations or on experts in particular methodological areas. Relatively little attention has also been given to roles and responsibilities related to effective dissemination and implementation strategies and their rigorous evaluation..”

Interpretation Progress in the development, adaptation, dissemination, and implementation of recommendations for member states will need leadership, the resources necessary for WHO to undertake these processes in a transparent and defensible way, and close attention to the current and emerging research literature related to these processes.

(J N Lavis MD)
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Continuous improvement...a living guideline development handbook!



14. Strong recommendations when the evidence is low quality

14.1 Background

To improve systems in 2002, the Development body of results

15. Using evidence from qualitative research to develop WHO guidelines

16. Decision-making for guideline development at WHO

16.1 Introduction

The process on the part of WHO handbook for important groups and

17. Developing guideline recommendations for tests or diagnostic

17.1 Introduction

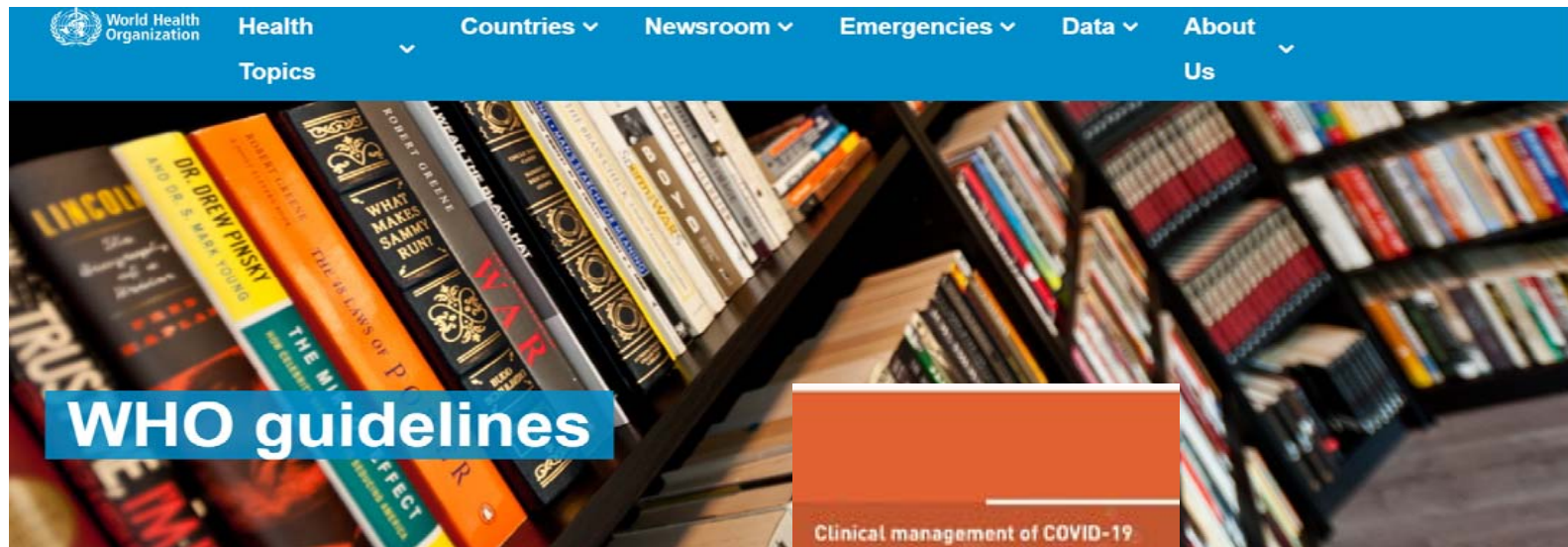
The prior chapters have addressed development can be considered in the form of accuracy

18. Incorporating a complexity perspective into WHO guidelines

18.1 Introduction

As outlined in Chapter 1 of the *WHO handbook for guideline development* (1), WHO guidelines aim to provide recommendations for decision-makers

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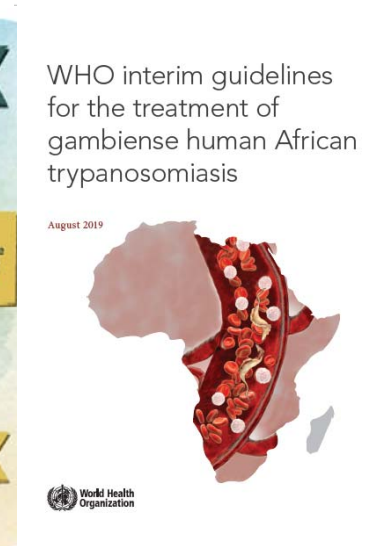
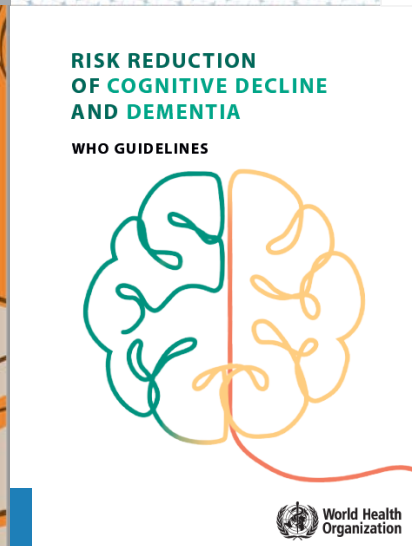
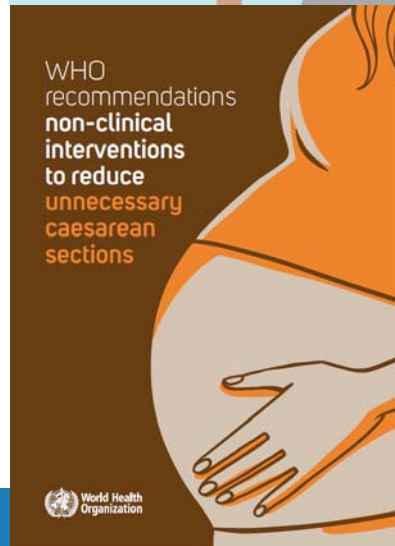
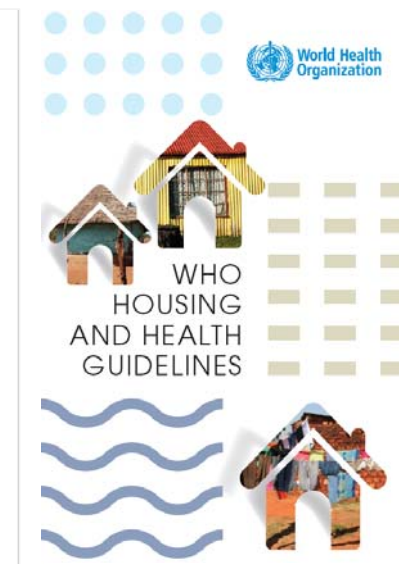
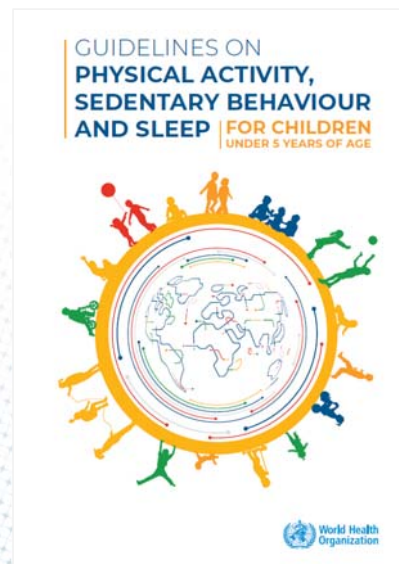
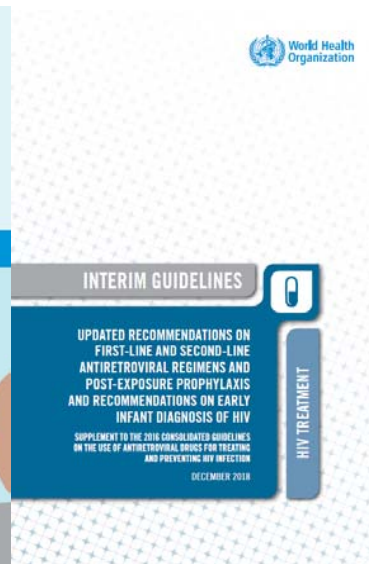
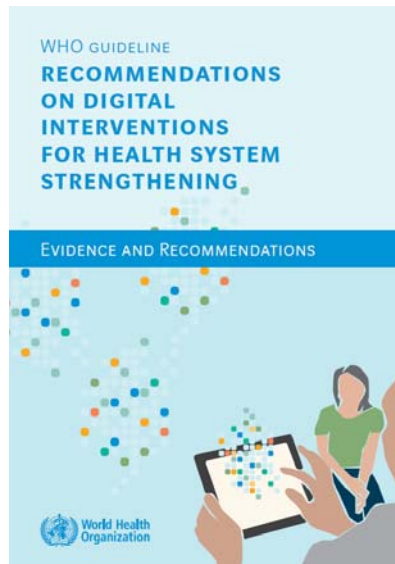


- Standard
- Compiled/consolidated
- Rapid advice guideline
- Emergency interim



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7 October 2022

World Health
Organization



Launch of the public consultation on the draft WHO guidelines on digital interventions for health system strengthening, 7 October 2022

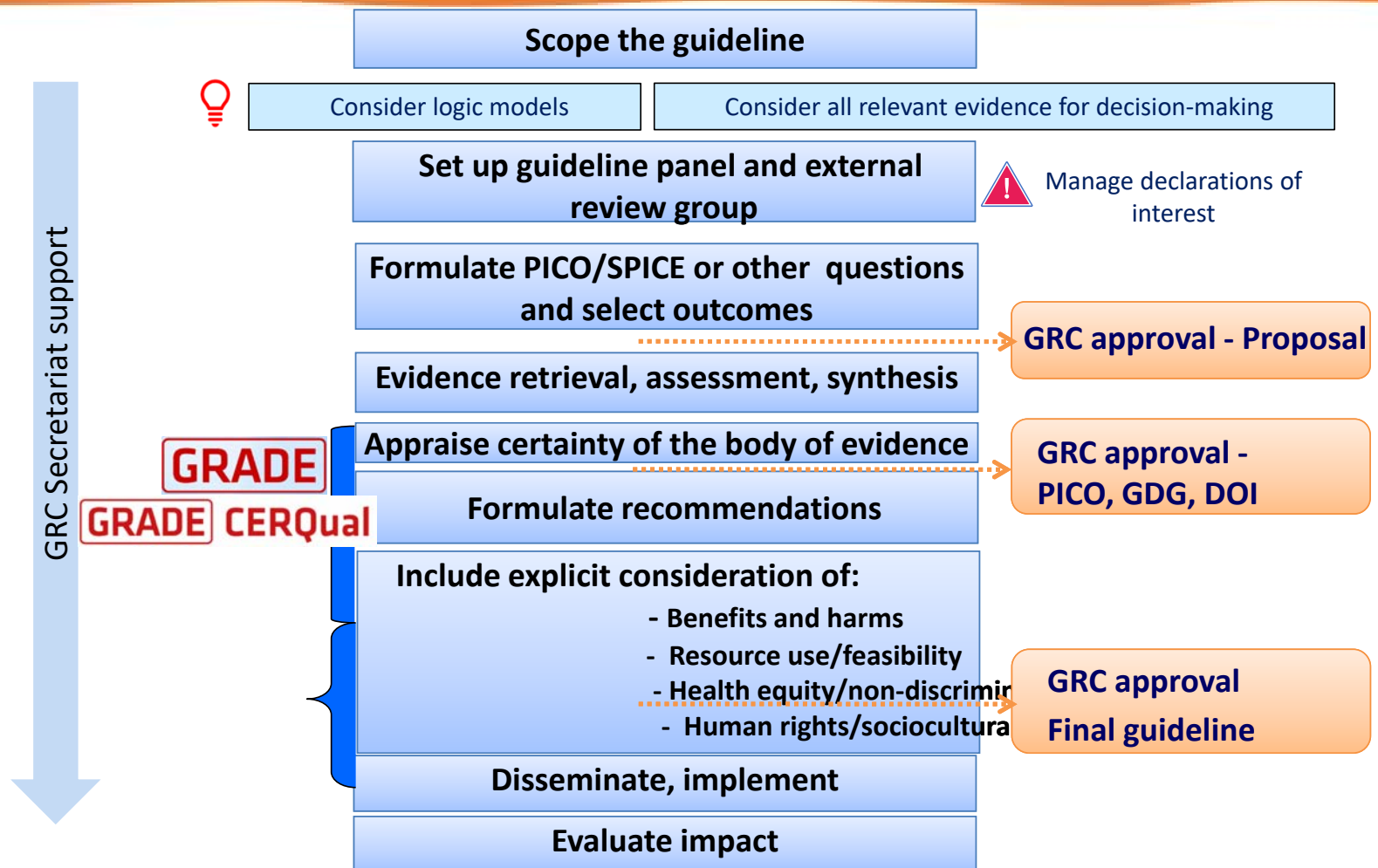


World Health Organization

Principles for trustworthy and credible guidelines

- **Evidence-based** - meet the highest quality standards for evidence-based guidelines
- **Diverse and inclusive**
- **Relevant and usable** Incorporate multiple processes to minimize bias and optimize usability
- **Explicit** in assessing the quality of the evidence and translating evidence to recommendations
- **Transparent** in all judgments and decision making processes

Guideline development process



WHO guideline development: a system of checks and balances

Guideline Development group (external experts)

- **Independent** experts, acting in an **individual** capacity
- Are **non-remunerated**
- Finalize scope, key questions, formulate recommendations

External Review group

- Review **scope** and/or **final** guideline for technical accuracy and to flag other implementation considerations.
- Do not change recommendations

WHO Steering group (internal)

- Supports the GDG procedurally and administratively
- Screens all contributors for conflicts of interest
- Commissions/performs systematic reviews
- Drafts guideline text under guidance of GDG

Technical resource persons

- Methodologist/Systematic reviewers

WHO guideline development: minimizing bias, maximising transparency and usability

Methods

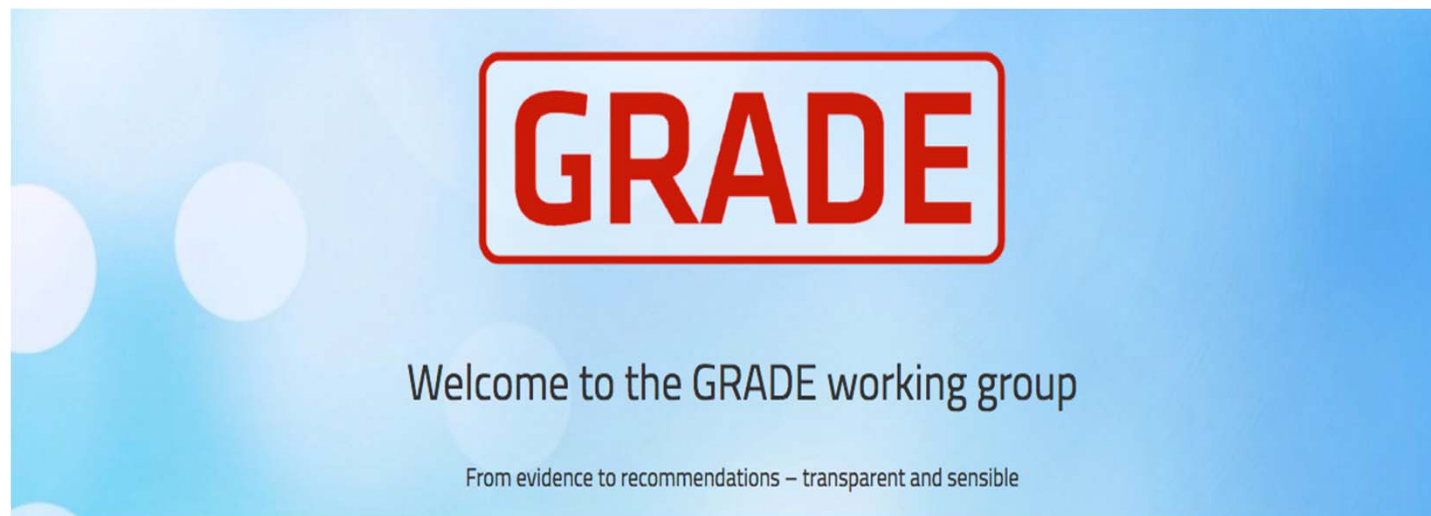
- ☐ **Explicit and transparent**
- ☐ Use **GRADE or other tools** which provide an explicit approach to:
 - Assessing the **certainty** of the evidence across studies and outcomes
 - Converting evidence to recommendation in consideration of all relevant factors (feasibility, equity, acceptability etc)
- ☐ Reflect a well-described **scope, objectives** and **target audience**
- ☐ Include detailed **funding** sources
- ☐ Adhere to WHO reporting **standards**

Recommendations

- ☐ Based on **consensus**
- ☐ Informed by **best available**, and **up-to-date evidence**
- ☐ Accompanied by a **rationale**, an assessment of the **certainty of the evidence**, the **strength** of the recommendation, and any differences in opinion among the guideline development group.
- ☐ Are clearly articulated and precise

Evidence retrieval, assessment and synthesis and formulation of recommendations

*To “reach agreement on a **common, sensible** approach to grading 1) quality of evidence and 2) strength of recommendations.”*



GRADE: assessing certainty of evidence

A. Recommendations are based on a balanced judgement of benefits and harms, values and preferences, resource use and quality of evidence

1) Quality/certainty of evidence

⊕⊕⊕⊕ (High)/⊕⊕⊕○ (Moderate)/⊕⊕○○ (Low)/⊕○○○ (Very low)

2) Strength of recommendation: 2 grades :

conditional (weak/context-specific)

strong

(May be for or against an intervention).

Certainty of evidence

Certainty of evidence based on assessment of:

1. limitations in detailed design and execution (*risk of bias criteria*)
2. Inconsistency (*or heterogeneity*)
3. Indirectness (*PICO and applicability*)
4. Imprecision (*number of events and confidence intervals*)
5. Publication bias

3 factors can increase certainty

1. Large magnitude of effect
2. All plausible residual confounding may be working to reduce the demonstrated effect or increase the effect if no effect was observed
3. Dose-response gradient

Implications of a strong recommendation

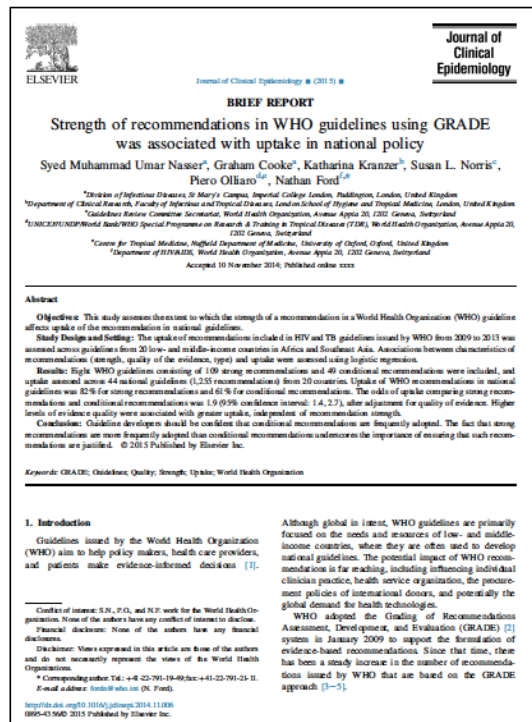
Most people in the situation would want the recommended course of action and only a small proportion would not.

Implications of a conditional recommendation

The majority of people in your situation would want the recommended course of action, but many would not.

Requires shared decision-making and involvement of stakeholders.



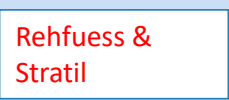
Uptake of recommendations



Adoption of
recommendations across
44 guidelines in 20
countries

Strong: 82%
Conditional: 61%

Evidence-to-decision making

Clinical /population health (2004) 	Clinical /population health 	WHO – INTEGRATE framework 
	Problem	
Benefits	Desirable effects	
Harms	Undesirable effects	
	Certainty of evidence	
Values and preferences	Values	
	Balance of effects	Balance of health benefits and harms
Resource considerations	Resources required	Financial and economic considerations
	Cost effectiveness	
	Equity	Health equity, equality, non-discrimination
	Acceptability	Human rights and socio-cultural acceptability
	Feasibility	Feasibility and health system considerations
		Societal impact

Rules of Procedure: Group decision making

WHO recommendations should be based on consensus

- Defined as general agreement among the decision makers
- Minor disagreements can be addressed in the Remarks Section of the guideline
- Voting can be used as a tool to achieve consensus

If consensus cannot be reached, voting can be used

- 2/3 majority, anonymous or hand-raising, Chair's discretion

Recommendation format

Recommendation

“At primary health-care facilities, health workers should provide general nutrition counselling to caregivers of overweight children aged less than 5 years (strength of recommendation: conditional; very low quality evidence).”

Justification remarks

Implementation consideration

Research priority

Supported by:

GRADE/CerQual Evidence profile

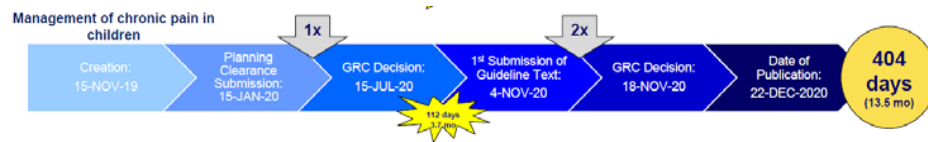
Quality assessment of the body of evidence.

Evidence to decision framework

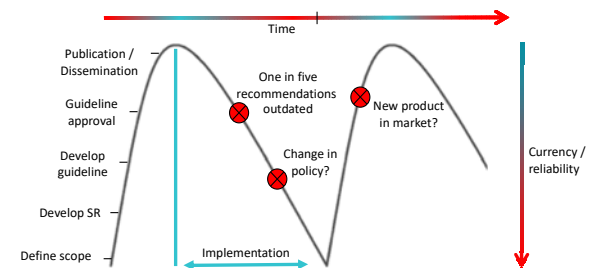
Strength assessment of the recommendation.

Living guidelines: trustworthy and up-to-date

Standard WHO guidelines are updated every 3-5 years



Current Model:
Intermittently updated guidelines

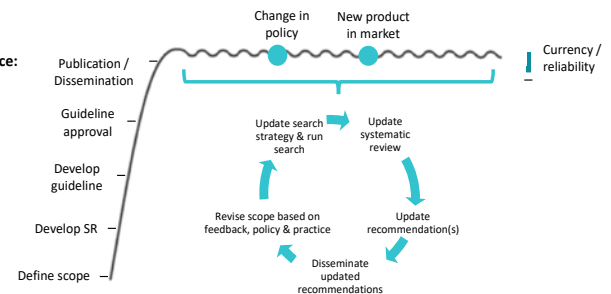


'Living' guidelines are updated every week / month / ?
and/or triggered by rules or algorithms that determine when emerging evidence would change a recommendation

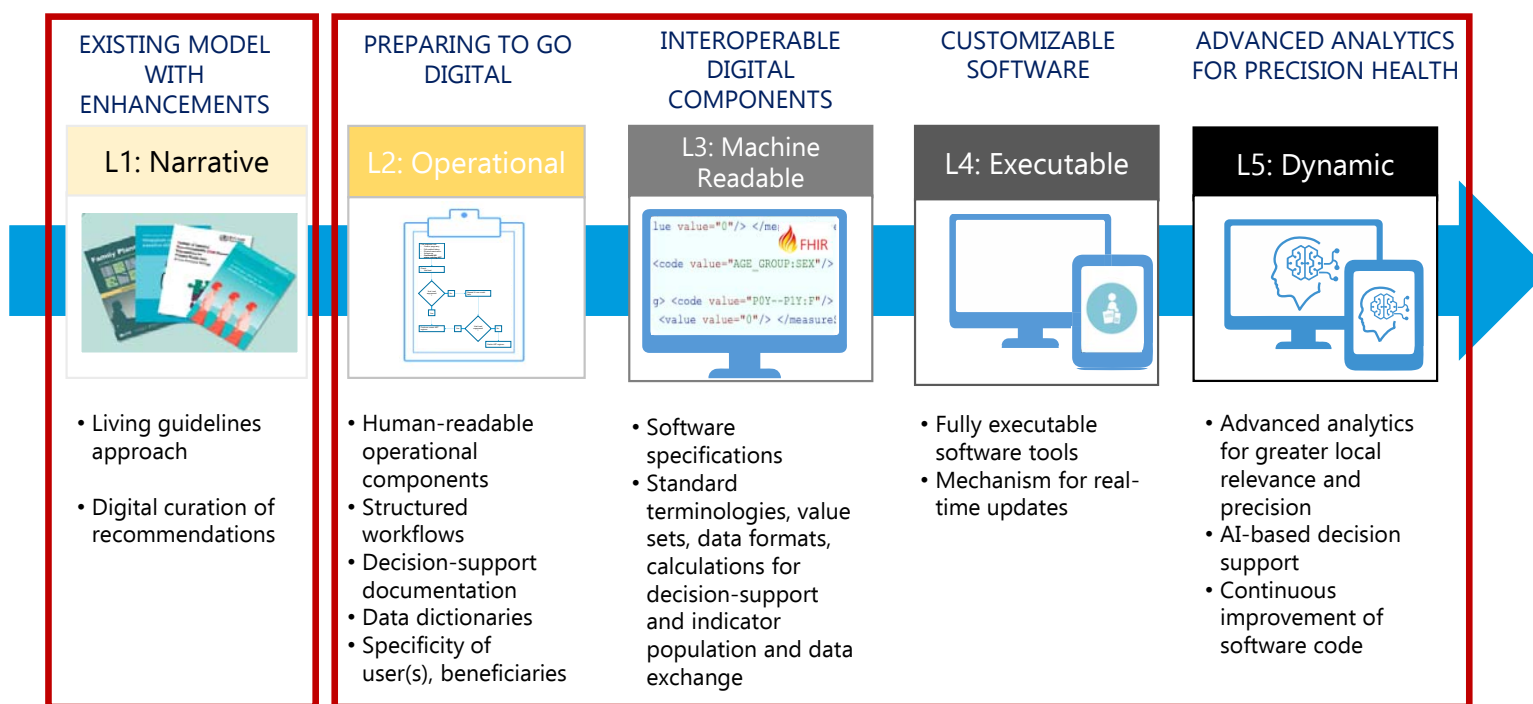
REMDESIVIR GUIDELINE



Living Evidence:
Continuously updated guidelines



Base for computable 'SMART' guidelines





Systematic review results

Dr Andrew Reynolds

Senior Research Fellow
University of Otago
New Zealand

Systematic reviews

Fibre
Wholegrains
Vegetables
Fruit
Pulses
Child intakes

Reynolds AN, Mann J, Cummings J, Winter N, Mete E, et al. Carbohydrate quality and human health: a series of systematic reviews and meta analyses. The Lancet. 2019

Aune D, Giovannucci E, Boffetta P, Fadnes LT, Keums N, et al. 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. International Journal of Epidemiology. 2017

Marventano S, Izquierdo Pulido M, Sánchez-González C, Godos J, Speciani A, et al. Legume consumption and CVD risk: a systematic review and meta-analysis. Public Health Nutrition. 2017

Afshin A, Micha R, Khatibzadeh S, Mozaffarian D. Consumption of nuts and legumes and risk of incident ischemic heart disease, stroke, and diabetes: a systematic review and meta-analysis. Am J Clin Nutr. 2014

Reynolds AN, Diep Pham HT, Montez J, Mann J. Dietary fibre intakes in childhood or adolescence and subsequent health outcomes: systematic review of prospective observational studies. Diabetes, Obesity and Metabolism. 2020

Results for dietary fibre

1. Observational studies of fibre intakes and hard outcomes
2. RCTs of changing fibre intakes on cardiometabolic risk factors

	Number of studies	Number of cases or number in intervention	Person-years or number of controls	Effect size (95% CI)	GRADE quality
Observational studies					
All-cause mortality	10	80 139	12.3 million person-years	RR 0.85 (0.79–0.91)	Moderate
Coronary heart disease mortality	10	7243	6.9 million person-years	RR 0.69 (0.60–0.81)*	Moderate
Coronary heart disease incidence	9	7155	2.7 million person-years	RR 0.76 (0.69–0.83)	Moderate
Stroke mortality	2	1103	1.3 million person-years	RR 0.80 (0.56–1.14)	Very low
Stroke incidence	9	13 134	4.6 million person-years	RR 0.78 (0.69–0.88)†	Low
Type 2 diabetes incidence	17	48 468	6.9 million person-years	RR 0.84 (0.78–0.90)	Moderate
Colorectal cancer incidence	22	22 920	16.9 million person-years	RR 0.84 (0.78–0.89)	Moderate
Cancer mortality	5	29 593	11.2 million person-years	RR 0.87 (0.79–0.95)	Moderate
Randomised trials					
Change in bodyweight (kg)	27	1294	1201	MD –0.37 (–0.63 to –0.11)	High
Change in glycated haemoglobin A _{1c} (%)	6	191	189	SMD –0.35 (–0.73 to 0.03)	Low
Change in total cholesterol (mmol/L)	36	1832	1671	MD –0.15† (–0.22 to –0.07)	Moderate
Change in systolic blood pressure (mm Hg)	15	1064	988	MD –1.27† (–2.50 to –0.04)	Moderate

RR=relative risk. MD=mean difference. SMD=standardised mean difference. *Egger's test for bias ($p=0.0040$). Trim and fill analysis did not change the direction or significance of the pooled estimate. †The high heterogeneity of the pooled effect size ($>50\%$) is unexplained by sensitivity analyses.

Table 1: Effects of higher compared with lower intakes of total dietary fibre on critical outcomes

Results for whole grains

1. Observational studies of wholegrain intakes and hard outcomes
2. RCTs of changing wholegrain intakes on cardiometabolic risk factors

	Number of studies	Number of cases or number in intervention	Person-years or number of controls	Effect size (95% CI)	GRADE quality
Observational studies					
All-cause mortality	9	99 224	10.7 million person-years	RR 0.81 (0.72–0.90)*	Low
Coronary heart disease mortality	2	1588	2.0 million person-years	RR 0.66 (0.56–0.77)	Low
Coronary heart disease incidence	6	7697	2.8 million person-years	RR 0.80 (0.70–0.91)*	Low
Stroke mortality	2	694	2.0 million person-years	RR 0.74 (0.58–0.94)	Low
Stroke incidence	3	1247	1.1 million person-years	RR 0.86 (0.61–1.21)	Very low
Type 2 diabetes incidence	8	14 686	3.9 million person-years	RR 0.67 (0.58–0.78)*	Low
Colorectal cancer incidence	7	8803	6.8 million person-years	RR 0.87 (0.79–0.96)	Moderate
Cancer mortality	5	32 727	10.1 million person-years	RR 0.84 (0.76–0.92)*	Low
Randomised trials					
Change in bodyweight (kg)	11	498	421	MD –0.62 (–1.19 to –0.05)	Moderate
Change in glycated haemoglobin A _{1c} (%)	3	141	141	SMD –0.54 (–1.28 to 0.20)	Low
Change in total cholesterol (mmol/L)	17	772	701	MD –0.09 (–0.23 to 0.04)	Moderate
Change in systolic blood pressure (mm Hg)	8	493	432	MD –1.01 (–2.46 to 0.44)	Moderate

Detailed justification for the GRADE quality of evidence is given in the appendix pp 35–50 for observational studies and appendix pp 105–136 for trials. RR=relative risk. MD=mean difference. SMD=standardised mean difference. *The high heterogeneity of the pooled effect size (>50%) is unexplained by sensitivity analyses.

Table 2: Effects of higher compared with lower intakes of whole grains on critical outcomes

Results for vegetables and fruits

1. Observational studies of vegetable and fruit intakes and hard outcomes

Summary of results from meta-analyses of higher compared with lower intake of vegetables and fruit

Outcome	Pooled estimate (95%CI)	No. studies	No. participants	Certainty
All-cause mortality*	RR 0.82 (0.79 to 0.86)	22	1 035 556	Low
CVD*	RR 0.84 (0.79 to 0.90)	16	963 240	Low
CHD*	RR 0.87 (0.83 to 0.91)	16	792 197	Moderate
Stroke*	RR 0.79 (0.71 to 0.88)	8	226 910	Moderate
Total cancer*	RR 0.93 (0.87 to 0.98)	13	904 300	Moderate

RR: relative risk, CI: confidence intervals

Results for pulses

1. Observational studies of pulses intake and hard outcomes

Summary of results from meta-analyses for higher compared to lower intakes of pulses

Outcome	Pooled estimate (95%CI)	No. studies	No. participants	Certainty
CVD	RR 0.90 (0.84 to 0.97)	5	129 692	Low
CHD*	RR 0.90 (0.84 to 0.97)	10	313 414	Moderate
Stroke	RR 1.01 (0.89 to 1.14)	6	266 241	Low
Type 2 diabetes	RR 0.79 (0.71 to 0.87)	2	100 179	Very low

RR: relative risk, CI: confidence intervals

Childhood intakes of fibre, whole grains, refined grains, vegetables and fruit

1. Observational studies of childhood intakes and diverse outcomes

Forty-five publications reporting on 44,676 participants from 31 cohorts.

Twenty-six studies reported on body weight, nine on blood pressure, eight on blood lipids, seven on glycaemic control, three on bone health, three on metabolic syndrome, three on cognition and development, one of growth, and one on bowel habits.

Summary

- The findings from studies on dietary fibre indicated potential benefits for total cholesterol (including non HDL cholesterol), and bowel habits.
- The findings from studies on vegetables indicated potential benefits for total cholesterol and decreased risk of metabolic syndrome later on in life.
- The findings from studies on fruit indicated a potential decreased risk of metabolic syndrome later on in life and improved outcomes in school.
- The findings on whole grains indicated a potential inverse association on weight gain.
- The findings on refined grains indicated a potential positive association on weight gain.

What was clear for all dietary exposures was that the current literature identified no adverse effects from higher intakes of dietary fibre, vegetables, fruit, and whole grains.



Draft recommendations and supporting information

Professor Shiriki Kumanyika

Chair, WHO NUGAG Subgroup on Diet and Health
Emeritus Professor
Perelman School of Medicine
University of Pennsylvania
United States of America

Recommendations on carbohydrate intake

Recommendations based on

- Review of the scientific evidence
- Review of evidence on potentially mitigating factors

Evidence to recommendations

Potential mitigating factor

Magnitude of the desirable effects

Magnitude of the undesirable effects

Overall certainty of the evidence

Balance of desirable and undesirable effects

Values and preferences

Resource implications

Cost-effectiveness

Acceptability to key stakeholders

Feasibility of implementing

Impact on health equity

Evidence to recommendation

Comprehensive reviews of the relevant literature were conducted for each of the potentially mitigating factors

Results were reviewed and discussed by NUGAG in order to make judgements

Evidence to recommendations

Potential mitigating factor	Judgement	
	Food sources of carbs	Dietary fibre
Magnitude of the desirable effects	Moderate to large	Large
Magnitude of the undesirable effects	Small (whole grains)*	Moderate*
Overall certainty of the evidence	Moderate	
Balance of desirable and undesirable effects	Favours recommendation	
Values and preferences	Probably no important uncertainty or variability	
Resource implications	Varies	
Cost-effectiveness	Varies	
Acceptability to key stakeholders	Probably yes	
Feasibility of implementing	Probably yes	
Impact on health equity	Probably increases health equity but may vary	

* Unexplained increased risk of prostate cancer with whole grains, and endometrial cancer with fibre

Recommendations on carbohydrate intake

1. WHO recommends that carbohydrate intake should come primarily from whole grains, vegetables, fruits and pulses (*strong recommendation*)

Recommendations on carbohydrate intake

2. In adults, WHO recommends an intake of at least 400 grams of vegetables and fruits per day (*strong* recommendation)

3. In children and adolescents, WHO suggests the following intakes of vegetables and fruits: (*conditional recommendation*)

- 2-5 years old, at least 250 grams per day
- 6-9 years old, at least 340 grams per day
- 10 years or older, at least 400 grams per day

Recommendations on carbohydrate intake

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

5. In children and adolescents, WHO suggests the following intakes of naturally-occurring dietary fibre as consumed in foods: (*conditional recommendation*)

- 2-5 years old, at least 15 grams per day
- 6-9 years old, at least 21 grams per day
- 10 years or older, at least 25 grams per day

Rationale for the recommendations

- Robust evidence from observational studies
- Recommended levels of intake in adults based on dose-response relationships
- Data for children were relatively limited but consistent with adult data
 - Because recommended intake values for children (vegetables, fruits and dietary fibre) were extrapolated from adults values, their strength was considered *conditional*

Key remarks



Addressing carbohydrate quality

One of the original aims of updating the guidance on carbohydrate intake was to provide guidance on carbohydrate quality. Having considered the available evidence relating to food sources of carbohydrate, dietary fibre, starch digestibility and glycaemic response as measured by glycaemic index and glycaemic load, the NUGAG Subgroup on Diet and Health concluded that providing guidance on dietary fibre and food sources of carbohydrate with proven benefit in terms of important health outcomes were the most effective means of addressing carbohydrate quality.

Amount of carbohydrate intake not in scope

The scope of this guideline did not include an update to the previous WHO guidance on amount of total carbohydrate intake (which was not determined directly but by calories remaining after defining amounts of dietary fat and protein) and therefore does not contain recommendations on amount. Results from a 2018 meta-analysis suggest that a range of total carbohydrate intake appears to be compatible with a healthy diet, with intakes of approximately 40–70% of total energy intake associated with reduced risk of mortality. This is largely consistent with the range of carbohydrate intake resulting from current WHO guidance on protein intake and recently updated guidance on total fat intake.

Types of food covered

All types of whole grains

Vegetables, fruits and pulses

Related caveats and considerations

Whole grains

Whole grains contain the naturally-occurring components of the kernel (i.e. bran, germ, and endosperm). Some processed foods are labelled whole grain as long as these three components of the grain are included, regardless of the extent to which the grains have been processed, and highly processed products labelled as whole grain are becoming increasingly available (e.g. products containing flour from milled whole grains with added fat, sugar or salt). Because there is evidence to suggest that the naturally occurring structure of intact whole grains contributes to its observed health effects, minimally processed whole grains are preferred.

Vegetables and fruits

While fresh vegetables and fruits are a good choice when and where available, in some settings fresh vegetables and fruits present a significant risk for foodborne illness. In areas where risk of foodborne illness is known to be high, selecting vegetables and fruits with hard skins or peels that can be removed, thoroughly washing with potable water, or consuming cooked or canned varieties can lessen risk of illness

Vegetables and fruits

The recommendations are not limited to fresh vegetables and fruits; cooked, frozen or canned may also be acceptable. However, there is some evidence that tinned fruits (possibly because of free sugars in the syrups) may be associated with poor health outcomes. Specific evidence for dried fruits and fruit juices is very limited and results inconsistent, however both are concentrated sources of sugars, as are fruit concentrates and should therefore be consumed sparingly and in accordance with WHO recommendations on free sugars intake. Similarly, though there wasn't any specific evidence identified for canned vegetables, some canned vegetables contain added sodium and should therefore be consumed in accordance with WHO recommendations on sodium intake.

Preparation and level of processing

The method of preparation and level of processing should be considered when consuming whole grains, vegetables, fruits and pulses, and should be compatible with other WHO macronutrient recommendations as indicated in the following bullet. For example, frying and addition of sauces or condiments significantly increases the amount of fat, sugars or salt. Therefore, fresh foods or those otherwise minimally processed or modified without added fat, sugars or salt are preferred.

Additional dietary considerations

Plant-based foods contain a variety of compounds, some of which have been shown to inhibit absorption of certain nutrients (many of these compounds have also been shown to have health benefit unrelated to their impact on nutrient absorption). The extent to which nutrient absorption might occur varies from person to person and is generally only observed at very high intakes and in those with existing nutritional deficiencies. In addition, methods of preparation including soaking, heating, germination and fermentation appear to reduce inhibitory potential. Therefore, while those with nutritional deficiencies may need to adopt behaviours that minimise the ability of these compounds to inhibit absorption of other nutrients, those with adequate, diverse diets can generally consume whole grains, vegetables, fruits and pulses with little to no risk.

Naturally occurring dietary fiber

The source of dietary fibre in the evidence for disease and mortality outcomes is fibre naturally occurring in foods and not extracted or synthetic fibre. Although there was limited evidence for a small reduction in total cholesterol with use of extracted or synthetic fibre, further research on disease outcomes associated with these types of fibre is needed before conclusions on potential health benefits can be drawn. Therefore, the recommendations specifically cover dietary fibre naturally-occurring in foods.

Children under age 2 not covered

These recommendations do not cover children under two years of age, however whole grains, vegetables, fruits and pulses can be healthy sources of carbohydrates in complementary foods consumed by children from six months to two years of age and are strongly preferred to foods containing free sugars.



Public consultation process

Dr Jason Montez

Scientist

Standards and Scientific Advice Food & Nutrition

Department of Nutrition and Food Safety

World Health Organization

Public consultation

Open from: 7 October (14h CEST) – 6 November 2022 (23:59 CET)

The public consultation is open to all, However, a completed and signed Declaration of Interest (DOI) form **must accompany any comments**.

Comments on:

- overall clarity
- considerations and implications for adaptation and implementation of the guideline
- context and setting-specific issues that have not yet been captured, and
- any errors of fact or missing data.





Closing remarks

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