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EVIDENCE REVIEW FOR DIETARY GUIDANCE

TECHNICAL REPORT

2015

Canada 

Health Canada is the federal department responsible for helping the people of Canada maintain and improve their health. We assess the safety of drugs and many consumer products, help improve the safety of food, and provide information to Canadians to help them make healthy decisions. We provide health services to First Nations people and to Inuit communities. We work with the provinces to ensure our health care system serves the needs of Canadians.

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LIST OF ABBREVIATIONS

ACC	American College of Cardiology
AHA	American Heart Association
AI	Adequate Intake
BBE	Best Brains Exchange
CCHS	Canadian Community Health Survey
CCHS-RR	Canadian Community Health Survey Rapid Response Module
CCS	Canadian Cardiovascular Society
CDA	Canadian Diabetes Association
CFG	Canada's Food Guide
CHMS	Canadian Health Measures Survey
CIHR	Canadian Institutes of Health Research
CNF	Canadian Nutrient File
CUP	Continuous Update Project (WCRF)
CVD	Cardiovascular disease
DGAC	Dietary Guidelines Advisory Committee
DRI	Dietary Reference Intake
EAR	Estimated Average Requirement
ERC	Evidence Review Cycle
FAO	Food and Agriculture Organization
GRADE	Grading of Recommendations Assessment, Development and Evaluation
HDL	High Density Lipoprotein
NHLBI	National Heart, Blood and Lung Institute
LDL	Low Density Lipoprotein
MUFA	Monounsaturated Fatty Acid
NEL	National Evidence Library
NHMRC	National Health and Medicine Research Council
NTD	Neural Tube Defect
NUGAG	Nutrition Guidance Expert Advisory Group (WHO)
ONPP	Office of Nutrition Policy and Promotion
PUFA	Polyunsaturated Fatty Acid
RBC	Red Blood Cell
RDA	Recommended Dietary Allowance
SFA	Saturated Fatty Acid
SSB	Sugar sweetened beverage
UL	Tolerable Upper Intake Level
WCRF	World Cancer Research Fund
WHO	World Health Organization

EXECUTIVE SUMMARY

Background and context

Health Canada's goal is for Canada to be among the countries with the healthiest people in the world. This is achieved, in part, by relying on high-quality scientific research as the basis for Health Canada's work. Dietary risks are the number one risk factor for disease burden and nutrition-related chronic diseases and conditions continue to be issues of public health concern in Canada. Dietary guidance is one component of a comprehensive approach to support healthy eating and improve population health.

Health Canada currently communicates its dietary guidance through a number of policies, including *Eating Well with Canada's Food Guide* (Food Guide), which targets the healthy, general population two years of age and older. The Food Guide describes the amount and type of food that make up a healthy eating pattern while providing flexibility for making healthy choices within the various food groups, advice on fats and oils, and guidance on foods and beverages that should be limited. This guidance underpins nutrition and health policies and programs in Canada; supports consistency in healthy eating messages; and provides a standard for the assessment of dietary intakes of Canadians.

The growing volume of evidence and public interest in nutrition policy stimulated Health Canada to establish a mechanism for more formalized review of the evidence underpinning dietary guidance. The Evidence Review Cycle for Dietary Guidance (ERC) model was developed by Health Canada to guide the review process (Figure 1; Table 1). The ERC is a systematic approach to gathering, assessing, and analyzing data relevant to dietary guidance. The ERC model includes five steps as part of an iterative cycle. This process formalizes the evidence review and ensures dietary guidance remains scientifically sound, relevant and useful.

The 2015 ERC focused on reviewing evidence for guidance targeted at Canadians two years of age and older, excluding guidance for prenatal nutrition and infant feeding since Health Canada's other dietary guidance products on infant feeding and prenatal nutrition were recently revised. This review provides the foundation for the evidence that Health Canada will use—and build on—to inform future dietary guidance policy. Certain factors that are important considerations for formulating dietary guidance were not captured in this evidence review. For example, within the Canadian Context key input area, behaviours associated with food choices were not included. Health Canada has assessed various topicsⁱ, for example food skills in Canada, that were outside of the scope of the 2015 ERC. This report is not a policy document. However, the content will help to identify actions needed to support

Canadians in making healthy eating choices. The results of the report will also help determine whether or not there is a need to revise current guidance, or to develop new guidance.

How the research was conducted

Goal:

The goal of the evidence review was to assess the evidence base underpinning Canada's dietary guidance to ensure guidance continues to be current and useful, and to inform decisions related to Canadian dietary guidance.

Overarching objectives:

The report addresses the following overarching objectives:

- To describe food and nutrient intakes in the Canadian population;
- To describe the nutritional status of the Canadian population using available biomarkers;
- To understand the health status of Canadians by describing the frequency of nutrition-related chronic diseases;
- To collate and assess graded evidence on the effects of food and nutrients on health;
- To assess the revised Dietary Reference Intakes for calcium and vitamin D in relation to Canadians' intakes of these nutrients and available biomarkers for vitamin D;
- To understand how dietary guidance is being used and by whom.

Scope

The ERC model (Figure 1) was used to frame this evidence review process. The ERC model includes five steps as part of an iterative cycle. This Technical Report describes the **Gather, Assess, Synthesize** and **Identify Actions** of the ERC model. Three key input areas—**Scientific Basis, Canadian Context, and Use of Dietary Guidance**—were used to define the scope of the 2015 evidence review (Table 1).

The following sections of the Executive Summary provide brief synopses of the methods and findings for each ERC key input area (Part 3 and Part 4). The implications, considerations and next steps (Part 5) are also summarized.

ⁱ Relevant publications from Health Canada can be found at <http://publications.gc.ca/> or <http://canada.ca> and include: A Look at Food Skills in Canada (2015); Working with Grocers to Support Healthy Eating (2013); Measuring the Food Environment in Canada (2013); Healthy Eating After School (2012); Improving Cooking and Food Preparation Skills: A Synthesis of the Evidence to Inform Program and Policy Development (2010); Canadian Journal of Public Health (CJPH) Supplement Supportive Environments for Learning: Healthy Eating and Physical Activity Within Comprehensive School Health (2010); Defining "Healthy" and "Unhealthy" Foods: An International Review (2009); Canadian Community Health Survey, Cycle 2.2, Nutrition (2004) – Income-related household food security in Canada (2007); CJPH Special Supplement Understanding the Forces that Influence Our Eating Habits: What We Know and Need to Know (2005)

Figure 1: Evidence Review Cycle for Dietary Guidance

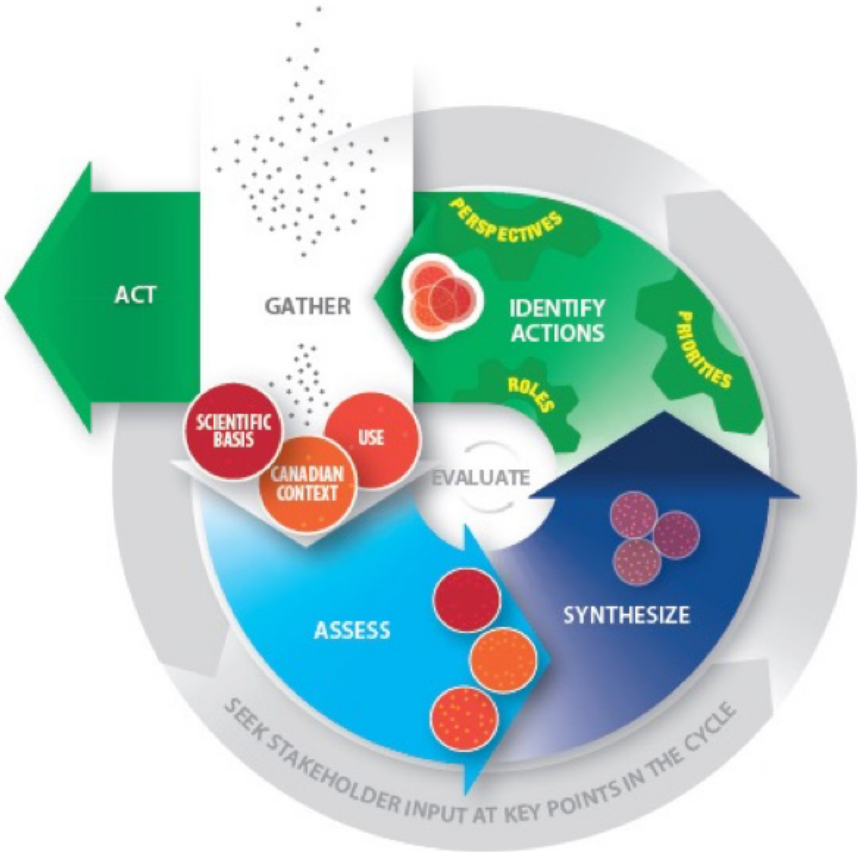


Table 1: Scope of the key input areas for the 2015 Evidence Review Cycle for dietary guidance

KEY INPUT AREA	SCOPE
Canadian Context	Food and nutrient intakes
	Nutritional status
	Health status
Scientific Basis	Effects of food and nutrients on health
	Nutrient standards (e.g. Dietary Reference Intakes)
Use of dietary guidance	Awareness and understanding
	Confidence and acceptance
	Integration and use

The evidence

Canadian context

Health Canada examined the **prevalence of nutrition-related chronic diseases**. The **quantity and quality of food intakes and nutrients of concern** in the population were also assessed. Data analyses were conducted to examine Canadians dietary intakes. Questions were addressed using data from the 2004 Canadian Community Health Survey – Nutrition (CCHS-2004), which is the most recent nationally representative survey of nutritional intake. Inadequate intakes were defined as greater than 10% of an age-sex group having usual intakes below the Estimated Average Requirement (EAR), a cut-off which is consistent with assessment criteria used in the development of the 2007 Food Guide pattern.

Health status of Canadians

Nutrition-related chronic diseases and conditions such as cardiovascular disease, certain cancers, type 2 diabetes, osteoporosis, and obesity, continue to be issues of public health concern in Canada. In 2013, nutrition-related chronic diseases, specifically ischemic heart disease, cerebrovascular disease, colorectal cancer, breast cancer, and diabetes, were among the highest-ranking causes of premature mortality in Canada, in terms of years of life lost.

Canadians food and nutrient intakes

Analyses of national survey data revealed that the majority of Canadians had intakes below the recommended number of Food Guide Servings for vegetables and fruit and milk and milk alternatives. Low quality food choices were observed in all food groups. For example, less than one-fifth of mean total grain products consumed by Canadians came from whole grains. Only approximately one-fifth of mean total meat and alternative servings came from meat alternatives such as legumes (e.g. chickpeas, black beans), nuts and seeds, and eggs. Further, foods in food groups that are not 'in line' with Food Guide guidance and "other" foods, contributed approximately one-third of total calories to the diet of Canadians age two years and older. Of the total calories from "other" foods, top sources included high fat and/or high sugar foods, non-alcoholic beverages, saturated fats and oils, trans fats and oils, and alcoholic beverages.

For children, inadequate intakes of the nutrients studied were only observed for calcium in 4-8 year olds. The majority of children were not consuming the recommended amount of vegetables and fruit, and a higher proportion of their vegetable and fruit Food Guide Servings were consumed as juice, compared to other age groups.

Adolescent boys had inadequate intakes of magnesium, calcium and vitamin A, whereas adolescent girls demonstrated inadequate intakes for most of the nutrients studied. The majority of adolescents consumed lower than recommended intakes of vegetables and fruit, milk and alternatives as well as meat and alternatives. Adolescent girls and premenopausal women were the only sub-groups with observed inadequate intakes for iron. Upon examination of available iron status data, less than 15% of adolescent girls had insufficient serum ferritin.

The majority of this sub-group consumed less than two Food Guide Servings of meat and alternatives, and those 19-50 years of age were not consuming the recommended amount of grain products – a main source of iron in the Canadian population.

Adults had inadequate intakes of calcium, magnesium, zinc, vitamin A and vitamin C. The majority of adults reported intakes below recommended amounts for vegetables and fruit, grain products and milk and alternatives.

Since a potential dose-response relationship has been postulated between intake of red meat and colorectal cancer, intakes were examined. Average intakes of red and processed meat among Canadians 2 years of age and older were lower than the 100 g/d and 50 g/d, respectively, that has been associated with an increased risk of colorectal cancer. Adult males had the highest mean intakes of red meat. Children, 4-8 years of age, consumed on average approximately one-third of their recommended Food Guide servings as processed meats.

Though inadequate dietary intakes of folate were observed for males older than 50 years of age, and females older than 14 years of age, folate deficiency (red blood cell folate <305 nmol/L) was virtually non-existent in the general population. Still, approximately one-fifth of women of childbearing age were not achieving optimal concentrations for neural tube defect risk reduction (red blood cell folate <906 nmol/L).

Updated Dietary Reference Intakes for Vitamin D and Calcium

In 2011, the Institute of Medicine released updated DRIs for vitamin D and calcium, replacing the previous standards set in 1997. Health Canada is assessing the impact the updated DRIs for vitamin D and calcium may have on nutrition policies, such as dietary guidance and fortification policies.

CCHS-2004 data demonstrated a high prevalence of inadequate calcium intakes (with the exception of children under 4 years of age) in the general population. While there appears to be a high prevalence of inadequate intakes of vitamin D, available blood status measures do not suggest wide-spread vitamin D deficiency in the Canadian population. However, vitamin D status in some sub-populations, such as those with darker skin, may warrant further consideration.

Scientific basis

The role of food in the etiology of certain nutrition-related health outcomes was examined. The aim of this component was to identify findings on the **relationship between food and nutrition-related chronic diseases and conditions** published since 2005, when the last formal examination of the evidence was completed. Reports published between 2006 and 2015 from leading scientific organizations or federal agencies, as well as health claims assessments from Health Canada were considered as the primary source of evidence.

For numerous topics, the convincing conclusions re-affirmed Health Canada's current understanding of food and health relationships. These included conclusions related to:

- Sodium and increased risk of high blood pressure
- Trans fatty acids and increased risk for cardiovascular disease
- Dietary patterns—characterized by higher consumption of vegetables, fruits, whole grains, low-fat dairy, and seafood, lower consumption of red and processed meats, refined grains, and sugar-sweetened foods and beverages—and positive cardiovascular disease outcomes.

There was a stronger evidence base since 2005 for several convincing conclusions:

Alcohol:

- Alcohol intake and increased risk of liver, colorectal (men), mouth, pharynx, larynx and oesophageal cancer

Fats:

- Fatty acids intake and risk of type 2 diabetes
- Replacement of saturated fatty acids (SFA) with unsaturated fatty acids and reduced risk of cardiovascular disease

Fibre:

- Intake of single grains (beta-glucan oat fibre, barley grain products, psyllium) and flaxseed and decreased cholesterol
- Intake of fibre and decreased risk of colorectal cancer

Meat and meat alternatives:

- Intake of standardized amounts of meat (red 100g/d and processed 50 g/d) in relation to increased risk for colorectal cancer
- Association between soy protein and lowered cholesterol

Sugars:

- Intake of sugar-sweetened beverages and increased risk of adiposity in children
- Intake of added sugars and increased risk of obesity or type 2 diabetes

The review also highlighted areas where evidence was not convincing, for example associations between intake of total fat and certain health outcomes (e.g. cardiovascular disease, obesity), between intake of 100% fruit juice and obesity and between intake of whole grains and coronary heart disease risk reduction.

Use of Canadian Dietary Guidance

The Use input area focused on assessing integration of Food Guide guidance into policies, programs, services and resources; facilitators and challenges to its use and integration; and suggested areas for improvement. Qualitative data were collected through document and content reviews, key informant interviews, thematic case studies, discussion groups, on-line consultation with stakeholders and interviews with patients/consumers. Quantitative data collected through a nationally representative survey (Rapid Response Module of the Canadian Community Health Survey) on consumer awareness and use of the Food Guide were also analysed. A wide range of stakeholders participated in the assessment, including provincial and territorial governments, non-governmental health organizations, professional associations and researchers, educators and communicators, and food industry representatives.

The majority of Canadians reported having seen or heard of the Food Guide. The vast majority of stakeholders reported that they had 'carefully read' the Food Guide and were 'extensively aware of the contents'. Further, observations during key informant interviews, case studies and discussion groups demonstrated that participants could easily discuss the Food Guide guidance, and in many instances, could provide considerable detail on specific aspects of the Food Guide.

There was considerable uptake of the Food Guide guidance across stakeholder groups (public, private, not-for-profit, health, education and the food industry) and various populations were targeted by stakeholders, including parents, children, seniors and youth. Further, the Food Guide was identified as the basis for many policies, programs, services and resources developed with respect to nutrition and healthy eating.

The programs and resources reviewed were likely to integrate the Food Guide in its entirety or replicate portions of it. The majority had integrated information about the four food groups, number of servings, serving sizes, and directional statements. When lower numeracy levels or limited food skills were identified among participants, the least complex content of the Food Guide (e.g. food group names) was more often integrated than more complex content. Life stage guidance and guidance on oils and fats were least likely to be integrated into resources.

Though many factors were identified by stakeholders as facilitators to the use and integration of the Food Guide guidance, a number of challenges were also reported by stakeholders, which included clarity, relevance and integration by individuals. Credibility of recommendations was identified as a facilitator and a challenge, with most respondents identifying it as a facilitator. Further, the Food Guide guidance was considered credible since stakeholders viewed it as being derived from scientific evidence and because guidance development is led by the federal government. Clarity of the recommendations was reported as a challenge by respondents of the stakeholder survey, with some identifying perceived contradictions in guidance. For example in the vegetables and fruit group, 100% juice is depicted as a serving example and there is guidance to have vegetables and fruit more often than juice. However, most stakeholders identified clarity of recommendations as a facilitator.

Implications, considerations and next steps

The results of the evidence review for dietary guidance were interpreted in relation to Canada's Food Guide, whose purpose is to define and promote healthy eating for Canadians. Implications were considered related to dietary guidance development and Canada's Food Guide as a policy and educational tool.

Implications related to dietary guidance development

Maintaining stakeholder confidence in the credibility of Health Canada's dietary guidance is important. It is necessary to share the process and evidence that underpins dietary guidance. Health Canada has committed to regular communication about the review and assessment of evidence related to dietary guidance on a cycle of every five years, or more frequently as needed.

The 2015 ERC review revealed that many aspects of the scientific basis for the Food Guide are consistent with the latest evidence on diet and health. However, further precision may be needed in the guidance on certain topics. Examples include being more explicit in certain areas (e.g. replacement of saturated fat by unsaturated fat) and further emphasizing the importance of overall healthy eating patterns. The review also highlighted areas where evidence was not convincing, for example associations between intake of total fat and certain health outcomes (e.g. cardiovascular disease, obesity), and between intake of 100% fruit juice and obesity. While recent advancements in the science base do not represent radical changes, it is essential to take them into account and incorporate them into future updates of dietary guidance.

Health Canada is committed to a transparent approach in the development of dietary guidance to ensure it remains free of any conflict of interest. As part of this transparency, Health Canada will clearly communicate reviews of the evidence, as well as how input from stakeholders is used in policy development.

Implications for Canada's Food Guide as a policy and educational tool

As a policy tool, Canada's Food Guide is playing an important role in underpinning a wide variety of policies, programs, and initiatives to promote healthy eating. Stakeholders are using various aspects of the guidance to meet the needs of different audiences in different circumstances. There are high levels of awareness and confidence in Health Canada's dietary guidance by consumers, yet the food and nutrient intakes of Canadians indicate that many do not follow a healthy pattern of eating. Stakeholders identified several challenges related to consumer understanding and application of guidance that imply the Food Guide could be more useful as an educational tool to promote healthy eating. Addressing these challenges may require adding more detail to policy and educational tools in some cases, while simplifying them in others. One tool may not be meeting the needs of all audiences.

Considerations for next steps

The nutrition information environment is complex

The nutrition information environment is crowded, complex, and rapidly evolving. There is renewed interest by some stakeholders in having simplified key messages to convey to consumers.

Health Canada, provincial/territorial governments, and various other stakeholders can work together to maximize the positive impact that dietary guidance can have in Canada

Guidance developed by Health Canada serves as an important policy underpinning for a wide variety of policies, programs, and initiatives to promote healthy eating. Health Canada has a role to play in supporting intermediaries in their efforts to help Canadians apply dietary guidance.

Additional information is needed to further inform dietary guidance development

Certain factors that are important considerations for formulating dietary guidance were not captured in this evidence review, such as behaviours associated with food choices. Health Canada has assessed various topics that were outside of the scope of the 2015 ERC, and will continue to investigate these topics in future decision making for dietary guidance. Further, the scope of future evidence reviews could be broadened to incorporate work on eating behaviours (such as eating out); food security as it relates to food and nutrient intakes; environmentally sustainable diets; and information on the dietary intakes of populations such as First Nations, Inuit, and Metis.

Updated data on the food and nutrient intakes of Canadians will be examined when available

The 2015 Canadian Community Health Survey – Nutrition has gathered information on usual dietary intake, height and weight, and data on certain health conditions. An updated (2015) version of the Canadian Nutrient File, a database which lists the nutrient values in Canadian foods, is available and provides a more up-to-date representation of the foods in the Canadian marketplace.

Food choices are not simply a matter of personal choice

Dietary guidance is one part of a comprehensive approach to support healthy eating. Creating supportive environments by addressing the broader determinants of healthy eating is required.

Conclusion

Nutrition-related chronic diseases and conditions continue to be issues of public health concern in Canada. The food and nutrient intakes of Canadians indicate that for many, different food choices are required to improve the quality of their diet. Dietary guidance can make an important contribution to nutritional health, but must be used and implemented by Canadians in order to do so. The findings of the 2015 ERC review have brought to light important implications for Canada's Food Guide that need to be considered as guidance evolves in the future and Health Canada strives to provide credible and relevant tools appropriate for defining and promoting healthy eating in Canada.

There is a continued need for Federal guidance on nutrition and healthy eating to provide a consistent basis for the diverse range of policies, programs, and resources developed by stakeholders. Educational tools are also required to support consumers in applying dietary guidance on an individual level. Developing distinct policy and education tools to support the various uses of Canada's Food Guide may help to address some of the challenges identified with using the existing Food Guide.

Going forward, it will be important to enhance collaborative efforts with stakeholders working to support healthy eating. Determining how best to support and leverage the expertise of others should lead to having more relevant tools for policymakers, health professionals, nutrition educators, and consumers that complement, rather than compete with, each other.

Part I

INTRODUCTION

The Evidence Review Cycle (ERC) for Dietary Guidance is a systematic approach to gathering, assessing, and analyzing data relevant to dietary guidance.¹ The overarching purpose of the ERC is to formalize the evidence review process and ensure dietary guidance remains scientifically sound, relevant, and useful.

Dietary guidance is evidence-based information and advice for making food choices that promote health and reduce the risk of nutrition-related chronic diseases and obesity. Chronic diseases or conditions such as cardiovascular disease, hypertension, osteoporosis, type 2 diabetes, certain cancers, and obesity continue to be issues of public health concern in Canada and internationally. The Global Burden of Diseases, Injuries and Risk Factors Study (2013) identified dietary risk as the number one risk factor for disease burden.^{2,3} Further, six of the top 10 risk factors that contribute to the most disease burden in Canada were nutrition related. Guiding Canadians towards a healthy pattern of eating through policy and education is a key component of population health promotion efforts.

Health Canada currently communicates its dietary guidance through a number of policies, including *Eating Well with Canada's Food Guide* (the Food Guide).^{4,5} The Food Guide describes the amount and type of food that make up a healthy eating pattern while providing:

- flexibility for making healthy choices within the various food groups
- advice on fats and oils
- guidance on foods and beverages that should be limited.

The importance of combining healthy eating and physical activity is emphasized. This guidance underpins nutrition and health policies and programs and supports consistency in healthy eating messages. It provides a standard for the assessment of the dietary intakes of Canadians.

This Technical Report reflects Health Canada's review of the evidence on dietary intakes, the health and nutritional status of Canadians, the relationship between nutrition and chronic disease outcomes, and use of existing guidance. It describes the methodology for gathering evidence and presents the evidence base resulting from the 2015 ERC.

The 2015 ERC focused on reviewing evidence for guidance targeted at Canadians two years of age and older, excluding guidance for prenatal nutrition. Future cycles may include evidence for guidance across the lifecycle. While this report provides a foundation, it does not include the entirety of the evidence that will be considered when informing dietary guidance. It is not a policy document. However, the content will help to identify actions needed to support Canadians in making healthy eating choices. The report will also help determine whether or not there is a need to revise current guidance, or to develop new guidance.

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GOAL, OVERARCHING OBJECTIVES, AND SCOPE OF THE EVIDENCE REVIEW

Goal:

The goal of the evidence review was to assess the evidence base underpinning Canada's dietary guidance to ensure guidance continues to be current and useful, and to inform decisions related to Canadian dietary guidance.

Overarching objectives:

The report addresses the following overarching objectives:

- To describe food and nutrient intakes in the Canadian population;
- To describe the nutritional status of the Canadian population using available biomarkers;
- To understand the health status of Canadians by describing the frequency of nutrition-related chronic diseases;
- To collate and assess graded evidence on the effects of food and nutrients on health;
- To assess the revised Dietary Reference Intakes for calcium and vitamin D in relation to Canadians' intakes of these nutrients and available biomarkers for vitamin D;
- To better understand how dietary guidance is being used and by whom.

Scope

The Evidence Review Cycle for Dietary Guidance (ERC) model was used to frame this evidence review process. The model is described briefly here and in greater detail elsewhere.¹

The ERC model (Figure 2.1; Table 2.1) includes five steps as part of an iterative cycle. This Technical Report describes the **Gather, Assess, Synthesize** and **Identify Actions** of the ERC model. Three key input areas—**Scientific Basis, Canadian Context, and Use of Dietary Guidance**—were used to define the scope of the 2015 evidence review (Table 2.2). Evidence from the three key areas appears as spheres within each stage of the model to emphasize how these components are considered at each step of the ERC.

In the Gather step, data is gathered for each of the three key input areas. The spheres for each key input area are separate in this step, since the type of evidence and methods for data gathering varied considerably for each input. The evidence review focused on guidance targeted at Canadians two years of age and older. It excluded guidance for prenatal nutrition, since Health Canada's other dietary guidance products on infant feeding² and prenatal nutrition³ were recently revised. The Canadian Context evidence input assesses the type and quality of food intakes, nutrients of concern, and nutrition-related chronic disease prevalence in Canada. To address the Scientific Basis input area, the role of food in the etiology of certain nutrition-related health outcomes was examined. The aim of this component of the review was to identify findings on the role of food in health. The Scientific Basis also covers nutrient standards, such as the Dietary Reference Intakes (DRIs), which have been revised since 2005. An assessment of the 2011 update of the DRIs for calcium and vitamin D was considered as part of the 2015 ERC.⁴

Figure 2.1: Evidence Review Cycle for Dietary Guidance

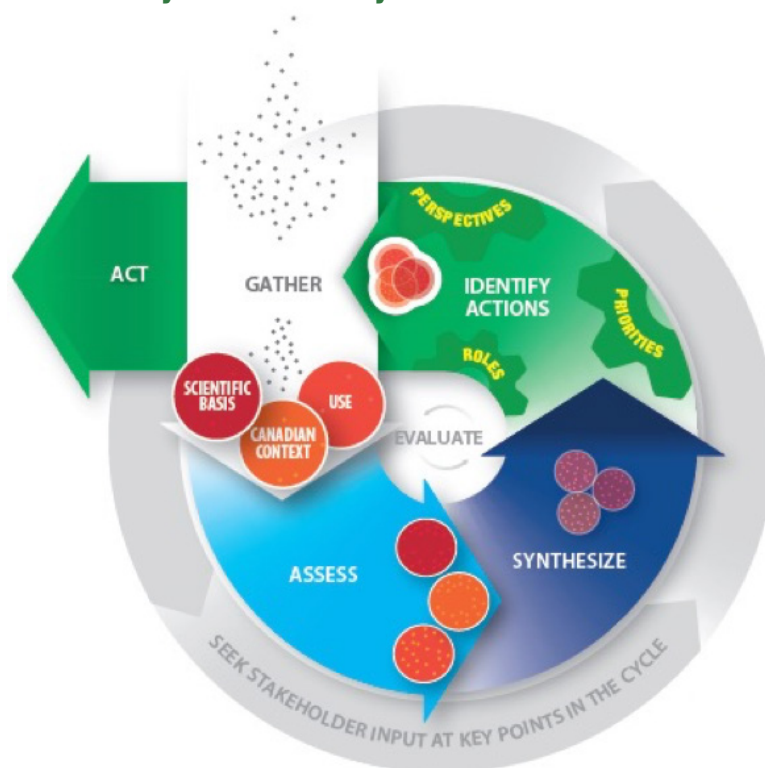


Table 2.1: Overview of the steps in the Evidence Review Cycle for Dietary Guidance

STEP	DESCRIPTION
Gather	Gather data for each evidence input
Assess	Assess data from each evidence input and identify relevant findings Gather more data through further analyses, as needed
Synthesize	Synthesize overall relevant findings from each input area
Identify actions	Identify areas of focus and issues of concern Identify potential options for action Consider roles, perspectives, and priorities
Act	Implement actions Communication process and results

The Use input area focused on:

- consumer awareness and use of the Food Guide
- assessing integration of Food Guide guidance into policies, programs, services and resources
- facilitators and challenges to its use and integration
- areas for improvement that may serve to support consumers and stakeholders in using Food Guide guidance.

In the Assess step of the ERC, the data gathered are assessed and findings that may have implications for dietary guidance, or how dietary guidance is used and understood, are identified. In the Synthesize step, the spheres for the key input areas begin to overlap. Here, the relevant findings from the assessment step are synthesized to identify relationships among the key input areas. Potential options for action are identified, which involves assessing approaches that could be initiated or strengthened to address areas of focus or issues of concern. Each approach is assessed in relation to roles, public health priorities and stakeholder perspectives. This leads to the Identify Actions step, where the most feasible and relevant actions are identified.

Limitations of the evidence review scope

This Report provides the foundation for the evidence that Health Canada will use—and build on—to inform future dietary guidance policy. Certain factors that are important considerations for formulating dietary guidance were not captured in this evidence review. For example, within the Canadian Context key input area, behaviours associated with food choices were not included. Health Canada has assessed various topicsⁱ, for example food skills in Canada, that were outside of the scope of the 2015 ERC, and will continue to investigate these topics in future decision making for dietary guidance.

Table 2.2: Scope of the key input areas for the 2015 Evidence Review Cycle for dietary guidance

KEY INPUT AREA	SCOPE
Canadian Context	Food and nutrient intakes
	Nutritional status
	Health status
Scientific Basis	Effects of food and nutrients on health
	Nutrient standards (e.g. Dietary Reference Intakes)
Use of dietary guidance	Awareness and understanding
	Confidence and acceptance
	Integration and use

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3. Health Canada. Prenatal nutrition [cited 2016 Feb 15]. Available from: <http://www.hc-sc.gc.ca/fn-an/nutrition/prenatal/index-eng.php>.
4. Institute of Medicine. 2011. Dietary Reference Intakes for calcium and vitamin D. Washington, DC: The National Academies Press.

ⁱ Relevant publications from Health Canada can be found at <http://publications.gc.ca/> or <http://canada.ca> and include: A Look at Food Skills in Canada (2015); Working with Grocers to Support Healthy Eating (2013); Measuring the Food Environment in Canada (2013); Healthy Eating After School (2012); Improving Cooking and Food Preparation Skills: A Synthesis of the Evidence to Inform Program and Policy Development (2010); Canadian Journal of Public Health (CJPH) Supplement Supportive Environments for Learning: Healthy Eating and Physical Activity Within Comprehensive School Health (2010); Defining “Healthy” and “Unhealthy” Foods: An International Review (2009); Canadian Community Health Survey, Cycle 2.2, Nutrition (2004) – Income-related household food security in Canada (2007); CJPH Special Supplement Understanding the Forces that Influence Our Eating Habits: What We Know and Need to Know (2005).

Part 3

EVIDENCE BASE

Section 3.1: Canadian Context: Food and nutrient intakes, nutritional status and health status

Section 3.1.1 Methodology

2004 Canadian Community Health Survey (CCHS)-Nutrition analyses

The 2004 CCHS-Nutrition^{1,2} was the most recent survey to collect food consumption data for Canada. The survey's data were used to assess Canadians' food consumption, as well as nutrient intakes from food. The CCHS design, sample, and interview procedures are described in detail elsewhere.³ The CCHS excludes members of the regular Canadian Forces and people living in the territories, on Indian reserves, in institutions, in some remote regions, and all residents (military and civilian) of Canadian Forces bases.

Descriptive statistics (means, medians, percentages) were performed by Health Canada to:

1. identify nutrients that were under- or over-consumed
2. highlight food and nutrients of concern across the population or within particular sub-groups
3. determine whether Food Guide recommendations were being met.

Assessment of nutrient intakes

Dietary Reference Intake (DRI) tables are included in [Appendix B](#) (nutrients with an EAR) and [Appendix C](#) (Acceptable Distribution Macronutrient Range or AMDR). Nutrient intake findings were considered to have potential implications if data showed the following:

- Intakes were inadequate. This was defined as greater than 10% of an age-sex group having usual intakes below the EAR, a cut-off which is consistent with assessment criteria used in the development of the 2007 Food Guide pattern.⁴
- The median usual intake of a nutrient was above the UL.
- The median usual intake of a nutrient was below the AI (for nutrients with an AI).
- Mean usual intakes of carbohydrate, protein, or total fat were greater than 10% above or below the AMDR.

Assessment of amounts and types of foods

Descriptive analyses were conducted using the 2004 CCHS-Nutrition data⁵ to examine the prevalence of usual intakes from food groups based on the 2007 Food Guide recommendations.

The proportion of the population with intakes "below" the recommended number of servings, by age and sex, is an indicator of the potential presence of low intake. However, it should be noted that since the recommended number of servings are the average amounts that people should try to consume over time, rather than minimums or maximums, consuming less than the recommended amount for a given food group does not necessarily indicate inadequate intake.

Quality of food choices was examined using the validated Canadian Nutrient File/Canada's Food Guide (CNF/CFG) classification tool,⁴ which assigns foods to categories to identify how closely they align with Food Guide guidance. Examples for food classifications for each food group are outlined in more detail in [Appendix D](#).⁶ The classified foods were compared to the recommended amounts and types of foods and beverages in the Food Guide, to create three categories: "in line," "partially in line," and "not in line" with Canada's Food Guide guidance. Within each food and age-sex group, the prevalence of consuming foods "in line," "partially in line," or "not in line" was calculated by dividing the mean number of servings from each category by the mean total number of servings. Mean intakes of foods specified in the Food Guide directional statements (Table 3.1) were also examined.

The term "serving" refers to both CFG Servings and CFG serving equivalents (used for foods "not in line" with CFG guidance).

Table 3.1: Canada's Food Guide directional statements that were examined as part of the assessment of quality of food choices

-
- Eat at least one **dark green vegetable** each day.
 - Eat at least one **orange vegetable** each day.
 - Have **vegetables and fruit** more often than juice.
 - Make at least half of your **grain products** whole grain each day.
 - Have **meat alternatives** such as beans, lentils and tofu often.
-

Other data sources

Health Canada relied on the assessment of several other data sources to understand the current status of food and nutrient intakes and the prevalence of nutrition-related chronic diseases in Canada. These included a literature scan and published reports from Governmental and non-Governmental organizations on health status.

Literature scan

Inclusion and exclusion criteria

To supplement the Health Canada analysis of the 2004 CCHS-Nutrition data, a scan of the literature was conducted to identify nationally representative studies that examined the food and nutrient intake and health status of Canadians 2 years of age and older. A broad range of food and nutrient related keywords were chosen for inclusion *a priori*. These included “Canadian health survey,” “food,” “beverage,” “fat,” “nutrition,” “intake,” “diet,” and “eating.” Data sources on food intake were included if they were based on a nationally representative sample and related to at least one of the following sections of Canada’s Food Guide: guidance on type of food and beverage (i.e., a food or beverage related to one of the directional statements); foods and beverages to limit; amounts of food (e.g. Food Guide servings), oils and fats, or life stage guidance (Table 3.2). National level data on biochemical indicators of nutrient status were also included. Excluded were studies focused on food safety topics, the broader food environment, or evaluations of adherence to recommendations from the 1992 Food Guide. Further, studies that only examined nutritional supplement intake were excluded unless these were related to recommendations for women of childbearing age or Canadians over 50 years of age.

Search strategy

Health Canada conducted a comprehensive search of the literature to identify relevant national level studies on food or nutrient intake in Canada. Articles published between 2006 and September 2012 were retained—though the search covered literature from the year 2000—to ensure any literature referring to the national level nutrition data collected in the 2004-CCHS nutrition were captured. The search used numerous databases (Embase, Ovid MEDLINE, Econlit, Food Science and Technology Abstracts, International Pharmaceutical Abstracts, PsycINFO, and Social Policy and Practice). The search was limited to English and French language. In addition to the search of electronic databases, hand-searching of reference lists of relevant articles was conducted. The output was cross-referenced with Statistics Canada’s list of published articles⁷ that utilized data from the 2004 Canadian Community Health Survey-Nutrition (CCHS),¹ and cycles 1 and 2 of the Canadian Health Measures Survey (CHMS),^{8,9} which included biochemical indicators for serum ferritin, red blood cell folate, vitamin B₁₂, and vitamin D. Search strategies are presented in [Appendix A](#).

Table 3.2: Inclusion and exclusion criteria used to select studies on Canadian food and nutrient status

INCLUSION CRITERIA	EXCLUSION CRITERIA
<ul style="list-style-type: none"> • Focused on food or beverage intake in relation to Canada’s Food Guide guidance • Type of food and beverage (i.e. a food or beverage related to one of the directional statements) • Foods and beverages to limit • Amounts of food (e.g. servings) • Oils and fats • Life stage guidance • Used national-level data • French or English language 	<ul style="list-style-type: none"> • Focused on food safety, broader food environment • Nutritional supplement intake (unless related to recommendations for women of childbearing age or adults over 50 years of age) • Compared intakes to recommendations from the 1992 Canada’s Food Guide

Data extraction

Titles and abstracts were screened by two reviewers for articles that met the inclusion criteria, and duplicates were removed. This was followed by full-text review. Data was extracted into an Excel table to capture information on data source, population, food or nutrient topic, broad food group or nutrient category, and key findings.

Publications from Government and Non-Governmental organizations

Relevant publications from the Public Health Agency of Canada, Canadian Cancer Society, the Canadian Diabetes Association and Statistics Canada were reviewed for data on the prevalence of a broad range of nutrition-related chronic diseases and conditions—cardiovascular disease, including hypertension and stroke, type 2 diabetes, cancer (including mouth, pharynx, larynx, nasopharynx, lung, stomach, pancreas, liver, colon and rectum, breast, prostate, kidney, and bladder), osteoporosis, bone health, fractures, weight gain, adiposity, and obesity. These chronic diseases and conditions have been associated with food or nutrient intake. Health status was described based on the prevalence outlined in relevant reports and this information was used to characterize the population and provide context for assessment.

Section 3.1.2 Canadian food and nutrient intakesⁱ and nutritional status

Vegetables and fruit

Amounts of vegetables and fruit

More than 50% of all age and sex groups, with the exception of 2-3 year-olds, had usual intakes below the recommended number of servings for vegetables and fruit (Tables 3.3-3.5).

Among children, approximately 80% of females 9-13 years of age had intakes of vegetables and fruit below the recommended number of servings. The lowest prevalence of intakes below the recommended number of servings (48%) was among 2-3 year olds (Table 3.3).

For adolescents 14-18 years of age, 86% of both males and females had usual intakes of vegetables and fruit below the recommended number of servings (Table 3.4).

Among adults 19 years of age and older, males 19-30 years of age (93%) and females 19-30 years of age (94%) had the highest prevalence of usual intakes of vegetables and fruit below recommended amounts. The lowest prevalence (67%) was for males 51-70 years of age (Table 3.5).

Black and Billette¹⁰ also examined vegetable and fruit intakes, using 2004 CCHS-Nutrition data, and observed that 74% of Canadians aged 2 years and older did not meet the recommended number of servings.

Quality of vegetable and fruit choices

For all age groups, mean vegetable and fruit servings that were “in line” with the Food Guide guidance represented more than 80% of the mean total vegetable and fruit servings (Figure 3.1).

ⁱ Nutrient intakes reported are based on unpublished Health Canada descriptive analyses, unless otherwise referenced

For adults 51 years of age and older, mean vegetables and fruit servings that were “in line” with Food Guide guidance represented 91% of the mean total vegetable and fruit servings (Figure 3.1). For adolescents 14-18 years of age, mean vegetables and fruit servings that were “in line” with Food Guide guidance represented 83% of the mean total vegetable and fruit servings.

In the overall population, the mean intake of either dark green or orange vegetables was less than one Food Guide serving per day (data not shown). Separately, the mean intake of dark green vegetables was 0.35 servings per day. For orange vegetables this was 0.25 servings per day.

Black and Billette¹⁰ reported, using 2004 CCHS-Nutrition data, that the majority of Canadians did not consume at least one daily Food Guide serving of dark green vegetables (79%) or one or more daily Food Guide serving of orange vegetables (91%).

In the overall population, aged 2 years and older, servings of juice contributed less than 20% of total vegetables and fruit Food Guide servings (Figure 3.2). The highest contribution from juice was found in children aged 2-3 years (37% of total vegetable and fruit Food Guide servings).

Grain products

Amount of grain products

Less than 50% of children and adolescents had usual intakes below the recommended number of servings for grain products. Approximately 37% of females, 9-13 years of age, had usual intakes below the recommended number of servings for grain products (Table 3.6). The lowest prevalence was for 4-8 year olds (approximately 3%). More than 50% of children 4-8 years of age consumed two or more Food Guide servings above recommended amounts.

Among 14-18 year olds, females had a higher prevalence than males of consuming less than the recommended number of servings for grain products (47% and 23%, respectively) (Table 3.7). Forty-seven percent of males 14-18 years of age consumed two or more Food Guide servings above recommended amounts.

More than 50% of adults, with the exception of females 19-30 years old, had usual intakes below the recommended number of servings for grain products. Among adults 19 years of age and older, those older than 70 years of age had the highest prevalence of consuming grain products below the recommendations (82%). Males 19-30 years of age had the lowest prevalence (approximately 53%) (Table 3.8).

Quality of grain product choices

Mean Food Guide servings from grain products choices that were “in line” with the Food Guide guidance represented 61% and 68% of mean total servings from grain products, for children and adolescents, respectively. This was lower than other age groups, with the highest being among adults 19-50 years of age and older than 50 years of age (74% and 72%, respectively) (Figure 3.1). The overall contribution of whole grains consumed to total grain products was 16% in the Canadian population (Figure 3.3).

Milk and alternatives

Amount of milk and alternatives

Among children, 77% of females 9-13 years of age reported intakes of milk and alternatives that were less than the recommended number of servings. The lowest prevalence of intakes below recommended servings (26%) was among 2-3 year-olds (Table 3.9).

Females 14-18 years of age had a higher prevalence of consuming milk and alternatives below recommended intakesⁱ (81%) than males 14-18 years of age (56%) (Table 3.10).

More than 50% of adults 19 years of age and older reported intakes of milk and alternatives below recommended intakes. The highest prevalence of intakes below the recommended amount was among females older than 70 years of age (97%). The lowest prevalence below the recommended amount was among males 19-30 years of age (53%) (Table 3.11).

In the overall population two years of age and older, the mean intake of fluid milkⁱⁱ was less than one Food Guide Serving per day (Figure 3.4). Mean intake of more than two Food Guide servings of fluid milk per day was not reported by any age-sex group.

Quality of milk and alternatives choices

For adults 19-50 years of age, mean servings from milk and alternatives that were ‘in line’ with the Food Guide guidance represented 40% of mean total servings from milk and alternatives. This was 45% for adults older than 50 years of age (Figure 3.1). In the general population two years of age and older, 0.75 servings of fluid milk came from sources that were ‘in line’ with the Food Guide guidance, 0.19 servings came from sources “partially in line,” and 0.01 servings came from sources that were “not in line” (Figure 3.4).

Meat and alternatives

Amount of meat and alternatives

Fifty-seven percent of adolescent males, 48% of females 31-50 years of age, and 69% of females older than 70 years of age reported consuming less than the recommended number of servings for meat and alternatives (Table 3.12). Sampling variability was too high in other age-sex groups and serving size categories to report meat and alternatives intake below recommended amounts (Tables 3.13 and 3.14).

Quality of meat and alternative choices

For children 2-13 years of age, mean servings from meat and alternatives choices that were “in line” with the Food Guide guidance represented 26% of mean total servings of Meat and Alternatives. This was higher for adults 50 years of age and older (38%) (Figure 3.1). In the general population two years of age and older, 22% of mean total meat and alternative servings came from meat alternatives such as legumes (e.g. chickpeas, black beans), nuts and seeds, and eggs (data not shown). The prevalence was relatively consistent across age-sex groups, although boys 14-18 years of age had a significantly lower prevalence of meat alternatives choices (16%) compared to most adults.

ⁱ The reference amount used was three Food Guide Servings for these age-sex groups.

ⁱⁱ Skim, 1%, 2%, homogenized, reconstituted dry milk powder, evaporated milk, fortified soy-based beverages, and flavoured milks

Mudryi et al. used the 2004 CCHS-Nutrition data to describe pulse intakes and observed that 13% of Canadian adults consumed pulses (defined in the study as dry beans, peas or lentils), with the highest prevalence being among those 51-70 years of age (15%).¹¹

An additional Health Canada analysis of Canadians two years of age and older, who reported consuming red or processed meat indicated that mean intakes were less than 100 g/d and 50 g/d respectively. Males 31-50 years of age had the highest mean intake of red meat (85 g/d). Further, males 14-18 years of age (38 g/d), children aged 4-8 years (24 g/d), and females 9-13 years of age (24 g/d) had the highest mean intakes of processed meat.

Calories from “other” foods

A Health Canada analysis demonstrated that foods in food groups that are not ‘in line’ with Food Guide guidance and “other”¹¹ foods, contributed approximately one-third of total calories to the diet of Canadians age two years and older (Figure 3.5). Of the total calories from “other” foods (20%), top sources included high fat and/or high sugar foods (6%), non-alcoholic beverages (6%), saturated fats and oils or trans fats and oils (3%), and alcoholic beverages (3%) (Figure 3.6).

Sugar-sweetened beverages

Using 2004 CCHS-nutrition data, Garriguet reported that Canadian children consumed sweetened drinks (i.e soft drinks and fruit drinks with less than 100% juice) in amounts that represented approximately 3% of total energy intake for children aged 1-3 years of age. This was between 4% and 8% for children 4-18 years of age.¹² Prevalence of regular soft drink consumption was higher in adolescents than in children. Among adults, regular soft drink consumption was lowest among those 71 years and older (10%), and highest for men 19-30 years of age (47%).¹³ Another study of children 2-18 years of age determined beverage intake patterns using cluster analysis with 2004 CCHS-Nutrition data, by which non-overlapping groups of individuals with similar beverage intake patterns were created based on the dominant pattern of beverage intake. Sweetened beverage clusters appeared in all age–sex groups. Further, mean intakes of sweetened beverages ranged from 553 to 1059 g/d and contributed between 2% and 18% of total energy intake, depending on the cluster.¹⁴ For example, the percent energy from sweetened beverages was 2% for 2-5 year olds and 6-11 year old boys in the fruit juice cluster and was 18% for 12-18 year old boys in the soft drink cluster and 18% for 12-18 year old girls in the fruit drink cluster.

Macronutrients

Statistics Canada analyses of 2004 CCHS-Nutrition data demonstrated that Canadians’ average daily calorie intake from protein was within age-appropriate AMDR ranges (Appendix C).¹⁵ Canadians’ average daily calorie intake from carbohydrates were also within age-appropriate AMDR ranges. Children and adolescents consumed approximately 55% of calories from carbohydrates. For adults this was approximately 50%. Seven percent of children 4-8 years of age had total fat intakes above the AMDR.¹⁵ For children 1-8 years of age, saturated fat contributed approximately 12% of total energy

intake, while polyunsaturated fat and monounsaturated fat contributed approximately 4% and 11%, respectively. Among adults, more than 25% of those aged 31-50 years consumed greater than 35% (the upper end of the AMDR) of their total calories from fat.¹⁵ The mean percentage of Canadian adults’ total energy intake from saturated fat was approximately 10%, while their mean intake from monounsaturated fat was approximately 12 to 13%. The percentage of Canadian adults’ total energy intake from polyunsaturated fat was approximately 6%. Approximately one third of the fat intakes for adults was from the meat and alternatives group, and about 25% from “other foods,” which was defined by Garriguet based on the 1992 Canada’s Food Guide criteria and included healthy and unhealthy fats and oils, such as butter and cooking oils.¹⁵ Among children 4-18 years of age, approximately 25% of fat intakes came from each meat and alternatives, milk products, and “other foods.”

Nutrient intake from food sourcesⁱⁱ (Table 3.15)

Vitamin A: Prevalence of inadequate intakes for vitamin A was greater than 10% for all age and sex groups 9 years of age and older. The highest prevalence of inadequate intakes was among males older than 70 years of age (49%) and lowest prevalence was among males 9-13 years of age (12%).

Vitamin C: Prevalence of inadequate intakes for vitamin C was greater than 10% for adults 19 years of age and older. The highest prevalence of inadequate intakes was among males older than 70 years of age (32%) and lowest among females 19-30 years of age (11%).

Iron: Prevalence of inadequate intakes for iron was greater than 10% for females 14-50 years of age. The prevalence was highest among females 31-50 years old (18%) and lowest among females 14-18 years old (12%).

Magnesium: Prevalence of inadequate intakes for magnesium was greater than 10% for males and females 14 years of age and older, as well as females 9-13 years of age. In males, prevalence was highest for males older than 70 years of age (65%) and lowest for males 19-30 years old (35%). In females, prevalence was highest for 14-18 year-olds (66%) and lowest for 9-13 year-olds (18%).

Phosphorus: Prevalence of inadequate intakes for phosphorus was greater than 10% among females 9-18 years of age (30% for 9-13 year-olds and 35% for 14-18 year-olds).

Vitamin B₆: Prevalence of inadequate intakes for vitamin B₆ was greater than 10% for males older than 50 years of age and in females 14-18 years old and older than 30 years of age. In males, prevalence was 11% for 51-70 year-olds and 23% for men older than 70 years of age. In females, prevalence was highest for those older than 70 years of age (33%) and lowest for 14-18 year-olds (11%).

i All other foods include: beverages, foods not classified, meal replacements and supplements, uncategorized foods, high fat and/or high sugar foods, and saturated and/or trans fats and oils.

ii Vitamin D and calcium intakes from food and supplements, as well as blood status, are assessed in detail in *Part 4, Section 1*, since the Dietary Reference Intakes for these nutrients were updated in 2011.

Zinc: Prevalence of inadequate intakes for zinc was greater than 10% for males older than 30 years of age and females 9-50 years of age and older than 70 years of age. In males, prevalence was highest for those older than 70 years of age (41%) and the prevalence was lowest for 31-50 year-olds (13%). In females, the prevalence was highest for those older than 70 years of age (25%) and the prevalence was lowest for 31-50 year-olds (14%).

Folate: Prevalence of inadequate intakes for folate was greater than 10% for males older than 50 years of age and for females 14 years of age and older. In males, the prevalence was 12% for 51-70 year olds and 23% for those older than 70 years of age. In females, the prevalence was highest in women older than 70 (47%) and lowest in 19-30 year-olds (19%).

Folate intake in the Canadian population was also explored in the literature. Prevalence of folate inadequacy from dietary sources was less than 20% across all age and sex groups (except females >70 years of age [33%]), after adjustment for folic acid overagesⁱ. Less than 1% of women of childbearing age consumed 400 µg folic acid or more from dietary sources alone. Folic acid-containing supplement intake was reported by approximately 25% in the general Canadian population and 18% for women of childbearing age.¹⁶ The highest prevalence of folic acid-containing supplement use was found among children 4-8 years of age (39%) and adults 51-70 years of age (31%). Folic acid intakes exceeded the tolerable upper intake level (UL)ⁱⁱ for 1.2%-5% of individuals in each age and sex group. This was only observed in folic acid supplement users—not in those who consumed folic acid from diet alone—even when accounting for potential overages.¹⁶

Vitamin B₁₂: Inadequate intakes were most prevalent among females 14 years of age and older (16% for 14-18 year-olds, 14% for 31-50 year-olds, 15% for women over 70 years old). Approximately 11% of those 19 years of age and older had vitamin B₁₂ intakes below the EAR.

Vitamin B₁₂-containing supplement use was reported in the literature, with intakes observed in 23% percent of children, 12% of adolescents, and 26% of adults.¹⁷

Fibre and potassium: Median usual intakes were below the adequate intake (AI) across age and sex groups for both fibre and potassium (Table 3.16). Median usual intakes for fibre in adults older than 19 years of age were 19 g for females and 18 g for males. Median usual intakes for potassium in adults were 3394 mg for males and 2750 mg for females.

Sodium: Median usual intakes for sodium exceeded the UL for all age-sex groups (Table 3.16). Adult (19 years of age and older) median intakes were 3479 mg/d for males and 2582 mg/day for females.

Nutritional Statusⁱⁱⁱ

Folate status^{iv}

RBC folate concentrations were reported in the literature using CHMS (2007-2009).¹⁸ In the overall population (6-79 years of age), folate deficiency (RBC folate <305 nmol/L) was less than 1%. Median RBC folate was 1248 nmol/L. The overall population estimated to have higher folate status was either 40% using a cut-off of >1360 nmol/L or 65%¹⁹ using a cut-off of >1090 nmol/L respectively.

Older adults (60-79 years of age) had the highest median RBC folate concentrations (1409 nmol/L).

Approximately 22% of women of childbearing age (15-45 years of age) were not achieving the RBC folate cut-off of 906 nmol/L²⁰ considered to be an optimal concentration for maximal NTD risk reduction.^v

Vitamin B₁₂ status

Vitamin B₁₂ concentrations were reported in the literature using CHMS (2009-2011).^{17,19} Approximately 4% of Canadians 3-79 years of age were vitamin B₁₂ deficient (<148 pmol/L). Less than 1% of 3-11 year-olds were deficient. The prevalence of vitamin B₁₂ deficiency ranged from 3% among 12-19 year-olds to 5% among 40-79 year-olds. There was no significant difference in the prevalence of insufficient vitamin B₁₂ levels between the sexes.¹⁷

Iron status

Hemoglobin and serum ferritin concentrations were reported in the literature using CHMS (2007-2009).²⁰ The mean hemoglobin concentration was 142 g/L among Canadians aged 3 to 79. For 97% of people aged 3 to 79, hemoglobin levels were at or above age group and sex reference values, indicating that they were not anemic. Hemoglobin sufficiency ranged from a low of 90% among women aged 65 to 79 to nearly 100% for males aged 12 to 19. Ninety-six percent of Canadians had sufficient serum ferritin concentrations. The figure was significantly higher among males (99%) than it was among females (92%). Adolescent females 12-19 years of age had the highest prevalence of insufficient serum ferritin (13%).

iii Vitamin D and calcium intakes from food and supplements, as well as blood status, are assessed in detail in Part 4, Section 1, since the Dietary Reference Intakes for these nutrients were updated in 2011.

iv The RBC folate concentrations were assessed using Immulite 2000 immunoassay, the method used in the 2007-2009 Canadian Health Measures Survey, which measures RBC folate concentrations higher than microbiologic assay (the gold standard).

v This cut-off was derived from a large, Irish, case-control study of antenatal women from 1986 to 1990. The study demonstrated a continuous, inverse dose-response relationship between RBC folate concentration (up to 1292 nmol/L) and NTD risk.²¹ The concentration of 906 nmol/L represents the lower boundary of the uppermost RBC folate concentration group in this study population, as well as the category with the lowest risk of an NTD birth.

i Adjusted to account for potential overages (i.e. more folate may be in fortified foods than would be expected based on mandated fortification levels and food composition values compared with the mandated level of fortification)

ii The UL applies to synthetic forms of folate (folic acid) only.

Table 3.3: The usual number of vegetable and fruit servings consumed per day by Canadian children 2-13 years of age, CCHS 2004

SEX	AGE (YRS)	N	NUMBER OF SERVINGS														CFG RECOMMENDED INTAKE (SERVINGS)	APPROXIMATE % BELOW RECOMMENDED INTAKE*
			PREVALENCE (% (SE))															
			<2		2 TO <3		3 TO <4		4 TO <5		5 TO <6		6 TO <7		≥7			
MF	2-3	1430	7.7E	(1.7)	16.7	(1.4)	23.7	(1.3)	21.0	(1.3)	13.8	(1.1)	8.1	(0.7)	8.9	(1.5)	4	48.1
MF	4-8	3235	7.0E	(1.5)	16.9	(1.3)	23.2	(1.3)	20.4	(1.4)	14.6	(0.9)	8.8	(0.7)	9.1E	(1.5)	5	67.5
M	9-13	2080	4.0E	(1.2)	12.1	(1.7)	20.2	(1.6)	20.9	(1.4)	16.3	(1.1)	11.3	(0.9)	15.1E	(3.0)	6	73.5
F	9-13	1980	F		12.3E	(2.6)	23.5	(2.7)	25.6	(2.4)	18.4	(2.2)	10.1	(1.5)	8.0E	(2.4)	6	81.9**

CFG: *Eating Well with Canada's Food Guide* (2007)

MF: male and female combined, M: male, F: female

SE: Standard Error

E: Data with a coefficient of variation from 16.6% to 33.3%—interpret with caution.

F: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval not entirely between 0 and 3%—suppressed due to extreme sampling variability.

<3: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval entirely between 0 and 3%—interpret with caution.

* This is an indicator of the potential presence of low intake. However, since the number of servings recommended are not minimums or maximums, but the average amounts that people should try to consume over time, consuming less than the recommended amount for a given food group does not necessarily indicate inadequate intake.

** Due to extreme sampling variability in lowest category, approximated as (100-(% at or above the recommended number of servings)).

Table 3.4: The usual number of vegetable and fruit servings consumed per day by Canadian adolescents 14-18 years of age, CCHS 2004

SEX	AGE (YRS)	N	NUMBER OF SERVINGS																	CFG RECOMMENDED INTAKE (SERVINGS)	APPROXIMATE % BELOW RECOMMENDED INTAKE*	
			PREVALENCE (% (SE))																			
			<2	2 TO <3		3 TO <4		4 TO <5		5 TO <6		6 TO <7		7 TO <8		8 TO <9		≥9				
M	14-18	2288	F	8.5 ^E	(1.4)	16.0	(1.3)	17.8	(1.1)	17.5	(1.2)	13.7	(1.1)	9.4	(0.8)	6.3	(0.7)	8.2 ^E	(1.8)	8	85.5**	
F	14-18	2256	5.1 ^E	(1.5)	13.3	(1.6)	20.7	(1.4)	20.6	(1.3)	15.9	(1.3)	10.6	(1.0)	6.4	(0.7)	3.6	(0.6)	3.8 ^E	(1.1)	7	86.2

CFG: *Eating Well with Canada's Food Guide (2007)*

MF: male and female combined, M: male, F: female

SE: Standard Error

E: Data with a coefficient of variation from 16.6% to 33.3%— interpret with caution.

F: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval not entirely between 0 and 3%—suppressed due to extreme sampling variability.

<3: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval entirely between 0 and 3%—interpret with caution.

* This is an indicator of the potential presence of low intake. However, since the number of servings recommended are not minimums or maximums, but the average amounts that people should try to consume over time, consuming less than the recommended amount for a given food group does not necessarily indicate inadequate intake.

** Due to extreme sampling variability in lowest category, approximated as (100-% at or above the recommended number of servings).

Table 3.5: The usual number of vegetable and fruit servings consumed per day by Canadian adults 19 years of age and older, CCHS 2004

SEX	AGE (YRS)	N	NUMBER OF SERVINGS																		CFG RECOMMENDED INTAKE (SERVINGS)	APPROXIMATE % BELOW RECOMMENDED INTAKE*
			PREVALENCE (% (SE))																			
			<3		3 TO <4		4 TO <5		5 TO <6		6 TO <7		7 TO <8		8 TO <9		9 TO <10		≥10			
M	19-30	1804	10.0 ^E	(3.2)	13.1	(1.9)	16.6	(1.5)	16.6	(1.7)	14.1	(1.8)	10.6	(1.3)	7.5	(0.9)	4.8 ^E	(0.8)	6.6 ^E	(1.9)	10	93.3
F	19-30	1854	14.2 ^E	(3.5)	20.0	(1.6)	22.7	(2.1)	18.8	(1.9)	11.9	(1.3)	6.7	(1.0)	3.3 ^E	(0.8)	< 3		< 3		8	94.3
M	31-50	2596	11.3 ^E	(2.4)	14.8	(1.3)	17.0	(1.2)	16.0	(1.5)	13.3	(1.3)	9.9	(0.8)	6.9	(0.6)	4.5	(0.6)	6.2 ^E	(1.8)	8	82.3
F	31-50	2686	18.4	(2.2)	17.7	(1.0)	17.7	(0.9)	15.3	(0.8)	11.8	(0.8)	7.8	(0.7)	4.8	(0.5)	2.8	(0.4)	3.8 ^E	(0.8)	7	80.9
M	51-70	2550	10.1 ^E	(1.8)	11.8	(1.1)	15.1	(1.1)	15.8	(0.9)	13.7	(0.7)	11.2	(0.7)	8.2	(0.7)	5.4	(0.6)	8.8	(1.8)	7	66.5
F	51-70	3200	8.1 ^E	(1.7)	14.5	(1.1)	20.5	(1.1)	19.8	(1.2)	15.1	(0.9)	10.2	(0.7)	5.9	(0.6)	3.0	(0.5)	2.8 ^E	(0.8)	7	78.0
M	71+	1520	11.6 ^E	(2.4)	17.5	(1.8)	19.4	(1.6)	17.2	(1.7)	13.0	(1.4)	8.6	(0.9)	5.3	(0.8)	3.2 ^E	(0.7)	F		7	78.7
F	71+	2610	16.7	(2.0)	19.5	(1.1)	20.6	(1.0)	16.6	(0.7)	11.6	(0.7)	7.1	(0.7)	3.9	(0.5)	2.0 ^E	(0.3)	2.1 ^E	(0.5)	7	85.0

CFG: *Eating Well with Canada's Food Guide* (2007)

MF: male and female combined, M: male, F: female

SE: Standard Error.

E: Data with a coefficient of variation from 16.6% to 33.3%—interpret with caution.

F: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval not entirely between 0 and 3%—suppressed due to extreme sampling variability.

<3: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval entirely between 0 and 3%—interpret with caution.

* This is an indicator of the potential presence of low intake. However, since the number of servings recommended are not minimums or maximums, but the average amounts that people should try to consume over time, consuming less than the recommended amount for a given food group does not necessarily indicate inadequate intake.

Table 3.6: The usual number of grain products servings consumed per day by Canadian children 2-13 years of age, CCHS 2004

SEX	AGE (YRS)	N	NUMBER OF SERVINGS												CFG RECOMMENDED INTAKE (SERVINGS)	APPROXIMATE % BELOW RECOMMENDED INTAKE*		
			PREVALENCE (% (SE))															
			<2	2 TO <3		3 TO <4		4 TO <5		5 TO <6		6 TO <7		≥7				
MF	2-3	1430	F												3	NA		
MF	4-8	3235	0.0	(0.0)	<3		F		15.4 ^E	(2.6)	28.8	(3.1)	27.2	(3.4)	25.2	(4.1)	4	3.4**
M	9-13	2080	0.0	(0.0)	<3		<3		F		9.7 ^E	(2.5)	19.3	(2.0)	68.2	(5.5)	6	12.5**
F	9-13	1980	0.0	(0.0)	<3		F		11.8	(2.0)	20.9	(1.7)	23.4	(2.0)	39.9	(4.1)	6	36.7**

CFG: *Eating Well with Canada's Food Guide (2007)*

MF: male and female combined, M: male, F: female

NA: not able to calculate due to sampling variability in some categories

SE: Standard Error

E: Data with a coefficient of variation from 16.6% to 33.3% —interpret with caution.

F: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval not entirely between 0 and 3%—suppressed due to extreme sampling variability.

<3: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval entirely between 0 and 3% —interpret with caution.

* This is an indicator of the potential presence of low intake. However, since the number of servings recommended are not minimums or maximums, but the average amounts that people should try to consume over time, consuming less than the recommended amount for a given food group does not necessarily indicate inadequate intake.

** Due to extreme sampling variability in lowest category, approximated as (100-(% at or above the recommended number of servings)).

Table 3.7: The usual number of grain products servings consumed per day by Canadian adolescents 14-18 years of age, CCHS 2004

SEX	AGE (YRS)	N	NUMBER OF SERVINGS														CFG RECOMMENDED INTAKE (SERVINGS)	APPROXIMATE % BELOW RECOMMENDED INTAKE*	
			PREVALENCE (% (SE))																
			<3	3 TO <4	4 TO <5	5 TO <6	6 TO <7	7 TO <8	8 TO <9	≥9									
M	14-18	2288	0.0	(0.2)	F	F	7.3 ^E	(1.4)	11.8	(1.2)	14.7	(1.1)	15.5	(1.3)	46.9	(3.9)	7	22.9	
F	14-18	2256	F	8.1	(1.3)	15.5	(1.3)	20.3	(1.3)	18.6	(1.4)	14.0	(1.0)	9.4	(0.8)	11.3 ^E	(2.0)	6	46.7**

CFG: *Eating Well with Canada's Food Guide (2007)*

MF: male and female combined, M: male, F: female

SE: Standard Error

E: Data with a coefficient of variation from 16.6% to 33.3%—interpret with caution.

F: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval not entirely between 0 and 3%—suppressed due to extreme sampling variability.

<3: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval entirely between 0 and 3%; interpret with caution.

* This is an indicator of the potential presence of low intake. However, since the number of servings recommended are not minimums or maximums, but the average amounts that people should try to consume over time, consuming less than the recommended amount for a given food group does not necessarily indicate inadequate intake.

** Due to extreme sampling variability in lowest category, approximated as (100-(% at or above the recommended number of servings)).

Table 3.8: The usual number of grain products servings consumed per day by Canadian adults 19 years of age and older, CCHS 2004

SEX	AGE (YRS)	N	NUMBER OF SERVINGS														CFG RECOMMENDED INTAKE (SERVINGS)	APPROXIMATE % BELOW RECOMMENDED INTAKE*		
			PREVALENCE (% (SE))																	
			<3		3 TO <4		4 TO <5		5 TO <6		6 TO <7		7 TO <8		8 TO <9				≥9	
M	19-30	1804	<3		<3		F		10.6 ^E	(2.1)	17.0	(2.3)	19.8	(2.8)	17.8	(2.6)	29.3 ^E	(5.4)	8	52.9**
F	19-30	1854	F		12.7 ^E	(2.3)	23.1	(2.2)	23.4	(2.3)	16.8	(1.9)	10.4	(1.4)	5.3 ^E	(1.2)	F		7	NA
M	31-50	2596	F		5.8 ^E	(1.3)	11.1	(1.3)	15.9	(1.2)	16.9	(1.5)	14.9	(1.5)	11.8	(1.1)	21.2	(3.0)	8	67.0**
F	31-50	2686	6.6 ^E	(1.9)	15.4	(1.6)	24.3	(1.8)	22.9	(2.1)	15.6	(1.1)	8.9	(1.1)	4.0 ^E	(0.9)	F		6	69.2
M	51-70	2550	F		9.4	(1.4)	17.6	(1.4)	20.8	(1.6)	17.0	(1.6)	12.6	(1.0)	8.5	(0.7)	9.8 ^E	(2.0)	7	69.1**
F	51-70	3200	9.7 ^E	(2.1)	20.4	(1.7)	24.7	(1.7)	20.6	(1.5)	12.9	(1.1)	6.7	(0.9)	3.0 ^E	(0.7)	<3		6	75.1
M	71+	1520	4.2 ^E	(1.2)	12.6	(1.9)	21.3	(2.0)	22.5	(1.6)	17.4	(1.3)	10.9	(1.4)	5.9 ^E	(1.2)	F		7	78.0
F	71+	2610	11.4 ^E	(2.1)	23.9	(1.6)	27.0	(1.4)	19.6	(1.3)	10.6	(1.1)	4.7	(0.7)	1.8 ^E	(0.4)	<3		6	81.9

CFG: *Eating Well with Canada's Food Guide (2007)*

MF: male and female combined, M: male, F: female

NA: not able to calculate due to sampling variability in some categories

SE: Standard Error

E: Data with a coefficient of variation from 16.6% to 33.3%—interpret with caution.

F: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval not entirely between 0 and 3%—suppressed due to extreme sampling variability.

<3: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval entirely between 0 and 3%—interpret with caution.

* This is an indicator of the potential presence of low intake. However, since the number of servings recommended are not minimums or maximums, but the average amounts that people should try to consume over time, consuming less than the recommended amount for a given food group does not necessarily indicate inadequate intake.

** Due to extreme sampling variability in lowest category, approximated as (100-(% at or above the recommended number of servings)).

Table 3.9: The usual number of milk and alternatives servings consumed per day by Canadian children 2-13 years of age, CCHS 2004

SEX	AGE (YRS)	N	NUMBER OF SERVINGS													CFG RECOMMENDED INTAKE (SERVINGS)	APPROXIMATE % BELOW RECOMMENDED INTAKE*	
			PREVALENCE (% (SE))															
			<1	1 TO <2	2 TO <3	3 TO <4	4 TO <5	5 TO <6	≥6									
MF	2-3	1430	3.2 ^E	(0.9)	22.4	(2.2)	36.8	(2.5)	23.9	(1.8)	9.9	(1.2)	3.0 ^E	(0.6)	F	2	25.6	
MF	4-8	3235	4.0 ^E	(0.9)	27.6	(1.6)	37.8	(1.8)	20.7	(1.0)	7.2	(0.9)	2.0 ^E	(0.5)	<3	2	31.6	
M	9-13	2080	4.1 ^E	(1.2)	22.8	(2.5)	31.4	(2.0)	22.4	(2.1)	11.6	(1.1)	4.9 ^E	(0.8)	2.8 ^E	(0.8)	3-4**	58.3
F	9-13	1980	6.3 ^E	(1.5)	35.0	(2.4)	35.9	(2.3)	16.4	(1.6)	5.0 ^E	(1.1)	<3	<3	3-4**	77.2		

CFG: *Eating Well with Canada's Food Guide* (2007)

MF: male and female combined, M: male, F: female

SE: Standard Error

E: Data with a coefficient of variation from 16.6% to 33.3%—interpret with caution.

F: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval not entirely between 0 and 3%—suppressed due to extreme sampling variability.

<3: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval entirely between 0 and 3%—interpret with caution.

* This is an indicator of the potential presence of low intake. However, since the number of servings recommended are not minimums or maximums, but the average amounts that people should try to consume over time, consuming less than the recommended amount for a given food group does not necessarily indicate inadequate intake.

** A recommended intake of 3 servings per day was used to estimate the recommended intake for these age groups.

Table 3.10: The usual number of milk and alternatives servings consumed per day by Canadian adolescents 14-18 years of age, CCHS 2004

SEX	AGE (YRS)	N	NUMBER OF SERVINGS														CFG RECOMMENDED INTAKE (SERVINGS)	APPROXIMATE % BELOW RECOMMENDED INTAKE*
			PREVALENCE (% (SE))															
			<1		1 TO <2		2 TO <3		3 TO <4		4 TO <5		5 TO <6		≥6			
M	14-18	2288	4.5 ^E	(1.4)	20.2	(2.3)	30.9	(1.8)	22.9	(2.1)	12.4	(1.2)	5.5	(0.9)	3.6 ^E	(1.1)	3-4**	55.6
F	14-18	2256	14.3 ^E	(2.5)	35.9	(2.5)	30.3	(1.9)	13.3	(1.5)	4.4 ^E	(0.9)	1.3 ^E	(0.4)	<3		3-4**	80.5

CFG: *Eating Well with Canada's Food Guide (2007)*

MF: male and female combined, M: male, F: female

SE: Standard Error

E Data with a coefficient of variation from 16.6% to 33.3%; interpret with caution.

<3 Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval entirely between 0 and 3%; interpret with caution

* This is an indicator of the potential presence of low intake, however, since the number of servings recommended are not minimums or maximums, but the average amounts that people should try to consume over time, consuming less than the recommended amount for a given food group does not necessarily indicate inadequate intake.

** A recommended intake of 3 servings per day was used to estimate the recommended intake for this age group.

Table 3.11: The usual number of milk and alternatives servings consumed per day by Canadian adults 19 years of age and older, CCHS 2004

SEX	AGE (YRS)	N	NUMBER OF SERVINGS												CFG RECOMMENDED INTAKE (SERVINGS)	APPROXIMATE % BELOW RECOMMENDED INTAKE*
			PREVALENCE (% (SE))													
			<1		1 TO <2		2 TO <3		3 TO <4		4 TO <5		5 TO <6			
M	19-30	1804	16.8 ^E	(3.2)	36.6	(4.1)	28.2	(2.5)	12.1	(1.9)	4.2 ^E	(1.2)	<3	<3	2	53.9
F	19-30	1854	20.9 ^E	(4.1)	46.0	(3.8)	24.5	(2.7)	6.9 ^E	(1.7)	<3	<3	<3	2	66.9	
M	31-50	2596	23.8	(3.2)	38.3	(3.5)	25.0	(2.0)	9.1	(1.4)	2.6 ^E	(0.7)	<3	<3	2	62.1
F	31-50	2686	27.2	(3.4)	41.5	(3.8)	21.4	(2.4)	7.1 ^E	(1.3)	2.1 ^E	(0.7)	<3	<3	2	68.7
M	51-70	2550	34.5	(3.4)	38.6	(2.9)	18.3	(3.0)	6.1 ^E	(1.3)	F	<3	<3	3	91.4	
F	51-70	3200	38.4	(3.5)	43.1	(2.4)	14.6 ^E	(2.9)	3.1 ^E	(0.9)	<3	<3	<3	3	96.1	
M	71+	1520	35.0	(5.1)	39.2	(4.4)	17.1 ^E	(3.0)	6.0 ^E	(1.7)	F	<3	<3	3	91.3	
F	71+	2610	33.3	(3.6)	47.1	(2.9)	16.1	(2.0)	3.0 ^E	(0.9)	<3	<3	<3	3	96.5	

CFG: *Eating Well with Canada's Food Guide* (2007)

MF: male and female combined, M: male, F: female

SE: Standard Error

E: Data with a coefficient of variation from 16.6% to 33.3%—interpret with caution.

F: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval not entirely between 0 and 3%—suppressed due to extreme sampling variability.

<3: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval entirely between 0 and 3%—interpret with caution.

* This is an indicator of the potential presence of low intake. However, since the number of servings recommended are not minimums or maximums, but the average amounts that people should try to consume over time, consuming less than the recommended amount for a given food group does not necessarily indicate inadequate intake.

Table 3.12: The usual number of meat and alternatives servings consumed per day by Canadian children 2-13 years of age, CCHS 2004

SEX	AGE (YRS)	N	NUMBER OF SERVINGS													CFG RECOMMENDED INTAKE (SERVINGS)	APPROXIMATE % BELOW RECOMMENDED INTAKE*
			PREVALENCE (% (SE))														
			0 TO <0.5	0.5 TO <1	1 TO <1.5	1.5 TO <2	2 TO <2.5	2.5 TO <3	3 TO <3.5	3.5 TO <4	≥ 4						
MF	2-3	1430	<3	34.3 ^E (9.4)	56.1 ^E (11.8)	F	<3	<3	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1	NA			
MF	4-8	3235	<3	F	42.5 (3.8)	30.8 (4.3)	10.2 (2.0)	F	<3	<3	<3	<3	1	NA			
M	9-13	2080	<3	F	11.8 ^E (3.4)	26.3 (2.4)	26.8 (3.1)	18.3 2.5	8.8 (1.6)	3.9 (1.0)	F	2	NA				
F	9-13	1980	<3	F	37.6 (4.3)	35.9 (5.4)	14.1 (3.1)	F	<3	<3	<3	1	NA				

CFG: *Eating Well with Canada's Food Guide* (2007)

MF: male and female combined, M: male, F: female

NA: not able to calculate due to sampling variability in some categories

SE: Standard Error

E: Data with a coefficient of variation from 16.6% to 33.3%—interpret with caution.

F: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval not entirely between 0 and 3%—suppressed due to extreme sampling variability.

<3: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval entirely between 0 and 3%—interpret with caution.

* This is an indicator of the potential presence of low intake. However, since the number of servings recommended are not minimums or maximums, but the average amounts that people should try to consume over time, consuming less than the recommended amount for a given food group does not necessarily indicate inadequate intake.

Table 3.13: The usual number of meat and alternatives servings consumed per day by Canadian adolescents 14-18 years of age, CCHS 2004

SEX	AGE (YRS)	N	NUMBER OF SERVINGS										CFG RECOMMENDED USUAL INTAKE (SERVINGS)	APPROXIMATE % BELOW RECOMMENDED INTAKE*
			PREVALENCE (% (SE))											
			<1	1 TO <2	2 TO <3	3 TO <4	4 TO <5	≥5						
M	14-18	2288	< 3	19.5 (3.1)	35.8 (2.7)	25.8 (2.2)	11.2 (1.4)	6.1 ^E (1.8)					3	56.9**
F	14-18	2256	F	67.9 (6.8)	24.3 ^E (4.6)	F	<3	0.0 (0.0)					2	NA

CFG: *Eating Well with Canada's Food Guide* (2007)

MF: male and female combined, M: male, F: female

NA: not able to calculate due to sampling variability in some categories

SE: Standard Error

E: Data with a coefficient of variation from 16.6% to 33.3%—interpret with caution.

F: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval not entirely between 0 and 3%—suppressed due to extreme sampling variability.

<3: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval entirely between 0 and 3%— interpret with caution.

* This is an indicator of the potential presence of low intake. However, since the number of servings recommended are not minimums or maximums, but the average amounts that people should try to consume over time, consuming less than the recommended amount for a given food group does not necessarily indicate inadequate intake.

** Due to extreme sampling variability in lowest category, approximated as (100-(% at or above the recommended number of servings)).

Table 3.14: The usual number of meat and alternatives servings consumed per day by Canadian adults 19 years of age and older, CCHS 2004

SEX	AGE (YRS)	N	NUMBER OF SERVINGS										CFG RECOMMENDED USUAL INTAKE (SERVINGS)	APPROXIMATE % BELOW RECOMMENDED INTAKE*	
			PREVALENCE (% (SE))												
			<1	1 TO <2		2 TO <3		3 TO <4		4 TO <5		≥5			
M	19-30	1804	<3	15.6 ^E	(4.3)	38.6	(4.1)	28.8	(3.8)	11.5 ^E	(2.2)	F	3	NA	
F	19-30	1854	F	57.4	(5.6)	30.8	(4.5)	F	<3	<3	<3	2	NA		
M	31-50	2596	<3	F	37.2	(4.5)	38.1 ^E	(8.1)	14.5 ^E	(3.6)	F	3	NA		
F	31-50	2686	6.1 ^E	(2.0)	42.0	(2.9)	36.9	(3.0)	11.8	(1.8)	2.6 ^E	(0.8)	<3	2	48.1
M	51-70	2550	<3	15.4 ^E	(3.6)	43.6	(3.6)	28.8	(3.0)	9.2 ^E	(1.6)	F	3	NA	
F	51-70	3200	F	42.2	(4.7)	45.6	(5.5)	9.6 ^E	(2.6)	<3	<3	2	NA		
M	71+	1520	F	38.1	(4.2)	40.4	(4.2)	14.7	(2.4)	F	<3	3	NA		
F	71+	2610	9.6 ^E	(2.9)	59.8	(3.7)	26.1	(3.2)	4.0 ^E	(1.2)	<3	<3	2	69.5	

CFG: *Eating Well with Canada's Food Guide* (2007)

MF: male and female combined, M: male, F: female

NA: not able to calculate due to sampling variability in some categories

SE: Standard Error

E: Data with a coefficient of variation from 16.6% to 33.3% —interpret with caution.

F: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval not entirely between 0 and 3%—suppressed due to extreme sampling variability.

<3: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval entirely between 0 and 3%— interpret with caution.

* This is an indicator of the potential presence of low intake. However, since the number of servings recommended are not minimums or maximums, but the average amounts that people should try to consume over time, consuming less than the recommended amount for a given food group does not necessarily indicate inadequate intake.

Table 3.15: Proportion of the Canadian population with usual intakes below the Estimated Average Requirement (EAR) for certain nutrients* from food sources, by age-sex group, CCHS 2004

SEX	AGE (YRS)	NUTRIENTS % <EAR								
		Folate (DFE)	Iron	Magnesium	Phosphorus	Vitamin A	Vitamin B ₆	Vitamin B ₁₂	Vitamin C	Zinc
Both	1-3	2.9 ^E	1.4 ^E	<3	<3	<3	<3	<3	<3	<3
	4-8	<3	0.6 ^E	<3	<3	2.5 ^E	<3	<3	<3	<3
Male	9-13	<3	<3	4.7 ^E	8.9 ^E	11.6 ^E	<3	<3	<3	<3
	14-18	5.2 ^E	<3	41.5	4.9 ^E	38.3	<3	1.7 ^E	7.1 ^E	5.6 ^E
	19-30	<3	<3	34.8	<3	47.4	F	F	13.7 ^E	F
	31-50	F	<3	45.7	<3	42.7	F	F	24.4	13.3 ^E
	51-70	11.5	<3	53.6	<3	42.5	10.9 ^E	F	24.0	24.6
	>70	23.1	1.9 ^E	65.3	F	49.0	23.1 ^E	F	31.5	41.0
	19+	6.8	0.4 ^E	—	0.4 ^E	44.3	—	2.7 ^E	22.5	16.8
Female	9-13	F	<3	18.3	30.2	23.1	F	F	<3	14.6 ^E
	14-18	20.1	11.9	66.3	35.1	42.2	11.1	15.8 ^E	6.0	19.6
	19-30	18.8	16.8	36.6	<3	43.4	<9.6 ^E	F	10.8 ^E	14.7 ^E
	31-50	19.6	18.3	36.4	1.8	34.1	15.9	13.7 ^E	19.9	14.2
	51-70	25.0	<3	37.5	1.8 ^E	33.8	19.4 ^E	F	14.2	F
	>70	47.0	2.0 ^E	51.1	3.3 ^E	40.2	32.5	15.3 ^E	20.8	25.2
	19+	24.6	—	—	1.9	35.8	—	11.1 ^E	16.7	14.0

EAR: Estimated Average Requirement

DFE: Dietary folate equivalent

Shaded area: Issue of concern—proportion of the group with usual intakes below the EAR is greater than 10%

E: Data with a coefficient of variation (CV) from 16.6% to 33.3%—interpret with caution.

<3: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval entirely between 0 and 3%—interpret with caution.

F: Data with a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval not entirely between 0 and 3%—suppressed due to extreme sampling variability.

—: Data not available

* Vitamin D and calcium intakes are reported in *Part 4, Section I*.

Note: Thiamin was marginally inadequate for females >70 years of age (11%) (data not shown).

Table 3.16: Median usual intake for potassium, fibre, and sodium in the Canadian population, CCHS 2004

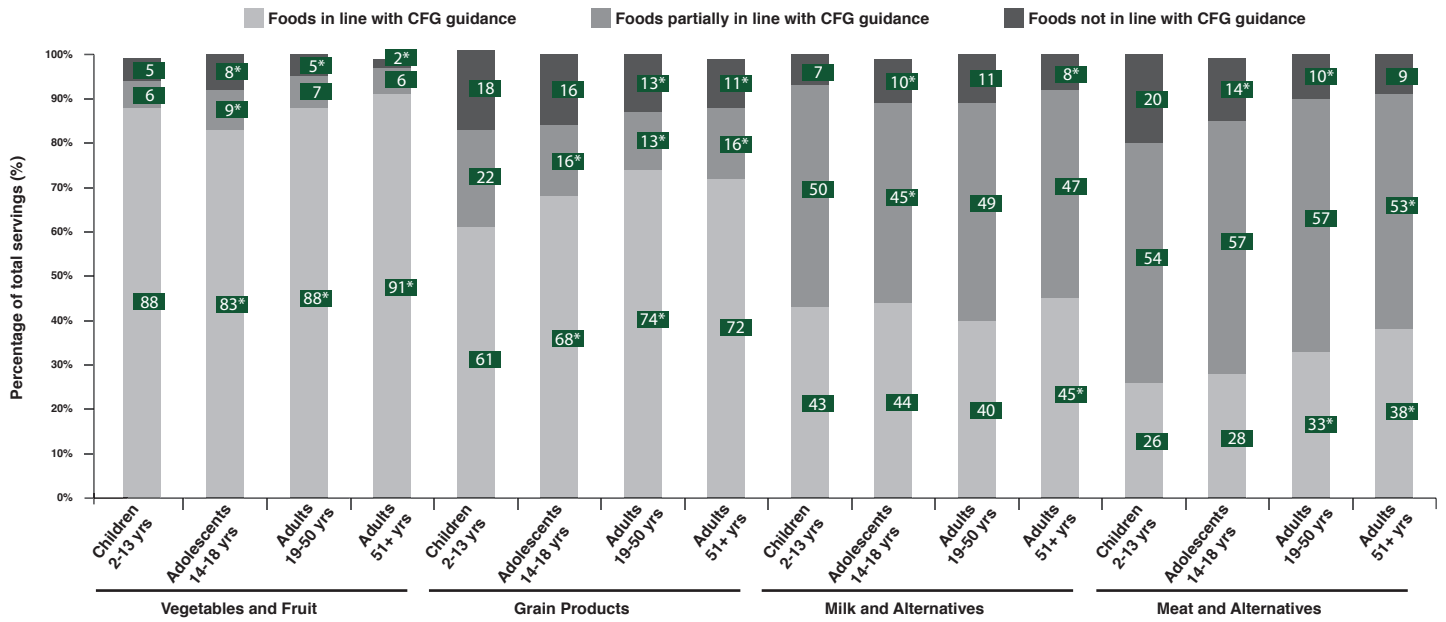
SEX	AGE (YRS)	NUTRIENTS					
		Potassium (mg/day)		Fibre (g/day)		Sodium (mg/day)	
		Median	AI	Median	AI	Median	UL
Both	1-3	2321	3000	9.9	19	1887	1500
	4-8	2549	3800	13.4	25	2650	1900
Male	9-13	3096	4500	16.3	31	3510	2200
	14-18	3637	4700	18.2	38	4151	2300
	19-30	3469	4700	19.2	38	4046	2300
	31-50	3490	4700	18.2	38	3565	2300
	51-70	3318	4700	18.1	30	3213	2300
	>70	2984	4700	17.0	30	2808	2300
	19+	3394	4700	18.2	-	3479	2300
Female	9-13	2578	4500	17.0	26	2885	2200
	14-18	2632	4700	17.5	26	2962	2300
	19-30	2627	4700	16.9	25	2635	2300
	31-50	2810	4700	19.1	25	2714	2300
	51-70	2804	4700	20.3	21	2527	2300
	>70	2582	4700	18.4	21	2207	2300
	19+	2750	4700	19.0	-	2582	2300

Note: These nutrients were an issue of concern (i.e. median usual intake <AI or median usual intake >UL) for all age and sex groups

AI: Adequate Intake

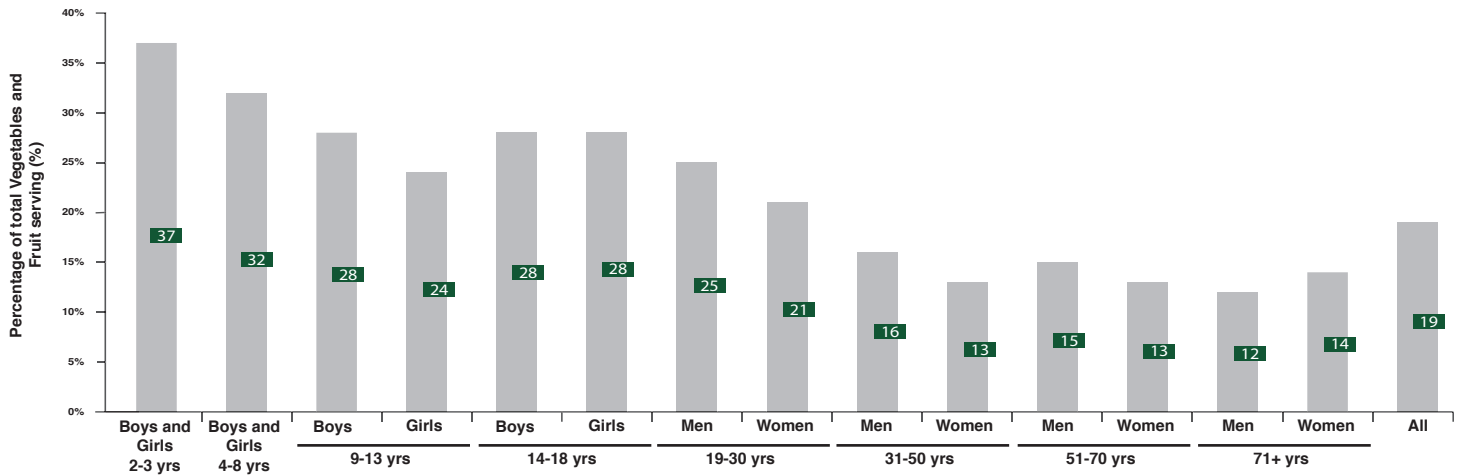
UL: Tolerable Upper Intake Level

Figure 3.1: Prevalence of mean servings from foods “in line,” “partially in line,” and “not in line” with Canada’s Food Guide (CFG) guidance, first 24h recall in CCHS 2004



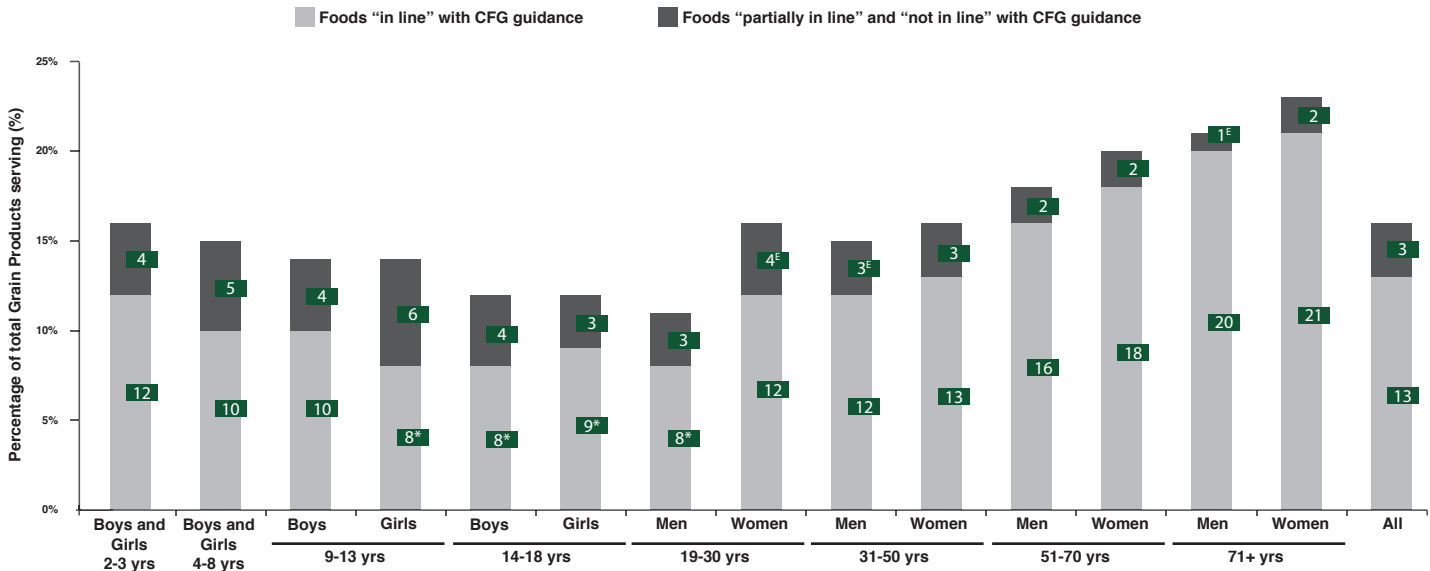
* Different from the previous age group in the same food group (95% confidence intervals did not overlap).

Figure 3.2: Contribution of juice* servings to total vegetables and fruit servings, first 24h recall in CCHS 2004



* Juice includes 100% fruit juices, juices with sugar added, and vegetable cocktails. Drinks or fruit cocktails were excluded since they are not considered part of the Vegetable and Fruit Food Group.

Figure 3.3: Contribution of whole grain servings “in line,” “partially in line,” and “not in line” with Canada’s Food Guide (CFG) guidance for total grain products servings, first 24h recall in CCHS 2004

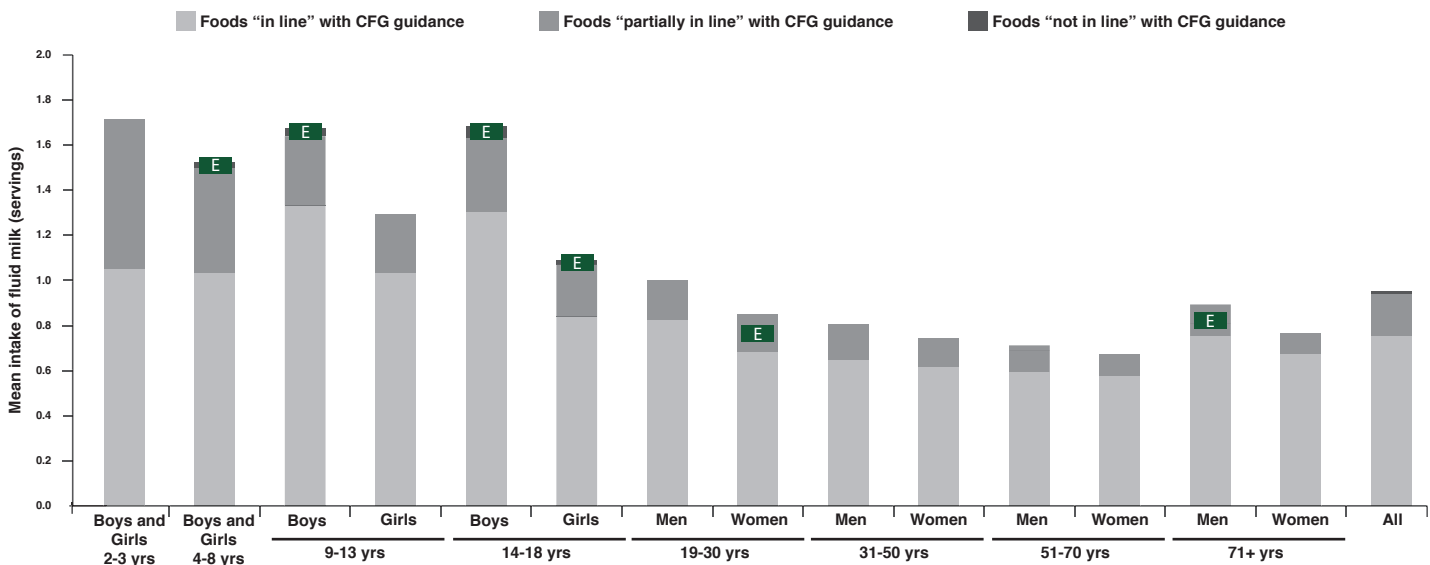


E: Data with a coefficient of variation from 16.6% to 33.3% —interpret with caution.

* Different from adults aged 51-70 and 71+, in the category foods “in line” with CFG guidance (95% CI did not overlap)

Note: Foods “partially in line” and “not in line” with CFG guidance were combined because the extreme variance of the estimates of foods “not in line” with guidance made them unreportable.

Figure 3.4: Mean intake of fluid milk “in line,” “partially in line,” and “not in line” with Canada’s Food Guide (CFG) guidance, first 24h recall in CCHS 2004

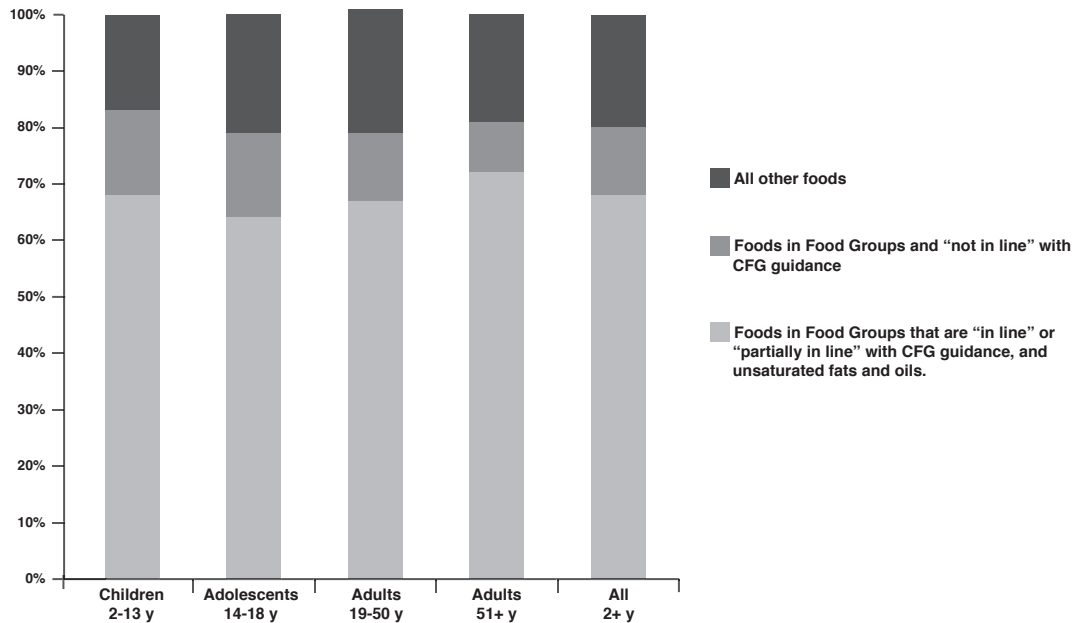


E: Data with coefficient of variation (CV) from 16.6% to 33.3% - interpret with caution.

F: The category “Foods not in line with CFG guidance” for the following age/sex groups had a coefficient of variation (CV) greater than 33.3% with a 95% confidence interval not entirely between 0 and 3% and were therefore suppressed due to extreme sampling variability: boys and girls 2-3 yrs; girls 9-13 yrs; Men 19-30 yrs, 31-50 yrs, 51-70 yrs and 71 yrs and over; and Women 19-30 yrs, 31-50 yrs, 51-70 yrs and 71 yrs and over.

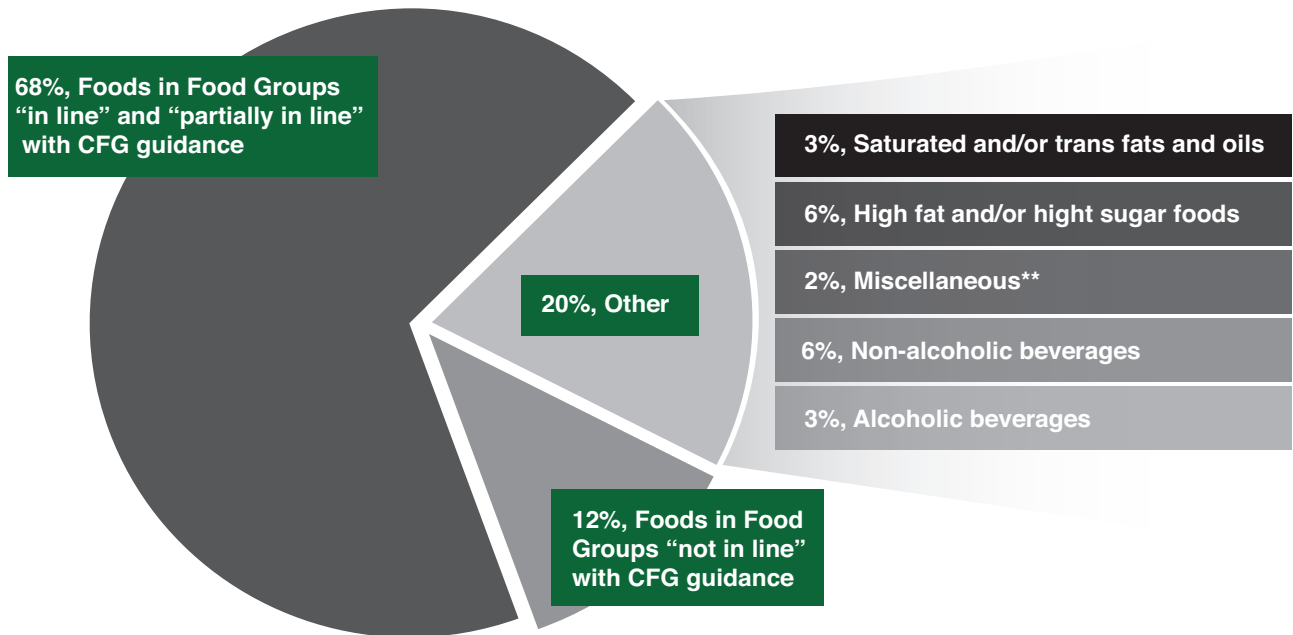
Fluid milk includes: skim milk, 1% M.F. (milk fat) milk, 2% M.F. milk, homogenized milk, reconstituted dry milk powder, evaporated milks, fortified soy-based beverages, and flavoured milks.

Figure 3.5: Percentage of total energy intake from foods “in line,” “partially in line,” and “not in line” with Canada’s Food Guide (CFG) guidance and “all other foods”*, first 24h recall in CCHS 2004



* “All other foods” includes: non-alcoholic beverages, alcoholic beverages, high-fat and/or high-sugar foods, saturated and trans fats and oils, and miscellaneous foods.
 “Miscellaneous” includes uncategorized foods such as spices, herbs, and condiments, which contributed an average 1% of total energy. It also includes “Foods not classified” (e.g. due to missing nutrient values) and “Meal replacements and supplements,” which contributed an average of 1% of total energy. See glossary of terms for definitions.

Figure 3.6: The percentage of total energy intake from foods and beverages grouped into “all other foods”*, first 24h recall in CCHS 2004, Canadians 2 years and older



* “All other foods” includes: non-alcoholic beverages, alcoholic beverages, high-fat and/or high-sugar foods, and saturated and trans fats and oils.
 **“Miscellaneous” includes uncategorized foods such as spices, herbs, and condiments, which contributed an average 1% of total energy. It also includes “Foods not classified” (e.g. due to missing nutrient values) and “Meal replacements and supplements,” which contributed an average of 1% of total energy. See glossary of terms for definitions.

Section 3.1.3 Canadian health status

Nutrition-related chronic diseases and conditions such as cardiovascular disease, certain cancers, type 2 diabetes, osteoporosis, and obesity, continue to be issues of public health concern in Canada. Selected findings on the current rates of the most common nutrition-related health outcomes in the overall Canadian population are described in this section.

In 2013, nutrition-related chronic diseases, specifically ischemic heart disease, cerebrovascular disease, colorectal cancer, breast cancer, and diabetes, were among the highest-ranking causes of premature mortality in Canada, in terms of years of life lost.^{22,23}

Cardiovascular disease

Cardiovascular diseases (CVDs) are a group of disorders of the heart and blood vessels, which include coronary heart disease, cerebrovascular disease, and peripheral arterial disease. In 2007, 1.3 million Canadians 12 years of age or older reported being diagnosed with heart disease by a health professional.²⁴ The 2012-2013 CHMS used directly measured blood pressure to determine that 22% of Canadian adults aged 20-79 years had hypertension, and 16% of this group were unaware of their condition.²⁵ Among children and youth 6-19 years old, 95% had a measured blood pressure that was considered normal. Three percent had results considered borderline and 2% were categorized as having elevated blood pressure.²⁶ Those who were classified as being overweight or obese had a higher average blood pressure than their normal-weight counterparts.

In 2009, 68,342 deaths were attributable to major CVDs, including diseases of the heart, essential hypertension and hypertensive renal disease, cerebrovascular diseases, atherosclerosis, and other diseases of circulatory system. This was 1.9% less than the 2008 statistic.²⁷ From 2000 to 2009, the number of deaths caused by major CVDs declined (70,046 in 2005 versus 68,342 in 2009).

Cancer

Among Canadians alive on January 1, 2009, approximately 2.4% had been diagnosed with cancer in the previous 10 years, according to data from the Canadian Cancer Registry database at Statistics Canada.²⁸ More specifically, in the 10 years prior to January 1, 2009, the number of Canadians living with cancer included:

- 1 in 94 males diagnosed with prostate cancer
- 1 in 107 females diagnosed with breast cancer
- 1 in 297 males and 1 in 351 females diagnosed with colorectal cancer.

Prostate cancer accounted for 21% of all 10-year prevalent cancers, followed by breast cancers (19%) and colorectal cancer (13%). Detailed statistics for other nutrition-related types of cancer are described elsewhere.²⁸

Diabetes mellitus

According to the Canadian Chronic Disease Surveillance System (CCDSS), approximately 7% of Canadians older than 1 year of age had been diagnosed with diabetes mellitus (either type 1 or type 2) in 2008/09.²⁹ The majority of cases are type 2.³⁰ Prevalence was higher among males (7.2%) than females (6.4%). Prevalence of diagnosed diabetes mellitus generally increased with age, with a sharp rise after the age of 40 (the prevalence rate was 2.6% in those 35-39 years of age versus 4.0% in those aged 40-44 years). Those 75-79 years of age had the highest proportion of diagnosed diabetes mellitus (23.1% of females and 28.5% of males). However, more than half of those with diagnosed diabetes mellitus (1.2 million people) were between 25 and 64 years of age.

Age-standardized prevalence increased from 3.3% in 1998/99 to 5.6% in 2008/09. Within this time period, prevalence was consistently higher among males than females, and increased with age.²⁹ However, the proportion of people with diagnosed diabetes increased significantly among those 35-49 and 40-44 years of age, where prevalence rates doubled within this time period.

According to plasma glucose readings from the 2007-2009 Canadian Health Measures Survey (CHMS)²⁹, undiagnosed diabetes mellitus (cases not yet identified by a health care professional) was observed in 0.9% of Canadians aged 6 years and older.

Osteoporosis

Results from the 2009 Canadian Community Health Survey-Osteoporosis Rapid Response indicate that 1.5 million or 10% of Canadians aged 40 years and older reported having been diagnosed with osteoporosis.³¹ Women were four times more likely to report an osteoporosis diagnosis than men. Twenty-one percent of Canadians reported having had a fracture after 40 years of age at one of the following common sites for an osteoporotic fracture: wrist, upper arm, spine, pelvis, or hip.

Overweight and obesity

Many nutrition-related chronic diseases and conditions are common co-morbidities of obesity, such as type 2 diabetes, hypertension, cardiovascular disease, and certain cancers.³²

Based on measured height and weight from the 2012-13 CHMS, 62% of Canadians aged 18-79 years were classified as overweight or obese.³³ Males and females aged 40 and older had a higher prevalence of being overweight or obese (78% and 59% respectively) than males and females 18 to 39 years of age (58% and 47% respectively). Using body mass index and waist circumference measures (average waist circumference for Canadian men was 97.5 cm and for women it was 90.5 cm) together, 41% of Canadians aged 18 to 79 (34% of males and 48% of females) were identified as having a body composition associated with increased health risk.

For children and youth 5-17 years of age, 31% were overweight or obese. Children and youth aged 12 to 17 (37%) had a higher prevalence of being overweight or obese than those aged 5 to 11 (26%).³⁴ Boys were more likely to be obese than girls (15% and 11%, respectively), but there was no difference between these groups for overweight (19%).

Section 3.1.4 Strengths and limitations

The methodology used to examine the Canadian Context had several strengths. These include the use of data from large, representative surveys and related peer reviewed publications and the examination of nutrient intakes using defined inadequacy cut-offs based on DRIs.

Several limitations to the methodology were noted during this process. In the literature review, the choice of exclusion criteria may have eliminated important articles. For example, an article was excluded if the title or abstract referred only to supplement data, though relevant dietary intake data may have been reported in the main text. Articles were also excluded if the data was not nationally-representative, which did not allow for data specific to First Nations on reserve or Inuit to be captured.

Data from the 2004 CCHS-Nutrition were the most recent national-level evidence available to examine the quality and quantity of food and nutrient intake, which may not reflect current Canadian intakes. Further, these data were collected prior to the release of the 2007 Food Guide guidance. These analyses will be repeated following the release of data from the 2015 CCHS-Nutrition to update food and nutrient intake information.

The 2004 CCHS-Nutrition dietary intake data was self-reported. The survey used the five-step multiple-pass method to minimize recall errors. Though this has effectively assessed average energy intake under controlled conditions, under- or over-reporting has been observed in different settings.¹⁵

This review included two components of the Canadian context input area: food and nutrient intakes and health status. A more comprehensive understanding of the Canadian context (such as eating habits and behaviours, and the dietary intake of First Nations and Inuit) will assist decision making to ensure that dietary guidance continues to be relevant to Canadians.

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Section 3.2: Scientific Basis – Relationships between food, nutrients, and health outcomes

Section 3.2.1 Methodology

Literature scan – Reports

A scan of the literature was conducted on the relationship between food and nutrition-related chronic diseases and conditions published since 2005, when the last formal examination of the evidence was completed. Health Canada's 2005 evidence review was primarily based on two reports: the 2003 WHO/FAO Joint Report on Diet, Nutrition and the Prevention of Chronic Diseases and the 2005 US Dietary Guidelines Advisory Committee Report.¹⁻³

Existing authoritative reports were considered as the primary source of evidence. Specifically, these were reports published between 2006 and 2015 from leading scientific organizations or federal agencies, as well as health claims assessments from Health Canada. This approach allowed Health Canada to leverage existing resources on a comprehensive array of topics and chronic disease/conditions of interest, avoid duplication of effort, and best utilize internal resources.

Inclusion and exclusion criteria

Inclusion and exclusion criteria for the scan were determined *a priori* (Table 3.17). Relevant reports were assessed if the inclusion criteria were met. The population of interest was aged 2 years or older, non-pregnant. Predictors were food topics, inclusive of foods, beverages, components of foods and beverages (e.g. micronutrients), as well as dietary patterns and behaviours (e.g. snacking).

Table 3.17: Inclusion and exclusion criteria for the identification of reports in the 2015 ERC

INCLUSION CRITERIA
<ul style="list-style-type: none"> • Authored by a health organization with the involvement of an expert panel • Includes an original systematic review of the evidence for a diet-health relationship and an assessment of the quality of primary studies • Includes at least one food topic and its relationship to at least one outcome related to a chronic disease or condition that is of public health interest in Canada • Includes a clear description of the systematic review methodology • Provides an evidence grade for the overall quality of the evidence supporting the findings • French or English language
EXCLUSION CRITERIA
<ul style="list-style-type: none"> • Commissioned by industry or an organization with a business interest • Presented or concurred with findings from other reports • Later updated in another report by the same organization on the same topic • Focused on an outcome outside the scope of this scan (e.g. management of a chronic disease, food safety)

The outcomes of interest were chronic diseases/conditions of public health concern in Canada that were identified in ONPP's 2005 evidence review, specifically: cardiovascular disease/coronary artery disease (including hypertension, hyperlipidemia and stroke), cancer (various types), type 2 diabetes, osteoporosis (including bone health and fractures), and obesity (including adiposity and weight gain).

Expert review

Internal Health Portfolio (Health Canada Health Products and Food Branch [ONPP, Food Directorate], First Nations and Inuit Health Branch, Public Health Agency of Canada, and Canadian Institutes of Health Research) and external experts were asked to provide feedback on the preliminary findings, identify any key scientific evidence on food and health relationships that were missing from the scan, and identify any emerging population health conditions that should be considered. The list of experts who participated in the external review, as well as the criteria and process used to select external experts, is outlined in [Appendix E](#). The reviewers provided many constructive comments and suggestions, but they were not asked to endorse the contents of this report.

Expert reviewer comments were addressed by updating the scan, assessing suggested reports, and reviewing the literature on certain topics further.

Approach to the scan

The internet was scanned—using Google as a search engine—for reports that met our inclusion criteria. The term report was cross-referenced with the words “cancer,” “cardiovascular disease,” “chronic disease and health promotion,” “food,” “health promotion,” “mineral,” “non-communicable diseases,” “nutrition,” “obesity,” “osteoporosis,” “type 2 diabetes,” “vitamin,” and “nutrition information system.” Further, websites from leading scientific organizations and federal agencies (Canadian Cardiovascular Society, Osteoporosis Canada, United States Department of Agriculture, US Institute of Medicine, World Cancer Research Fund, and World Health Organization) were searched for publications that met the inclusion criteria. Reports were also identified through relevant networks and listservs.

Health Canada health claim assessments published after 2005 were also included for consideration, since these claims are based on a rigorous review process that provide evidence on the association between specific foods or nutrients and chronic disease prevention.

Updating the scan

Since the cut-off date for the scan was two years prior to the anticipated timing for dissemination of the ERC findings, there was concern that the evidence base would be out of date. To reduce the lag time between evidence gathering and reporting, reports published between March 31st, 2013 and July 10, 2015 that fit the inclusion criteria were considered. These reports were assessed using the same methods as for the original scan. After this date, additional reports were considered only if they were thought to potentially impact on, or inform, the conclusions drawn in this report. Lists of all reports included and excluded can be found in Tables 3.18 and 3.19.

Data extraction

Reports that met the inclusion criteria were reviewed and key characteristics were summarized ([Appendix F](#)). Conclusions from the reports related to food and health were extracted and organized according to disease/condition of interest and food topic ([Appendix G](#)). Findings related to cancer were only extracted from reports published by the World Cancer Research Fund (WCRF), a leading authority on the link between diet and cancer, unless a report included a question that was not addressed by the WCRF. Where a WCRF Continuous Update Project (CUP) report was available, these conclusions were retained rather than those from the 2007 Second Expert Report on Diet and Cancer.⁴

Table 3.18: List of reports included in the 2015 ERC (2006-July 10, 2015)

YEAR OF PUBLICATION	ORGANIZATION	TITLE
2007	WCRF/AICR	Second expert report on diet and cancer
2010	Health Canada	Oat products and blood cholesterol lowering
2010	Health Canada	Plant sterols (phytosterols) in foods and blood cholesterol lowering
2010	WCRF/AICR	Continuous update project. Breast cancer report
2010	FAO	Fats and fatty acids in human nutrition – Report of an expert consultation
2010	USDA	US DGAC report
2011	Health Canada	Psyllium products and blood cholesterol lowering
2011	WCRF/AICR	Continuous update project. Colorectal cancer report
2011	NHMRC	A review of the evidence to address targeted questions to inform the revision of the Australian Dietary Guidelines
2012	CCS	2012 Update of the Canadian Cardiovascular Society Guidelines for the Diagnosis and Treatment of Dyslipidemia for the Prevention of Cardiovascular Disease in the Adult
2012	WCRF/AICR	Continuous update project. Pancreatic cancer report
2012	WHO	Guideline: Sodium for adults and children
2012	WHO	Guideline: Potassium for adults and children
2012	Health Canada	Barley products and blood cholesterol lowering
2012	Health Canada	Unsaturated fat and blood cholesterol lowering
2012	Health Canada	Whole grains and coronary heart disease
2013	WHO	Dietary sugars and body weight: systematic review and meta-analyses of randomized controlled trials and cohort studies
2013	WCRF/AICR	CUP report: Endometrial cancer
2013	ACC/AHA	2013 AHA/ACC Guideline on Lifestyle Management to Reduce Cardiovascular Risk: A Report
2014	Health Canada	Ground whole flaxseed and blood cholesterol lowering
2014	WCRF/AICR	CUP report: Ovarian cancer
2014	WCRF/AICR	CUP report: Diet, nutrition, physical activity and prostate cancer
2015	WCRF/AICR	CUP report: Diet, nutrition, physical activity and gallbladder cancer
2015	WCRF/AICR	CUP report: Diet, nutrition, physical activity and liver cancer
2015	USDA	Scientific report of the 2015 Dietary Guidelines Advisory Committee
2015	WHO	Guideline Sugars intake for adults and children
2015	Cochrane review for WHO	Reduction in saturated fat intake for cardiovascular disease
2015	HC Health Claims	Summary of Health Canada's Assessment of a Health Claim about Soy Protein and Cholesterol Lowering (March 2015)
2015	HC Health Claims	Summary of Health Canada's Assessment of a Health Claim about Vegetables and Fruit and Heart Disease (June 2015)

Table 3.19: List of reports excluded in the 2015 ERC (2006–July 10, 2015)

YEAR OF PUBLICATION	ORGANIZATION	TITLE	RATIONALE
2006	IOM	Seafood choices: Balancing benefits and risks	Presented or drew upon findings from other reports
2006	WHO	Reducing the salt intake in populations. Report of a WHO forum and technical meeting 5–7 October 2006, Paris, France	Was later replaced by the 2012 WHO Guideline: Sodium for adults and children
2007	WHO	Protein and amino acid requirements in human nutrition – Report of an consultation (WHO Technical Report Series 935)	Focused on an outcome outside the scope of the scan (e.g. treatment of a chronic disease).
2010	Osteoporosis Canada	Clinical practice guidelines for the diagnosis and management of osteoporosis in Canada: summary	Focused on an outcome outside the scope of the scan (e.g. treatment of a chronic disease).
2010	Health Canada	Plant sterols (phytosterols) in foods and blood cholesterol lowering	Topic outside of the scope of the scan
2012	IOM	The Role of obesity in cancer survival and recurrence – Workshop summary	Focused on an outcome outside the scope of the scan (e.g. treatment of a chronic disease).
2012	ACS	American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Prevention	Did not contain original systematic review for diet-health relationships
2012	Global Burden of Diseases Nutrition & Chronic Diseases Expert Group	A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010	Did not grade evidence
2013	CHEP	The 2013 Canadian Hypertension Education Program Recommendations for Blood Pressure Measurement, Diagnosis, Assessment of Risk, Prevention, and Treatment of Hypertension	Did not contain original systematic review for diet-health relationships
2013	IOM	Sodium intake in populations: assessment of evidence	Did not grade evidence
2013	CDA	Canadian Diabetes Association Clinical Practice Guidelines	Focused on an outcome outside the scope of the scan (e.g. management and treatment of a chronic disease)
2014	WCRF/AICR	CUP report: Diet, nutrition, physical activity and breast cancer survivors	Focused on an outcome outside the scope of the scan (e.g. treatment of a chronic disease).

Grading the evidence

Each included conclusion was associated with a grade describing the strength of evidence to support the finding. These grades varied by report and were determined differently by each organization (Appendix F). To support consistent terminology among reports, ERC grades were described by the general descriptors “convincing,” “probable,” “possible,” and “insufficient.” The alignment between these descriptors and those used in the various reports is provided in Table 3.20.

Data assessment

Conclusions were assessed to identify changes in the evidence base since 2005. This included a difference in the evidence grade or consideration of evidence that was not included in the two reports used in the 2005 review. Congruence with the IOM DRI reports for macronutrients and micronutrients was also examined. Health Canada uses these standards in a variety of policies and programs and the DRIs are an important part of the totality of evidence examined when considering policy options.

Table 3.20: Descriptors⁵ used to compare grades of evidence from reports included in the 2015 ERC

ERC DESCRIPTORS	GRADING USED IN EACH INCLUDED REPORT							
	ACC/AHA REPORT	CCS REPORT	FAO REPORT	HC HEALTH CLAIM ASSESSMENT	NMHRC REPORT	US DGAC REPORT	WCRF/AICR REPORT	WHO REPORT
Convincing	High	High	Convincing	Sufficient	Grade A (convincing association)	Strong	Convincing	High
Probable	Moderate	Moderate	Probable	Insufficient	Grade B (probable association)	Moderate	Probable	Moderate
Possible	Low	Low	Possible		Grade C (suggestive association)	Limited	Limited-suggestive	Low
Insufficient	Insufficient	Very low	Insufficient		Grade D (evidence is weak)		Limited-no conclusion	Very low

ACC/AHA: American College of Cardiologists/American Heart Association
 CCS: Canadian Cardiovascular Society
 FAO: Food and Agriculture Organization
 HC: Health Canada
 NMHRC: National Medicine and Health Research Council
 US DGAC: United States Dietary Guidance Advisory Committee
 WCRF/AICR: World Cancer Research Fund/American Institute of Cancer Research
 WHO: World Health Organization

Literature searches on selected topics

In addition to the literature scan of reports, literature searches were conducted of recent systematic reviews and meta-analyses on selected topics that expert reviewers identified as potentially requiring further assessment. Limited resources prevented systematic reviews of primary studies. Topics were identified if at least one external expert reviewer indicated that newer studies may be available on this topic and dietary guidance related to the topic existed in the Food Guide. These topics included the relationships between intakes of saturated fatty acids and CVD/CHD, mono-unsaturated fatty acids and CVD/CHD, processed meat and CVD/CHD, processed meat and type 2 diabetes, whole grains and type 2 diabetes, milk and dairy and bone health/osteoporosis, and legumes and CVD.

Search strategies

For these topics, the search range was from January 2009 to June 2014ⁱ to include literature published since the release of the included reports. Only systematic reviews, with or without meta-analyses, that assessed the effect of the predictor and outcome of interest were included. Keywords were determined *a priori*. The full search strategies can be found in [Appendix H](#).

ⁱ Legumes were searched to August 2014

Identification of systematic reviews and quality assessment

Article titles and abstracts, identified using each search strategy, were screened by two independent reviewers based on the predefined eligibility criteria. Full text versions of relevant articles were then reviewed for eligibility and quality by two independent reviewers using a standardized quality assessment tool.⁶ Differences between reviewers were resolved through discussion. Results from reviews given a rating of ‘strong’ methodological quality were considered.

Section 3.2.2 Food and health outcomes

Conclusions from 810 systematically reviewed food and health-related questions were extracted from 29 reports. Of these, 693 conclusions were retained, with 59 (9%) graded “convincing,” 99 (14%) graded “probable,” 77 (11%) graded “possible,” and 460 (66%) graded “insufficient” (Figure 3.7).

Extracted data on the direction of risk and grade for the retained conclusions can be found in [Appendix G](#). Table 3.22 summarizes the convincing conclusions that were gathered from each report. These findings are described briefly in this section. Appendix G captures all probable, possible and insufficient conclusions (e.g. total fat and cardiovascular disease, 100% fruit juice and weight gain, whole grains and coronary heart disease). For additional details on the body of evidence cited, refer to the original sources as referenced.

For numerous topics, the convincing conclusions were consistent with those in the two reports available in 2005: the 2003 WHO/FAO Joint Report on Diet, Nutrition and the Prevention of Chronic Diseases and the 2005 US Dietary Guidelines Advisory Committee Report. These included conclusions related to:

- sodium and increased risk of high blood pressure
- trans fatty acids and increased risk for cardiovascular disease
- dietary patterns—characterized by higher consumption of vegetables, fruits, whole grains, low-fat dairy, and seafood, lower consumption of red and processed meats, refined grains, and sugar-sweetened foods and beverages—and positive cardiovascular disease outcomes.

There was a stronger evidence base for 22 convincing conclusions:

Alcohol:

- Alcohol intake and increased risk of liver, colorectal (men), mouth, pharynx, larynx and oesophageal cancer (n=4)

Fats:

- Fatty acids intake and risk of type 2 diabetes (n=4)
- Replacement of saturated fatty acids (SFA) with unsaturated fatty acids and reduced risk of cardiovascular disease (n=3)

Fibre:

- Intake of single grains (beta-glucan oat fibre, barley grain products, psyllium) and flaxseed and decreased cholesterol (n=4)
- Intake of fibre and decreased risk of colorectal cancer (n=1)

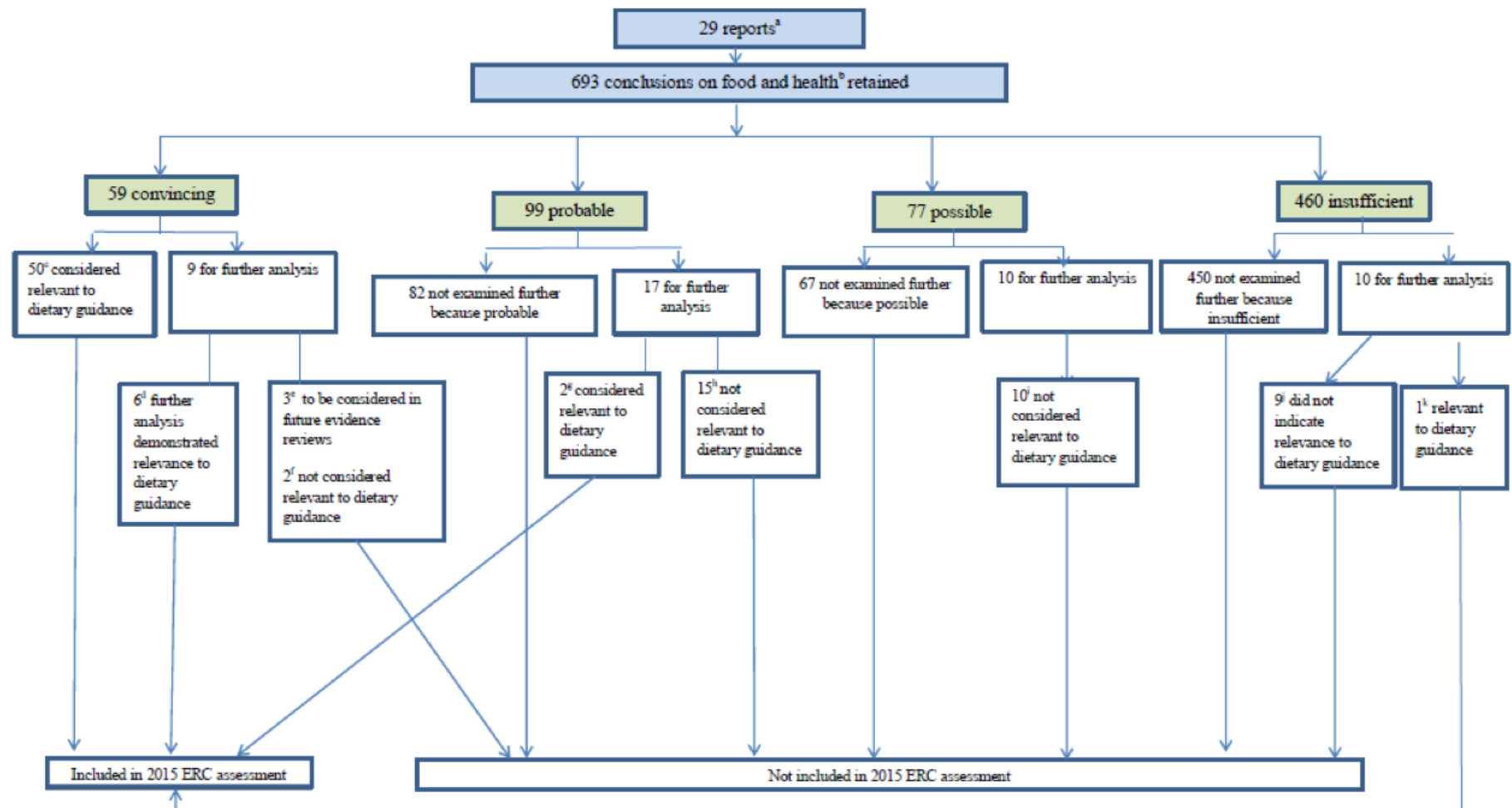
Meat and meat alternatives:

- Intake of standardized amounts of meat (red 100g/d [n=1] and processed 50 g/d [n=1]) in relation to increased risk for colorectal cancer
- Association between soy protein and lowered cholesterol (n=1)

Sugars:

- Intake of sugar-sweetened beverages and increased risk of adiposity in children (n=1)
- Intake of added sugars and increased risk of obesity (n=1) or type 2 diabetes (n=1)

Figure 3.7: Flowchart of the decision-making process for identifying food and health findings for inclusion in the 2015 Evidence Review Cycle



- a. See Tables 3.18 and 3.19 for a full list of reports.
- b. Total number of conclusions 810, 115 conclusions excluded because more recent finding, not original finding, or cancer- related topic also reviewed by the World Cancer Research Fund.
- c. See Table 3.22 for list of convincing findings by topic.
- d. Stronger evidence base since 2005 Health Canada review for conclusions on intake of processed meat (50 g/d) and increased risk of colorectal cancer (n=1), as well as red meat intake (50 g/d) and increased risk of colorectal cancer (n=1), replacement of SFA with unsaturated fatty acids and decreased risk of CVD/CHD (n=3), as well as soy protein intake (daily amount of 25 g) and lower cholesterol (n=1).
- e. Topic not assessed further but to be considered in future reviews. Fast food intake and increased risk of obesity (n=2) food behaviour graded “moderate” by DGAC 2015, rather than “strong” as per DGAC 2010, because the evidence base was small. Increased portion sizes associated with obesity (n=1) and food behaviour to be considered in future cycles.
- f. Topic not assessed further as not currently considered relevant to dietary guidance. Null association between glycemic index and obesity and type 2 diabetes (n=2).
- g. Two systematic reviews, addressing questions from the WHO Nutrition Advisory Group:
 - 1) Found moderate quality evidence of a small reduction in CVD risk on reduction of SFA. (Replacing SFA with PUFA appears to be a useful strategy, but replacement with CHO less useful, and replacement with MUFA unclear due to limited evidence). Relevant to dietary guidance when considered with convincing DGAC 2015 finding on this topic (n=1).
 - 2) Found moderate quality evidence that both increasing and decreasing free sugars in adults were associated with corresponding effect on weight. Also, reducing free sugars (principally a reduction of SSB) in children was associated with reduced adiposity. WHO made a strong recommendation for free sugars intake to be <10% of total energy intake. Thus this conclusion was considered relevant to dietary guidance (n=1).
- h. Probable findings not considered further:
 - calcium intake and reduced risk of colorectal cancer (n=1)
 - decreased sodium and reduced blood pressure (n=3 [n=2 children])
 - soy and soy products intake and improved blood lipids (n=1)
 - whole grains intake and reduced risk of obesity (n=2)
 - total fat intake and null association with cancer (n=1)
 - total fat intake and increased risk of obesity in children (n=1)
 - intake of high glycemic index foods and increased risk of T2D (n=1)
 - intake of milk and alternatives and decreased risk of CVD/CHD (n=2), stroke (n=1), and T2D (n=1)
 - whole grains intake and decreased risk of T2D (n=1) flagged by reviewer for further analysis, examined by review, change in grade not warranted at this time.
- i. Not examined further because graded possible:
 - Seafood n-3 fatty acids and null association with cancer (n=1)
 - Vitamin E intake and reduced risk of oesophageal cancer (n=1)
 - Not eating breakfast and increased risk of obesity (n=1)
 - increased potassium and decreased blood pressure in children (n=1)
 - Iron intake and increased risk of colon and rectum cancer (n=1)
 - Intake of legumes and decreased risk of colon and rectum cancer (n=1)
 - Soya/soy products/soy protein intake and improved blood lipids (n=1)
 - Coffee intake and null association with CVD/CHD (n=1)
 - Milk and alternatives and null association with obesity in children (n=1)
 - Intake of hot drinks and increased risk of oesophageal cancer (n=1).

- j. Did not indicate relevance to dietary guidance:
 - processed meat intake and increased risk of T2D (n=1) and CVD/CHD (n=1)—flagged by reviewer for further review
 - whole grains intake and reduced risk of T2D (n=1)—flagged by reviewer for further review
 - potassium intake and decreased blood pressure (n=1)
 - no conclusion possible for vitamin C and stomach (n=1) and lung (n=1) cancer
 - vegetables and fruit intake and null association with T2D (n=1)
 - vegetables and fruit intake and reduced risk of T2D (n=1)
 - decreased dietary cholesterol and improved blood lipids (n=1).
- k. Further examination of whole grain intake and null association with blood cholesterol (n=1) considered relevant to dietary guidance.

CHO: carbohydrate
 CVD/CHD: cardiovascular disease/coronary heart disease
 DGAC: Dietary Guidelines Advisory Committee
 ERC: Evidence Review Cycle
 MUFA: monounsaturated fatty acid
 PUFA: polyunsaturated fatty acid
 SFA: saturated fatty acid
 SSB: sugar-sweetened beverages
 T2D: Type 2 diabetes
 TFA: trans fatty acid
 WHO: World Health Organization

Table 3.21: 2015 ERC summary of convincing (strong) food and health relationships and changes since 2005

PREDICTOR	OUTCOME	DIRECTION OF RISK	SOURCE	CHANGES IN THE EVIDENCE SINCE 2005*
Alcohol				
	Liver cancer, colorectal cancer (men), mouth, pharynx, larynx, and oesophageal cancer	↑	WCRF 2015 ⁷ , WCRF 2011 ⁸ , WCRF 2007 (n=2) ⁴	Stronger evidence base since 2005
	Breast cancer	↑	WCRF 2010 ⁹	Consistent
	Cardiovascular disease	↓	DGAC 2010 ¹⁰	Consistent
Fats				
MUFA	Blood cholesterol related to T2D	↓	DGAC 2010 ¹⁰	Stronger evidence base since 2005
PUFA n-6	T2D			
SFA replaced with MUFA	T2D			
SFA	T2D	↑	DGAC 2010 ¹⁰	Stronger evidence base since 2005
SFA	Blood cholesterol and CVD	↑	DGAC 2010 ¹⁰	Consistent
SFA replaced with unsaturated fatty acids, especially PUFA	Blood cholesterol	↓	DGAC 2015 ¹¹ , ACC/AHA 2013 ²⁰	Stronger evidence base since 2005: More evidence on relationship between isocaloric replacement of SFA and CVD indicators available
SFA replaced with PUFA	CVD	↓	DGAC 2015 ¹¹	
SFA replaced with unsaturated fatty acids	Blood cholesterol	↓	HC health claims ¹²	Consistent
SFA replacement with carbohydrate	Blood cholesterol	↓	FAO 2010 ⁵ , ACC/AHA 2013 ²⁰	Stronger evidence base since 2005: More evidence on relationship between isocaloric replacement of SFA and CVD indicators available
Seafood n-3 or long chain PUFA	CVD	↓	FAO 2010 ⁵	Consistent
PUFA n-6 (particularly replaces SFA or TFA)	Blood cholesterol	↓	DGAC 2010 ¹⁰	Consistent
MUFA replaces SFA	Blood cholesterol	↓	DGAC 2010 ¹⁰	Consistent
SFA replaces TFA	Blood cholesterol	↓	FAO 2010 ⁵	Consistent
TFA	Blood cholesterol	↑	FAO 2010 ⁵	Consistent
TFA	CVD	↑	FAO 2010 ⁵	Consistent

PREDICTOR	OUTCOME	DIRECTION OF RISK	SOURCE	CHANGES IN THE EVIDENCE SINCE 2005*
Fibre				
Dietary fibre (total fibre, fruit and vegetable, whole grain)	Colorectal cancer	↓	WCRF 2011 ⁸	Stronger evidence base since 2005
Single grains (i.e. Beta-glucan oat fibre, barley grain products, psyllium fibre) and flaxseed	Blood cholesterol	↓	HC health claims ¹³⁻¹⁶	Stronger evidence base since 2005
Fruit and vegetables				
Fruit and vegetables	CVD	↓	HC health claims ¹⁷	Consistent
Meat and meat alternatives				
Red meat (by 100 g/d)	Colorectal cancer	↑	WCRF 2011 ⁸	Stronger evidence base since 2005
Processed meat (by 50 g/d)	Colorectal cancer	↑	WCRF 2011 ⁸	
Soy protein	Blood cholesterol	↓	HC health claims ¹⁸	
Micronutrients				
Sodium	Blood pressure	↑	WHO 2012 ¹⁹ (n=3); ACC/AHA 2013 ²⁰ (n=4); DGAC 2010 ¹⁰ ; NHMRC 2011 ¹⁷	Consistent
Sodium	Blood cholesterol	-	WHO 2012 ¹⁹	Consistent
Potassium	Blood cholesterol	-	WHO 2012 ²¹	Consistent
Potassium	Blood pressure	↓	WHO 2012 ²¹	Consistent
Milk and milk alternatives				
Milk and alternatives	Obesity (adults)	-	DGAC 2010 ¹⁰	Consistent
Patterns				
Macronutrients (pattern)	Blood cholesterol	↓	ACC/AHA 2013 ²⁰	Consistent
DASH pattern	Blood pressure	↓	ACC/AHA 2013 ²⁰ ; DGAC 2015 ¹¹	Consistent
DASH pattern	Blood cholesterol	↓	ACC/AHA 2013 ²⁰	Consistent
Dietary pattern**	CVD	↓	DGAC 2015 ¹¹	Consistent
Mediterranean, Portfolio, or DASH pattern	Blood cholesterol or CVD risk	↓	CCS ²²	Consistent
Sugars				
SSBs	Obesity (children)	↑	DGAC 2010 ¹⁰	Stronger evidence base since 2005
Added sugar (food and/or SSBs)	Obesity	↑	DGAC 2015 ¹¹	Stronger evidence base since 2005
Added sugar (food and/or SSBs)	Type 2 diabetes	↑	DGAC 2015 ¹¹	

Notes from Table 3.21

* Assessed based on two reports included in 2005 review:

- 1) WHO/FAO report: Diet, Nutrition and the Prevention of Chronic Diseases (2003)
- 2) the 2005 American Dietary Guidelines Advisory Committee Report or relevant Dietary Reference Intake reports.

** Dietary pattern characterized by higher consumption of vegetables, fruits, whole grains, low-fat dairy, and seafood, and lower consumption of red and processed meats, refined grains, and sugar-sweetened foods and beverages.

Convincing findings related to portion sizes and obesity (n=1), fast food consumption and weight gain (n=1), glycemic load and T2D (n=1), glycemic index/glycemic load and body weight (n=1), coffee intake and risk of pancreatic or kidney cancer (n=2), and carotenoids and skin cancer (n=1) were not assessed further, but will be considered in future reviews.

ACC/AHA: American College of Cardiology/American Heart Association

CCS: Canadian Cardiovascular Society

CVD: cardiovascular disease

DASH: Dietary Approaches to Stop Hypertension, a dietary pattern that emphasizes potassium-rich vegetables and fruits and low-fat dairy products and includes whole grains, poultry, fish, nuts and legumes. The pattern also includes reduced red meat, sweets, and sugar-containing beverages.

DGAC: Dietary Guidelines for Americans Committee

FAO: Food and Agriculture Organization of the United Nations
HC: Health Canada

MUFA: monounsaturated fatty acids

NHMRC: National Health and Medical Research Council

PUFA: polyunsaturated fatty acids

SFA: saturated fatty acids

SSB: sugar-sweetened beverages

T2D: type 2 diabetes

TFA: trans fatty acids

WCRF: World Cancer Research Fund

WHO: World Health Organization

Alcohol

Association between alcohol and risk of certain types of cancer

The WCRF reported a convincing link between intake of alcoholic drinks and increased risk of breast,⁹ colorectal (for men),⁸ and liver cancer,⁷ as well as cancer of the mouth, pharynx, larynx and oesophagus.⁴ This finding was based on several systematic reviews—the evidence base established in the WCRF/AICR Second Expert Report: Food, Nutrition, Physical Activity and the Prevention of Cancer: a Global Perspective⁴ and the Continuous Update Project reports related to breast,⁹ colorectal,⁸ and liver cancer⁷—in which evidence from cohort studies and pooled analyses showed an increased risk of these cancers with increased intake of alcohol.

Fats

Association between fatty acids and risk of cardiovascular disease or type 2 diabetes

The 2010 US DGAC¹⁰ utilized a NEL systematic review of the literature that identified 12 studies published since 2004 to conclude that there was convincing evidence for an association between intakes of dietary saturated fatty acids (SFA) and increased serum total, increased LDL cholesterol, and increased risk of CVD.

There was also convincing evidence for an association between decreased SFA intake and improved measures of CVD. Further, for each 5% energy decrease in SFA, replaced by monounsaturated fatty acids (MUFA) or polyunsaturated fatty acids (PUFA), there was evidence to support a decrease in CVD in healthy adults. Expert reviewers suggested that Health Canada conduct further analyses on the relationships between SFA, PUFA and MUFA and CVD. Health Canada's review of the literature identified 10 systematic reviews on this topic, published between 2009 and 2014, that met the inclusion criteria. Four of these were rated as 'strong' and were retained for review.²³⁻²⁶ This review found that there was no observed association between dietary SFA and increased risk of CVD or CHD, but did confirm that lower SFA intake, through replacement with unsaturated fat, appeared to reduce the risk of cardiovascular events. The ideal type of unsaturated fat was not clear.

The 2015 US DGAC¹¹ also summarized evidence published between January 2009 to August 2014 from high-quality systematic reviews and meta-analyses of the relationship between saturated fatty acid intake and several CVD outcomes (i.e. LDL-cholesterol, HDL-cholesterol, triglycerides, and blood pressure and incidence of CVD and CHD, CHD, CVD- and CHD-related death, myocardial infarction, or stroke).^{20,23-30} Strong evidence from RCTs supported a conclusion for an association between replacing SFA with unsaturated fats, especially PUFA, and a reduction in total and LDL cholesterol. Further, replacing SFA with carbohydrates reduced total and LDL cholesterol, but also significantly reduced HDL cholesterol and increased triglycerides. Strong evidence from RCTs and statistical modeling in prospective cohort studies showed that replacing SFA with PUFA reduced the risk of CVD events and coronary mortality. The evidence was not clear for replacement by MUFA or replacement with carbohydrate, and likely depends on the type and source.

The 2010 US DGAC also reported convincing evidence of increased intake of SFA and increased markers of insulin resistance and the risk of type 2 diabetes. Further, a decreased risk of type 2 diabetes was observed in healthy adults for each 5% energy decrease in SFA, replaced by MUFA or PUFA.

Fibre

Association between whole grains and risk of coronary heart disease

Separate health claims assessments, published between 2011 and 2014, supported therapeutic claims linking intake of single grains (i.e. Beta-glucan oat fibre,¹³ barley grain products,¹⁴ psyllium fibre¹⁵) and flaxseed¹⁶ with a reduction of blood cholesterol. A 2012 Health Canada health claims assessment summarized evidence from 32 studies—26 controlled clinical trials and six prospective cohort studies—on the relationship between intake of whole grains and risk of coronary heart disease.³¹ Health Canada concluded that the evidence was insufficient to support a whole grains and coronary heart disease risk reduction claim in Canada, as cohort studies were not generalizable and potentially biased due to confounding. Further the overall effect from pooled analysis of controlled clinical trials was largely attributable to those that tested single grains high in beta-glucan fibre and trials judged to be of poor quality.

Association between whole grains and risk of certain types of cancer

The WCRF reported convincing evidence of a link between intake of foods containing dietary fibre (total dietary fibre, fibre from specific sources [cereal, fruit, vegetables, and legumes] or whole grains) and decreased risk of colorectal cancer.⁸ This conclusion was based on a systematic review as part of the Continuous Update Project (CUP) related to colorectal cancer. The CUP builds upon the evidence base established in the WCRF/AICR Second Expert: Food, Nutrition, Physical Activity and the Prevention of Cancer: a Global Perspective,⁴ in which 13 of the 18 included cohort studies showed a decreased risk of colorectal cancer with increased intake of total dietary fibre. The CUP meta-analyses indicated a 10% decrease in the risk of colorectal cancer per 10 g/d intake of dietary fibre.⁸

Meat and meat alternatives

Association between red and processed meat intake and risk of colorectal cancer

The WCRF CUP report on colorectal cancer indicated a convincing link between increased intake, per 50 g/d, of processed meat and an 18% increased risk of colorectal cancer, as well as a 24% increased risk for colon cancer.⁸ For red meat, a convincing relationship was identified for increased intakes, per 100 g/d, and a 17% increased risk for colorectal cancer.⁸ Health Canada reviewed evidence from the WCRF CUP report on colorectal cancer, which included studies of red or processed meat intake, or a combination of red and processed meat intake. In total, 14 cohort studies³²⁻⁴⁵ and 3 meta-analyses⁴⁶⁻⁴⁸ were considered by the WCRF.

Expert reviewers suggested that Health Canada conduct further analysis on the topic of processed meat intake and increased risk of T2D or CVD/CHD. Of the five systematic reviews that

met the inclusion criteria, four were rated as 'strong' thus were retained for review.⁴⁹⁻⁵² These reviews indicated that evidence exists to support a relationship between intake of processed meats and increased risk of type 2 diabetes, as well as an increased risk of mortality from any cause and CVD/CHD. All of these reviews included highly heterogeneous data, thus results should be interpreted with caution.

Association between soy protein and lowered cholesterol

A Health Canada health claims assessment identified 79 clinical trials, published between 1980 and 2013, with meta-analyses supporting the conclusion that there was sufficient evidence to support a claim for soy protein intake and lowered cholesterol.¹⁸ There was no apparent dose-response relationship observed between soy protein intake and LDL cholesterol lowering. A "daily amount" of 25 g refers to the dose most commonly used in the studies reviewed, thus was considered the minimum effective daily intake.

Sugars

Association between sugars and obesity or type 2 diabetes

The 2010 US DGAC¹⁰ reported convincing evidence that intake of sugar sweetened beveragesⁱ was associated with increased adiposityⁱⁱ in children. The evidence base for this conclusion relied on a combined total of 18 peer-reviewed articles from a full National Evidence Library (NEL)⁵³ search (2004-2009) and an evidence review from the American Dietetic Association (1982-2004).

The WHO released an assessment of two systematic reviews in 2014, which examined the effects of increasing or decreasing intake of free sugars on excess weight gain and dental caries.^{54,55} The WHO rated the overall quality of available evidence on these topics in adults and children as "moderate," with the exception of the association between an increase in free sugars intake and increased body weight in children, which was considered to be "low." The 2015 US Dietary Guidelines Advisory Committee (DGAC)¹¹ utilized a WHO-commissioned systematic review,⁵⁵ as well as two other high-quality systematic reviews with meta-analyses,^{56,57} that examined intake of sugar-sweetened beverages and weight gain or obesity. The DGAC concluded that there was strong and consistent evidence that intakes of added sugars from food and/or sugar-sweetened beverages were associated with excess body weight in children and adults. Further, the reduction of added sugars and sugar-sweetened beverages in the diet reduced BMI in both children and adults. The 2015 DGAC graded the evidence as convincing, with consideration for identified limitations that were inherent to the primary research on which their findings were based. The DGAC concluded that comparison groups—in cohort studies of obesity indicators—with the highest versus the lowest intakes of added sugars were compatible with the WHO recommendation to keep free sugars intake below 10% of total energy intake.⁵⁴

i The 2010 DGAC defined sugar-sweetened beverages as liquids that are sweetened with various forms of sugars that add calories. These beverages include, but are not limited to, soda, fruit 'ades', and sports drinks (also called calorically-sweetened beverages).

ii Measures of adiposity included body weight, body mass index, skinfolds, and percent of body fat.

The 2015 DGAC also summarized evidence from five systematic reviews and meta-analyses⁵⁸⁻⁶² published between 2010 and 2014 to conclude that there was convincing evidence of a relationship between intake of added sugars—in particular sugar-sweetened beverages—and increased risk of type 2 diabetes among adults. This was not necessarily related to body weight.

Section 3.2.3 Strengths and limitations

The strengths of this work were the inclusion of high quality evidence and internal and external expert review. These reviews provided critical insight into areas for improvement and highlighted potential gaps in the evidence.

A limitation of the methodology was the reliance on authors' or organizations' interpretations of evidence, since the primary sources of evidence were pre-existing reports. Health Canada's analysis did not include an assessment of overlap in the studies that contributed to conclusions on the same topic. However, conclusions that were drawn directly from another report were excluded. While the grading system for evidence—how grades were determined and termed—varied across reports, the definitions for a “convincing” grade were similar. These “convincing” conclusions were generally substantiated by a well-established evidence base and were unlikely to change if new evidence emerged. Thus, only conclusions with an ERC grade of “convincing” were assessed further in the evidence review. However, probable, possible and insufficient conclusions from reports were also captured and will be considered, as needed, during the policy development process.

This methodology allowed us to leverage existing resources on a comprehensive array of topics and chronic disease/conditions of interest, avoid duplication of effort and best utilize internal resources. To mitigate bias, defined inclusion and exclusion criteria were used. Further, only reports from authoritative organizations that utilized an expert panel to promote transparency of their interpretation were included.

This document endeavors to provide the most up-to-date data. However, because time is required for reporting, collating, verifying, analyzing, and publishing surveillance data, the most recent information available may be years behind the current year. To address the time gap between the publication of studies used in the systematic reviews and the publication of reports, ONPP conducted a review of recent systematic reviews and select topics and also updated the review of reports.

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Section 3.3: Use

Section 3.3.1 Methodology

Health Canada conducted an assessment to better understand how *Eating Well with Canada's Food Guide* (the Food Guide)¹ and *Eating Well with Canada's Food Guide – for First Nations, Inuit and Métis*² are being used and by whom. The assessment methodology is described briefly here and in greater detail elsewhere.^{3,4}

Pinrae Research Associates Inc. were contracted to conduct the assessment between 2013 and 2014. Quantitative and qualitative data were collected from primary and secondary sources. Qualitative data were collected through document and content reviews, key informant interviews, thematic case studies, discussion groups, on-line consultation with stakeholders and interviews with patients/consumers. Quantitative data from the Rapid Response Module of the Canadian Community Health Survey (CCHS-RR)⁵ on consumer awareness and use of the Food Guide were also analysed. A wide range of stakeholders participated in the assessment, including provincial and territorial governments, health non-governmental organizations, professional associations and researchers, educators and communicators, and food industry representatives.

This design allowed for the triangulation of data and also produced a stronger design for assessing complex, multi-dimensional outcomes. The iterative design also meant that earlier phases of the implementation informed subsequent phases by refining questions and addressing gaps.

Document review

Forty-two documents were reviewed, including a number of secondary data reports or outputs. These provided background for the study and information on some of the activities and immediate Food Guide outcomes. This review was phased across the project so that most of the relevant documents and data summaries were reviewed.

Content review

Thirty-nine sets of materials which represented policies, programs, tools, and marketing materials from across Canada were reviewed to determine how various components and guidance from the Food Guide had been integrated.

Key informant interviews

Forty-two interviews were conducted with stakeholders including representatives from federal/provincial/territorial governments, health-based non-governmental organizations, professional associations, researchers, food industry, educators, and communicators.

Discussion groups

Thirty-seven stakeholders participated in nine discussion groups. These included professional educators and communicators, peer educators, food industry representatives, and individuals from health-based non-governmental organizations.

Online stakeholders survey

A total of 1,153 people responded to the survey. Invitations to participants were sent through the following groups:

- Federal/Provincial/Territorial Group on Nutrition
- Network on Healthy Eating
- Dietitians of Canada
- Regional networks across First Nations, Inuit, and Métis communities.

Case studies

Two thematic case studies were conducted on the integration of the Food Guide into education and health policies and on tools and approaches to help consumers interpret the Food Guide. Methods for the case studies included in-person and phone interviews, as well as document reviews. Overall, there were 49 participants from different communities, local programs, provincial and territorial ministries, and regional health and education authorities.

Interviews with patients and consumers

An Office of Nutrition Policy and Promotion (ONPP) representative conducted phone interviews with eight respondents selected from the Health Products and Food Branch Patient-Consumer Participation Pool. The interviews covered:

- general eating patterns
- health status information
- practices on healthy eating
- questions that explored the use or non-use of the Food Guide.

Statistics Canada's Canadian Community Health Survey Rapid Response Module

In 2012, Health Canada had Statistics Canada develop and implement a CCHS-RR Module. This is a set of questions that appear in a questionnaire for a single collection period and are asked of all CCHS respondents during that period. Detailed descriptions of the CCHS design, sample and interview procedures are described in detail elsewhere.⁵ The CCHS excludes members of the regular Canadian Forces and people living in the territories, on Indian reserves, in institutions, in some remote regions, and all residents (military and civilian) of Canadian Forces bases. This module gathered population level data on consumer awareness and use of the Food Guide. Data were collected from 9,700 respondents. The estimates are considered representative of the Canadian population overall, and by province.

Findings from the qualitative and quantitative data collected were reviewed and those that were related to awareness, use, and implementation were extracted. This included reported facilitators, challenges, and suggested areas for improvement.

Section 3.3.2 Results

Awareness and use of the Food Guide by consumers

The results of the CCHS-RR Module demonstrated that the majority of Canadians reported having seen or heard of the Food Guide (84%). Of these respondents, 76% also reported having looked through the Food Guide. A higher prevalence of having looked through the Food Guide was observed for the following sociodemographic, health, and diet-related factors:

- Females (84%) compared to males (67%)
- Younger age (12-18 years old: 86%) compared to middle age (19-50 years old: 77%)
- Middle age (19-50 years old: 77%) compared to older age groups (51 years and older: 72%)
- Higher education (post-secondary graduation: 79%) compared to lower education (secondary school graduation: 68%, lower than secondary graduation: 59%)
- Higher household income (78%) compared to middle income (74%)
- Households with children (80%) compared to households with no children (74%)
- Higher prevalence in the Atlantic Provinces and lower prevalence in Québec compared to Canada overall
- Underweight or normal weight (78%) compared to overweight (74%)
- Self-reported "excellent" health status (78%) compared to "fair/poor" health status (71%)
- Higher consumption of fruits and vegetables (5 or more times per day; 83%) compared to lower consumption of fruits and vegetables (less than 5 times per day; 71%)

Approximately 40% of Canadians reported having used the Food Guide to make healthy food choices and behaviour. The most frequently reported reasons for using the Food Guide were:

- to choose food for themselves (40%)
- to determine how much they needed to eat (35%)
- to assess how well they were eating (34%).

Approximately 20% of Canadians were aware of the Food Guide but had not looked through it, and of these respondents, 77% indicated that they were either not interested or had no need to look through the Food Guide and a small proportion (4%) reported that they did not trust the information.

Awareness of the Food Guide by stakeholders

In the online stakeholder survey, 91% of respondents reported that they had “carefully read” the Food Guide and 81% were “extensively aware of the contents” of the Food Guide. Further, observations during key informant interviews, case studies, and discussion groups demonstrated that participants could easily discuss the Food Guide guidance, and in many instances, could provide considerable detail on specific aspects of the Food Guide.

Integration of Food Guide guidance by stakeholders into policies, programs, and resources

Integrated data from the qualitative methods indicated that there was considerable uptake of the Food Guide guidance across stakeholder groups (public, private, not-for-profit, health, education, and the food industry). Various populations were targeted by stakeholders, including parents, children, seniors, and youth. Further, the Food Guide was identified as the basis for many policies, programs, services, and resources developed with respect to nutrition and healthy eating.

Approximately 40% of the policies found to integrate Food Guide guidance came from the education sector, for example school food guidelines. Others were from the health care sector (e.g. continuing care facilities), social services (e.g. daycare centres), or were developed to address a specific setting (e.g. arenas). The level to which guidance was integrated varied considerably across policies, with some offering a general statement about following the Food Guide, while others

integrated specific aspects of guidance. Most of the policies reviewed integrated guidance on number of servings, serving sizes, and guidance on fats and oils. All policies reviewed integrated food groups and the directional statements that guide towards lower-fat foods prepared with little or no added fat, sugar, or salt. Food Guide recommendations for women of childbearing age and older adults were less likely to be integrated since policies were often target-audience specific.

The programs and resources reviewed were likely to integrate the Food Guide in its entirety or replicate portions of it. The majority had integrated information about the four food groups, number of servings, serving sizes, and directional statements. When lower numeracy levels or limited food skills were identified among participants, less complex content of the Food Guide (for example, food group names and overarching guidance around foods prepared with little or no added fat, sugar, or salt) was more often integrated into programs and resources than more complex content. Life stage guidance and guidance on oils and fats were least likely to be integrated into resources.

Facilitators and challenges to the use and integration of Food Guide guidance

Many factors were identified by stakeholders as facilitators to the use and integration of the Food Guide guidance (Table 3.22). However, a number of challenges were also reported by stakeholders (see Table 3.22). The challenges related to “clarity,” “relevance,” and “integration by individuals” were identified.

Table 3.22: Overview of reported facilitators and challenges to the use and integration of Canada’s Food Guide guidance

FACILITATORS

- Credibility and confidence in recommendations
- Recommendations according to age and sex
Example: Tailoring according to age and sex rather than presenting wide ranges was viewed as particularly useful.
- Clarity of the layout and arrangement of the overall document
Example: Linking food groups, serving examples, and directional statements using graphics and colors, as well as the front cover graphic, assists with interpretation of guidance.
- Recognizing and integrating different patterns and styles of eating (flexibility)
Example: Someone choosing a vegetarian diet would be able to follow Food Guide guidance, as could many multicultural groups.
- Availability of associated materials
Examples: *The Resource for Educators and Communicators*, *My Food Guide* online tool, and the various translations of the Food Guide
- Inclusion of aspects beyond nutrition that encourage health and vitality
- Tailoring to First Nations, Inuit and Métis
Examples: Using local and traditional foods helps with interpreting the recommendations within a relevant, local context
- Availability of materials at no cost

CHALLENGES

- Credibility and confidence in recommendations
Example: Concerns that industry influenced the development of recommendations
- Clarity of recommendations
Example: Perceived contradictions in guidance. For example in the Vegetables and Fruit group, 100% juice is depicted as a serving example and there is guidance to have vegetables and fruit more often than juice
- Integration of guidance by individuals
Example: Translating guidance into meals and snacks
- Clarity of terminology
Example: Understanding serving sizes was a challenge for various types of consumers.
- Relevance in current context
Example: Updating recommendations to take into account new scientific evidence— particularly sodium, vitamin D, and oils and fats—or trends in the food supply
- Numeracy and literacy levels were noted as very high for some groups
Example: Interpretation and integration of information on number of servings and serving sizes can be challenging for some groups.
- Food security issues confronting certain groups

Identified in assessment of First Nations, Inuit, and Métis Food Guide:

- A perceived emphasis on whole food preparation, along with limited food skills creates a challenge in integrating the guidance into community members’ everyday activities.
- Providing specific food examples leads to the perception that there are “good foods” (those on the Food Guide) and “bad foods” (those that are not on the Food Guide) This can lead to dismissal of the overall guidance since the perceived recommended diet is viewed as overly restrictive and not possible in many communities, given food accessibility issues.

Credibility of Food Guide recommendations was identified as both a facilitator and a challenge, with most respondents identifying it as a facilitator. Further, participants in key informant interviews, case studies, and discussion groups considered the Food Guide guidance credible because they viewed it as being derived from scientific evidence and because guidance development is led by the federal government.

Clarity of the layout and arrangement of the overall document was identified as a facilitator by respondents to the stakeholder survey. Although some stakeholders reported clarity of recommendation as a challenge, the majority of respondents reported this aspect of guidance as a facilitator.

Areas for potential improvements reported by stakeholders

Stakeholders provided suggestions for improvement in the development of the Food Guide guidance, which included:

- Updating guidance more frequently
- Considering nutrition-related health conditions (such as diabetes), sub-populations, and community context (such as food availability/accessibility)
- Improved integration, by aligning Food Guide servings with the Nutrition Facts table serving sizes or highlighting the importance of food skills
- Assistance with interpreting guidance, by providing resources or other supports that help 'translate' guidance into meals or snacks
- Exploring additional formats for the Food Guide.

While many stakeholders endorsed the possibility of alternative formats to print copies, suggestions were vague as to what would be most useful. There continued to be a strongly stated need for print versions from all groups of stakeholders. Further, the primary mode of distribution of the Food Guide by stakeholders is printed copies or direct integration with other materials distributed in hard copy. Data on the distribution of the Food Guide showed that the vast majority of copies are disseminated by stakeholder organizations rather than directly by Health Canada.

Section 3.3.3 Strengths and limitations

Evidence was gathered from primary and secondary sources of quantitative and qualitative data, which permitted triangulation of data from multiple lines of evidence. This approach produced a strong design for assessing complex, multi-dimensional outcomes. One main limitation was that many of the samples selected (for example key informants, discussion group participants, stakeholder consultations, content review samples) were based primarily on purposive sampling techniques, except for the results from the CCHS-RR Module, which followed rigorous survey methods designed and implemented by Statistics Canada.

Given that these were not random samples derived from large populations, the data and findings presented cannot be considered representative of all stakeholders. To ensure the results are the most accurate indication of stakeholders' opinions and perspectives, care was used to develop and implement inclusion criteria for each method. Large numbers of samples were used across multiple methods. Attention was paid to the geographic distribution and diversity of stakeholders consulted, and the results were triangulated.

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UPDATED DIETARY REFERENCE INTAKES

The Dietary Reference Intakes (DRIs) are a comprehensive set of nutrient reference values for healthy populations. The DRIs are developed by Canadian and American scientists through a process overseen by the US Institute of Medicine (IOM). The IOM has established DRIs for all macronutrients as well as 35 vitamin and mineral nutrients. The DRI process began in 1994 and six volumes of nutrient reference values have been published, as well as two volumes describing the applications of these values, between 1997 and 2005. These eight volumes are summarized in *Dietary Reference Intakes: The Essential Guide to Nutrient Requirements*.¹ More information about the DRIs can be found at the following link: <http://www.hc-sc.gc.ca/fn-an/nutrition/reference/index-eng.php>

Health Canada uses the DRIs in a variety of nutrition policies and programs for the health and safety of Canadians. Since 2005, only the DRIs for calcium and vitamin D have been updated.

Section 4.1: Calcium and Vitamin D

In 2011, the IOM released its report on the updated DRIs for calcium and vitamin D, replacing the previous standards set in 1997.²

Background

In 2008, the Canadian and United States governments jointly commissioned the IOM to establish updated DRIs for calcium and vitamin D. A comprehensive, independent scientific expert review and evaluation process was conducted by the IOM, which built upon analyses from two systematic reviews conducted by the Agency for Healthcare Research and Quality (AHRQ).

The previous 1997 DRI report was only able to establish Adequate Intake (AI)ⁱ values for all life stage groups. However, the availability of newer data allowed the establishment of Estimated Average Requirements (EARs) and Recommended Dietary Allowances (RDAs) in the 2011 DRI report for vitamin D and calcium for all life stages with the exception of infants.²

As part of the review of the updated DRIs for calcium and vitamin D, a risk assessment framework was used to consider a wide range of health outcomes, including chronic diseases, upon which recommendations could be based. However, given the available evidence, the indicator of bone health was selected as the basis of the DRIs for calcium and vitamin D for all life stage groups.

For all other potential indicators examined (including cancer, cardiovascular disease, diabetes, metabolic syndrome, infectious diseases, falls and physical performance, neuro-

ⁱ If sufficient scientific evidence is not available to establish an EAR and to set an RDA, an AI is derived for the nutrient instead. An AI is based on much less data and incorporates substantially more judgment than is used in establishing an EAR and RDA. The AI is expected to meet or exceed the needs of most individuals in a specific life stage and sex group.

psychological condition, and autoimmune disorders), the IOM concluded that the collective scientific evidence was inconsistent, inconclusive as to causality, and insufficient to serve as a basis for informing nutritional requirements.² In 2014, the AHRQ released an updated systematic review, which reconfirmed these conclusions.³

Gathering and assessment of relevant findings

After the release of the 2011 IOM report, Health Canada analysed calcium and vitamin D intakes in the Canadian population from the 2004 CCHS relative to the updated DRI values.

According to the 2011 IOM report, estimates of inadequate intakes of vitamin D should be interpreted with caution, and should be considered in the context of vitamin D blood status. Vitamin D blood status is currently the best indicator of vitamin D nutriture, because it reflects vitamin D from all sources.² That includes the vitamin D synthesized in the body from sun exposure, as well as intakes from food and supplements.

Health Canada analysed vitamin D blood status, measured in 25-hydroxyvitamin D (25OHD), using standardizedⁱⁱ vitamin D blood data from the first two cycles of CHMS (2007-2009, 2009-2011).⁴

There is considerable discussion surrounding the blood concentrations of 25OHD associated with deficiency and sufficiency.² However, the IOM expert committee suggests that, relative to bone health:

- People are at risk of vitamin D deficiency (rickets or osteomalacia) at serum 25OHD concentrations <30 nmol/L. Some people are potentially at risk for inadequacy at concentrations ranging from 30–50 nmol/L.
- There may be reason for concern at serum concentrations >125 nmol/L.

The 2011 IOM report also states that the EAR and RDA of vitamin D intakes, for all age groups, were specified on the basis of achieving 25OHD concentrations of 40 nmol/L and 50 nmol/L respectively.²

The EAR is the value that should be used to assess the nutritional adequacy of a population.^{1,5} When using vitamin D blood status data at the population level, an EAR-type cut-off value (less than 40 nmol/L) more accurately reflects the prevalence of inadequacy than an RDA-type value (less than 50 nmol/L) for estimating the proportion of the population at risk of inadequacy.⁶

Using the RDA as a cut off at the population level would greatly overestimate the proportion of the population at risk of inadequacy. This is because the RDA is set at a level which exceeds the needs of most people (97.5% of the population).⁷

ⁱⁱ Health Canada is taking part in an initiative led by the Office of Dietary Supplements at the National Institutes of Health in the US to standardize Canadian vitamin D blood data. A standardized reference measurement procedure will make it possible to compare vitamin D blood data across CHMS cycles and from different national-level surveys.

Thus, the EAR cut-off value was used to estimate the proportion of the population at risk of inadequacy. In addition, blood concentrations of 25OHD below 30 nmol/L were used to assess risk of vitamin D deficiency in the Canadian population.

Key findings

Vitamin D blood status and intakes in the Canadian population

Standardized vitamin D blood data from the first two cycles of CHMS (2007-2009, 2009-2011) showed that about 19% of the population three to 79 years of age had inadequate (less than 40 nmol/L) blood concentrations. The standardized data also showed that about 7% of the population three to 79 years of age were at risk of vitamin D deficiency (less than 30 nmol/L) (Table 4.1).⁴

Analysis of the standardized data showed that the proportion of the population nine to 79 years of age with blood values less than 40 nmol/L ranged from 10 to 32% and that the proportion less than 30 nmol/L ranged from 6% to 17%, depending on age and sex groups. There were notable differences observed in the standardized vitamin D blood data between males and females. For instance, a significant difference was observed in the proportion of males 19-30 years of age (17%) with blood values less than 30 nmol/L when compared to females in the same age group (6%) (Table 4.1).⁴

Dietary intake data from the 2004 CCHS showed that, at a national level, the prevalence of inadequate intakes (% below the EAR) of vitamin D from food sources was high (75-96%, depending on age and sex) (Table 4.2).⁸ It was also found that Canadians get most of their dietary intake of vitamin D by eating fortified foods. Dietary intake data showed that the contribution to vitamin D intake from fluid milk was highest among children, and appeared to decrease with age, while the contribution to vitamin D intake from fish appeared to increase with age. Margarine and eggs were shown to be relatively important sources of vitamin D for all age groups.

Data on vitamin D intakes from food and supplement sources combined showed a lower prevalence of inadequate vitamin D intakes, although it was still high (54-84%, depending on age and sex) (Table 4.2).⁸

Although a high prevalence of inadequate intakes of vitamin D was observed, available blood status measures did not suggest wide-spread vitamin D deficiency in the Canadian population. Vitamin D status among some subpopulations, such as those with darker skin, may warrant further consideration.^{9,10}

Table 4.1: Standardized vitamin D blood (25OHD) values in the Canadian population, by age and sex groups (cycles 1 and 2 combined [2007-2011])⁴

SEX	AGE (YEARS)	SUBJECTS (N)	PERCENTAGE (%) OF THE POPULATION BELOW INDICATED VALUE	
			< 30 NMOL/L	< 40 NMOL/L
Both	3-79	11,336	7.4 (5.5, 10.0)	19.4 (16.0, 23.4)
Males	9-13	800	NA	12.1 (7.6, 18.8)*
	14-18	630	NA	21.2 (13.6, 31.5)*
	19-30	570	16.6 (10.8, 24.8)*	31.5 (23.7, 40.6)
	31-50	1387	10.2 (7.5, 13.8)	27.9 (21.3, 35.6)
	51-70	1116	6.1 (4.3, 8.6)	17.2 (12.9, 22.7)
	71-79	317	NA	9.8 (7.5, 12.9)
	All	5484	9.1 (6.6, 12.5)	22.6 (18.3, 27.5)
Females	9-13	779	NA	15.9 (10.1, 24.0)*
	14-18	581	8.6 (5.0, 14.4)*	16.6 (11.8, 22.9)
	19-30	668	5.5 (3.2, 9.2)*	21.3 (14.3, 30.5)*
	31-50	1647	6.2 (3.8, 9.9)*	18.1 (14.4, 22.6)
	51-70	1204	5.5 (3.5, 8.5)*	13.2 (9.9, 17.4)
	71-79	354	NA	10.3 (6.5, 16.0)*
	All	5852	5.7 (4.0, 8.2)*	16.3 (13.3, 19.8)

All values are cumulative population percentages; 95% CI in parentheses

NA: Data with a coefficient of variation (CV) greater than 33.3%—suppressed due to extreme sampling variability.

* Data with a coefficient of variation from 16.6% to 33.3%—interpret with caution.

Table 4.2: Proportion of the population below the Estimated Average Requirement (EAR) for vitamin D from food sources and food and supplements combined, by age-sex group (CCHS, 2004)

SEX	AGE (YEARS)	FOOD ONLY (%<EAR)	FOOD + SUPPLEMENTS (%<EAR)
Both	1-3	86.0	59.8
	4-8	92.7	59.8
Males	9-13	84.5	66.4
	14-18	74.7	67.7
	19-30	91.1	78.0
	31-50	90.5	78.0
	51-70	79.6	64.9
	>70	87.1	66.3
Females	9-13	93.1	77.4
	14-18	93.5	83.8
	19-30	96.4	81.4
	31-50	91.1	70.6
	51-70	90.7	57.6
	>70	91.8	54.3

Calcium intakes in the Canadian population

A high prevalence of inadequate intakes across age and sex groups were observed for calcium, except for children 1-3 years of age (range 23-87%, depending on age and sex group) (Table 4.3).⁸ The following groups had the highest prevalence of inadequate calcium intakes: girls 9 to 18 years of age; women 51 years of age and older; and men 71 years of age and older.

Milk and milk alternatives were the major food contributors to calcium intake among Canadians. Bread was also a food contributor, but to a lesser extent.

Data on calcium intakes from food and supplements combined showed that supplement use did not greatly affect the prevalence of inadequate calcium intakes. The exception was for adults over 50 years of age (Table 4.3). This is consistent with data showing that less than one in three Canadians under 50 years of age used supplements containing calcium.¹¹ This indicates that Canadians under 50 years of age get most of their calcium from their diet.

The margin between the RDA and UL values for calcium is narrow. Supplement use can increase the prevalence of calcium intakes exceeding the UL. This has been observed among some women older than 50 years of age.⁸

Table 4.3: Proportion of the population below the Estimated Average Requirement (EAR) for calcium from food sources and food supplements combined, by age-sex group (CCHS, 2004)

SEX	AGE (YEARS)	FOOD ONLY (%< EAR)	FOOD + SUPPLEMENTS (%<EAR)
Both	1-3	3.2	2.6
	4-8	23.3	18.7
Males	9-13	43.9	43.1
	14-18	33.4	31.9
	19-30	26.5	25.4
	31-50	39.0	36.6
	51-70	53.0	44.5
	>70	80.1	69.4
Females	9-13	66.9	65.4
	14-18	70.0	67.8
	19-30	47.5	41.6
	31-50	51.9	41.4
	51-70	82.4	56.8
	>70	86.9	63.1

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IMPLICATIONS, CONSIDERATIONS AND NEXT STEPS

The results of the evidence review for dietary guidance were interpreted in relation to Canada's Food Guide, whose purpose is to define and promote healthy eating for Canadians. Implications were considered related to dietary guidance development and Canada's Food Guide as a policy and educational tool.

5.1 Implications related to dietary guidance development

Maintaining stakeholder confidence in the credibility of Health Canada's dietary guidance is important. The assessment of use found that there were challenges with stakeholder confidence in the development of dietary guidance, which may adversely affect the credibility of the guidance from a scientific standpoint. Conveying these concerns to others can affect public confidence and in turn have negative impacts on the use of guidance. It is therefore necessary to share the process and evidence that underpins dietary guidance. Health Canada has committed to regular communication about the review and assessment of evidence related to dietary guidance on a cycle of every five years, or more frequently as needed.

The 2015 ERC review revealed that many aspects of the scientific basis for the Food Guide are consistent with the latest evidence on diet and health. However, further precision may be needed in the guidance on certain topics. Examples include being more explicit in certain areas (e.g. replacement of saturated fat by unsaturated fat) and further emphasizing the importance of overall healthy eating patterns. The review also highlighted areas where evidence was not convincing, for example associations between intake of total fat and certain health outcomes (e.g. cardiovascular disease, obesity), and between intake of 100% fruit juice and obesity. While recent advancements in the science base do not represent radical changes, it is essential to take them into account and incorporate them into future updates of dietary guidance.

Health Canada is committed to a transparent approach in the development of dietary guidance to ensure it remains free of any conflict of interest. As part of this transparency, Health Canada will clearly communicate reviews of the evidence, as well as how input from stakeholders is used in policy development.

5.2 Implications related to Canada's Food Guide as a policy and educational tool

As a policy tool, Canada's Food Guide is playing an important role in underpinning a wide variety of policies, programs, and initiatives to promote healthy eating. Stakeholders are using various aspects of the guidance to meet the needs of different audiences in different circumstances. The role that intermediaries play in integrating and disseminating dietary guidance in Canada is essential.

There are high levels of awareness and confidence in Health Canada's dietary guidance by consumers, yet the food and nutrient intakes of Canadians indicate that many do not follow a healthy pattern of eating. Thus, although the brand is strong, consumers are not following the advice in the Food Guide. Stakeholders identified several challenges related to consumer understanding and application of guidance that imply the Food Guide could be more useful as an educational tool to promote healthy eating. This speaks to the need for guidance that is accessible to consumers and available in ways that meet their needs.

Addressing these challenges may require adding more detail to policy and educational tools in some cases, while simplifying them in others. One tool may not be meeting the needs of all audiences. Considering new approaches to communicating guidance or developing different educational tools more suited to diverse audiences may be what is needed to help make Canada's Food Guide more useful and relevant.

With future updates of dietary guidance, Health Canada will consider how best to support health professionals and other stakeholders as they develop nutrition-related policies and programs. Health Canada will also reinforce and leverage the important role that intermediaries play in helping consumers apply dietary guidance. Further support to these stakeholders in interpreting dietary guidance for consumers would complement Health Canada's tools for consumers.

5.3 Considerations for next steps

The nutrition information environment is complex

The nutrition information environment is crowded, complex, and rapidly evolving. The way Canadians access information has also evolved, with social media, mobile apps, and blogs by opinion leaders being consulted along with more traditional media channels. Health Canada will explore innovative ways of communicating guidance and making it more accessible through new technologies. There is also renewed interest by some stakeholders in having simplified key messages to convey to consumers.

Health Canada, provincial/territorial governments, and various other stakeholders can work together to maximize the positive impact that dietary guidance can have in Canada

Guidance developed by Health Canada serves as an important policy underpinning. Health Canada also has a role to play in supporting intermediaries in their efforts to help Canadians apply dietary guidance. Exploring ways to leverage resources and areas of expertise among various stakeholders will help to reduce duplication of effort and ensure there is consistency between dietary guidance and consumer tools.

Additional information is needed to further inform dietary guidance development

Certain factors that are important considerations for formulating dietary guidance were not captured in this evidence review, such as behaviours associated with food choices. Health Canada has assessed various topics, that were outside of the scope of the 2015 ERC, and will continue to investigate these topics in future decision making for dietary guidance. Further, the scope of future evidence reviews could be broadened to incorporate work on eating behaviours (such as eating out); food security as it relates to food and nutrient intakes; environmentally sustainable diets; and information on the dietary intakes of populations such as First Nations, Inuit, and Metis.

Updated data on the food and nutrient intakes of Canadians will be examined when available

The 2015 Canadian Community Health Survey -Nutrition has gathered information on usual dietary intake, height and weight, and data on certain health conditions. This will provide a detailed and up-to-date picture of intakes for nutrients, foods, supplements, as well as eating patterns. When the data become available, this will also allow for an evaluation of how the diets of Canadians have changed since the 2004 survey.

An updated (2015) version of the Canadian Nutrient File, a database which lists the nutrient values in Canadian foods, is available and provides a more up-to-date representation of the foods in the Canadian marketplace.

Food choices are not simply a matter of personal choice

Many factors influence the food choices individuals make. The social, economic and physical environments play a powerful role in shaping the capacity to make healthy eating choices. Dietary guidance is one part of a comprehensive approach to support healthy eating. Creating supportive environments by addressing the broader determinants of healthy eating is required. Collective action at the policy, society and community levels in a range of settings will complement and extend the foundation for healthy eating provided by dietary guidance.

5.4 Conclusion

Nutrition-related chronic diseases and conditions continue to be issues of public health concern in Canada. The food and nutrient intakes evidence indicated that many Canadians need to eat differently to improve the quality of their diet. Dietary guidance can make an important contribution to nutritional health, but must be used and implemented by Canadians in order to do so. The findings of the 2015 ERC review have brought to light implications for Canada's Food Guide that need to be considered as guidance evolves.

The Food Guide is used in many ways, from policy development and program design through to individual nutritional assessment and counselling. Findings from the use of dietary guidance indicated that the existing all-in-one policy and education tool is not meeting the needs of all users. There are stakeholders who want more detailed information and stakeholders who want less detail.

There is a continued need for Federal guidance on nutrition and healthy eating to provide a consistent basis for the diverse range of policies, programs, and resources developed by stakeholders. Educational tools are also required to support consumers in applying dietary guidance on an individual level. Developing distinct policy and educational tools to support the various uses of Canada's Food Guide may help to address some of the challenges identified with using the existing Food Guide.

Going forward, it will be important to enhance collaborative efforts with stakeholders working to support healthy eating. Determining how best to support and leverage the expertise of others should lead to having more relevant tools for policymakers, health professionals, nutrition educators, and consumers that complement, rather than compete with, each other.

Part 6

APPENDICES

Appendix A: Search strategy for the identification of studies on nutrient/food intakes of Canadians

26 September, 2012

Database(s): **Embase** 1974 to 2012 September 26

Search Strategy:

#	SEARCHES	RESULTS
1	(canad* adj2 health* adj2 survey*).tw.	931
2	((cchs or chms or nphs) and canad*).tw.	403
3	(nation* adj2 populat* adj2 health* adj2 survey*).tw.	531
4	(canad* adj2 survey* adj2 (data or datasets or data sets or data set or dataset)).tw.	27
5	(canad* adj2 census*).tw.	299
6	exp nutrition/	1301716
7	(food* or nutrit* or intake* or diet* or supplement* or eating or eat or eats or beverage* or drink or drinks or consume or consumption or consumes or consumptions).ti.	416940
8	(1 or 2 or 3 or 4 or 5) and (6 or 7)	238
9	limit 8 to (yr=2000-2012 and (english or french))	214

Database(s): **Ovid MEDLINE(R), Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid OLDMEDLINE(R)** 1946 to Present

Search Strategy:

#	SEARCHES	RESULTS
1	(canad* adj2 health* adj2 survey*).tw.	823
2	((cchs or chms or nphs) and canad*).tw.	344
3	(nation* adj2 populat* adj2 health* adj2 survey*).tw.	492
4	(canad* adj2 survey* adj2 (data or datasets or data sets or data set or dataset)).tw.	24
5	(canad* adj2 census*).tw.	280
6	exp "food and beverages"/ or exp feeding behavior/ or exp food analysis/ or exp food deprivation/ or exp diet/ or exp food supply/ or exp Dietary Proteins/ or exp Potassium, Dietary/ or exp Dietary Fats/ or exp Dietary Sucrose/ or exp Iron, Dietary/ or exp Dietary Carbohydrates/ or exp Sodium Chloride, Dietary/ or exp Dietary Supplements/ or exp Cholesterol, Dietary/ or exp Dietary Fats, Unsaturated/ or exp Calcium, Dietary/ or exp Phosphorus, Dietary/ or exp Sodium, Dietary/ or exp Dietary Fiber/	1225614
7	(food* or nutrit* or intake* or diet* or supplement* or eating or eat or eats or beverage* or drink or drinks or consume or consumption or consumes or consumptions).ti.	352620
8	(1 or 2 or 3 or 4 or 5) and (6 or 7)	119
9	limit 8 to (yr=2000-2012 and (english or french))	112

Database(s): **Econlit** 1961 to August 2012, **Food Science and Technology Abstracts** 1969 to 2012 September Week 4, **Global Health** 1973 to August 2012, **International Pharmaceutical Abstracts** 1970 to September 2012, **PsycINFO** 1987 to September Week 3 2012, **Social Policy and Practice** 201207

Search Strategy:

#	SEARCHES	RESULTS
1	(canad* adj2 health* adj2 survey*).tw.	723
2	((cchs or chms or nphs) and canad*).tw.	323
3	(nation* adj2 populat* adj2 health* adj2 survey*).tw.	419
4	(canad* adj2 survey* adj2 (data or datasets or data sets or data set or dataset)).tw.	51
5	(canad* adj2 census*).tw.	292
6	(food* or nutrit* or intake* or diet* or eating or eat or eats or beverage* or drink or drinks or fruit* or veg*).ti,ab.	992621
7	(food* or nutrit* or intake* or diet* or supplement* or eating or eat or eats or beverage* or drink or drinks or consume or consumption or consumes or consumptions or fruit* or veg*).ti.	513138
8	(1 or 2 or 3 or 4 or 5) and (6 or 7)	202
9	limit 8 to (yr=2000-2012 and (english or french)) [Limit not valid in Social Policy and Practice; records were retained]	189
10	remove duplicates from 9	163

Appendix B: Dietary Reference Intake tables for vitamins, elements (minerals), and macronutrients

Unit	Vitamin A ^{1,2}						Vitamin D ^{**}						Vitamin E ⁵			Vitamin K	
	µg/day (RAE)			IU/day (RAE)			µg/day ⁴			IU/day ⁴			mg/day			µg/day	
	EAR	RDA/AI	UL ³	EAR	RDA/AI	UL ³	EAR	RDA/AI	UL	EAR	RDA/AI	UL	EAR	RDA/AI	UL ⁶	AI	UL ⁷
Infants																	
0-6 mo	<i>ND</i>	400*	600	<i>ND</i>	1333*	2000	<i>ND</i>	10*	25	<i>ND</i>	400*	1000	<i>ND</i>	4*	<i>ND</i>	2.0*	<i>ND</i>
7-12 mo	<i>ND</i>	500*	600	<i>ND</i>	1667*	2000	<i>ND</i>	10*	38	<i>ND</i>	400*	1500	<i>ND</i>	5*	<i>ND</i>	2.5*	<i>ND</i>
Children																	
1-3 y	<i>210</i>	300	600	<i>700</i>	1000	2000	<i>10</i>	15	63	<i>400</i>	600	2500	<i>5</i>	6	200	30*	<i>ND</i>
4-8 y	<i>275</i>	400	900	<i>917</i>	1333	3000	<i>10</i>	15	75	<i>400</i>	600	3000	<i>6</i>	7	300	55*	<i>ND</i>
Males																	
9-13 y	<i>445</i>	600	1700	<i>1483</i>	2000	5667	<i>10</i>	15	100	<i>400</i>	600	4000	<i>9</i>	11	600	60*	<i>ND</i>
14-18 y	<i>630</i>	900	2800	<i>2100</i>	3000	9333	<i>10</i>	15	100	<i>400</i>	600	4000	<i>12</i>	15	800	75*	<i>ND</i>
19-30 y	<i>625</i>	900	3000	<i>2083</i>	3000	10000	<i>10</i>	15	100	<i>400</i>	600	4000	<i>12</i>	15	1000	120*	<i>ND</i>
31-50 y	<i>625</i>	900	3000	<i>2083</i>	3000	10000	<i>10</i>	15	100	<i>400</i>	600	4000	<i>12</i>	15	1000	120*	<i>ND</i>
51-70 y	<i>625</i>	900	3000	<i>2083</i>	3000	10000	<i>10</i>	15	100	<i>400</i>	600	4000	<i>12</i>	15	1000	120*	<i>ND</i>
>70 y	<i>625</i>	900	3000	<i>2083</i>	3000	10000	<i>10</i>	20	100	<i>400</i>	800	4000	<i>12</i>	15	1000	120*	<i>ND</i>
Females																	
9-13 y	<i>420</i>	600	1700	<i>1400</i>	2000	5667	<i>10</i>	15	100	<i>400</i>	600	4000	<i>9</i>	11	600	60*	<i>ND</i>
14-18 y	<i>485</i>	700	2800	<i>1617</i>	2333	9333	<i>10</i>	15	100	<i>400</i>	600	4000	<i>12</i>	15	800	75*	<i>ND</i>
19-30 y	<i>500</i>	700	3000	<i>1667</i>	2333	10000	<i>10</i>	15	100	<i>400</i>	600	4000	<i>12</i>	15	1000	90*	<i>ND</i>
31-50 y	<i>500</i>	700	3000	<i>1667</i>	2333	10000	<i>10</i>	15	100	<i>400</i>	600	4000	<i>12</i>	15	1000	90*	<i>ND</i>
51-70 y	<i>500</i>	700	3000	<i>1667</i>	2333	10000	<i>10</i>	15	100	<i>400</i>	600	4000	<i>12</i>	15	1000	90*	<i>ND</i>
>70 y	<i>500</i>	700	3000	<i>1667</i>	2333	10000	<i>10</i>	20	100	<i>400</i>	800	4000	<i>12</i>	15	1000	90*	<i>ND</i>
Pregnancy																	
<18 y	<i>530</i>	750	2800	<i>1767</i>	2500	9333	<i>10</i>	15	100	<i>400</i>	600	4000	<i>12</i>	15	800	75*	<i>ND</i>
19-30 y	<i>550</i>	770	3000	<i>1833</i>	2567	10000	<i>10</i>	15	100	<i>400</i>	600	4000	<i>12</i>	15	1000	90*	<i>ND</i>
31-50 y	<i>550</i>	770	3000	<i>1833</i>	2567	10000	<i>10</i>	15	100	<i>400</i>	600	4000	<i>12</i>	15	1000	90*	<i>ND</i>
Lactation																	
<18 y	<i>885</i>	1200	2800	<i>2950</i>	4000	9333	<i>10</i>	15	100	<i>400</i>	600	4000	<i>16</i>	19	800	75*	<i>ND</i>
19-30 y	<i>900</i>	1300	3000	<i>3000</i>	4333	10000	<i>10</i>	15	100	<i>400</i>	600	4000	<i>16</i>	19	1000	90*	<i>ND</i>
31-50 y	<i>900</i>	1300	3000	<i>3000</i>	4333	10000	<i>10</i>	15	100	<i>400</i>	600	4000	<i>16</i>	19	1000	90*	<i>ND</i>

This table presents *Estimated Average Requirements (EARs) in italics*, **Recommended Dietary Allowances (RDAs) in bold type** and Adequate Intakes (AIs) in ordinary type followed by an asterisk (*). Tolerable Upper Intake Levels (ULs) are in shaded columns.

** New 2010 values have replaced previous 1997 values.

¹ As Retinol Activity Equivalents (RAE). See conversion factors for more details.

² No DRIs are established for beta-carotene or other carotenoids. However, existing recommendations for consumption of carotenoid-rich fruits and vegetables are supported.

³ UL as preformed vitamin A only. Beta-carotene supplements are advised only to serve as a provitamin A source for individuals at risk of vitamin A deficiency.

⁴ These reference values assume minimal sun exposure.

⁵ EAR and RDA/AI as alpha-tocopherol (2R-stereoisomeric forms) only. See conversion factors for more details.

⁶ The UL for vitamin E applies only to synthetic vitamin E (all isomeric forms) obtained from supplements, fortified foods, or a combination of the two.

⁷ Due to lack of suitable data, a UL could not be established for vitamin K. This does not mean that there is no potential for adverse effects resulting from high intakes.

NOTE: These are reference values for normal, apparently healthy individuals eating a typical mixed North American diet. An individual may have physiological, health, or lifestyle characteristics that may require tailoring of specific nutrient values.

Unit	Vitamin C ⁸			Thiamin			Riboflavin			Niacin ¹⁰			Vitamin B6		
	mg/day			mg/day			mg/day			mg/day (NE)			mg/day		
	EAR	RDA/AI	UL	EAR	RDA/AI	UL ⁹	EAR	RDA/AI	UL ⁹	EAR	RDA/AI	UL ¹¹	EAR	RDA/AI	UL
Infants															
0-6 mo	<i>ND</i>	40*	<i>ND</i>	<i>ND</i>	0.2*	<i>ND</i>	<i>ND</i>	0.3*	<i>ND</i>	<i>ND</i>	2* ^a	<i>ND</i>	<i>ND</i>	0.1*	<i>ND</i>
7-12 mo	<i>ND</i>	50*	<i>ND</i>	<i>ND</i>	0.3*	<i>ND</i>	<i>ND</i>	0.4*	<i>ND</i>	<i>ND</i>	4*	<i>ND</i>	<i>ND</i>	0.3*	<i>ND</i>
Children															
1-3 y	<i>13</i>	15	<i>400</i>	<i>0.4</i>	0.5	<i>ND</i>	<i>0.4</i>	0.5	<i>ND</i>	<i>5</i>	6	<i>10</i>	<i>0.4</i>	0.5	<i>30</i>
4-8 y	<i>22</i>	25	<i>650</i>	<i>0.5</i>	0.6	<i>ND</i>	<i>0.5</i>	0.6	<i>ND</i>	<i>6</i>	8	<i>15</i>	<i>0.5</i>	0.6	<i>40</i>
Males															
9-13 y	<i>39</i>	45	<i>1200</i>	<i>0.7</i>	0.9	<i>ND</i>	<i>0.8</i>	0.9	<i>ND</i>	<i>9</i>	12	<i>20</i>	<i>0.8</i>	1.0	<i>60</i>
14-18 y	<i>63</i>	75	<i>1800</i>	<i>1.0</i>	1.2	<i>ND</i>	<i>1.1</i>	1.3	<i>ND</i>	<i>12</i>	16	<i>30</i>	<i>1.1</i>	1.3	<i>80</i>
19-30 y	<i>75</i>	90	<i>2000</i>	<i>1.0</i>	1.2	<i>ND</i>	<i>1.1</i>	1.3	<i>ND</i>	<i>12</i>	16	<i>35</i>	<i>1.1</i>	1.3	<i>100</i>
31-50 y	<i>75</i>	90	<i>2000</i>	<i>1.0</i>	1.2	<i>ND</i>	<i>1.1</i>	1.3	<i>ND</i>	<i>12</i>	16	<i>35</i>	<i>1.1</i>	1.3	<i>100</i>
51-70 y	<i>75</i>	90	<i>2000</i>	<i>1.0</i>	1.2	<i>ND</i>	<i>1.1</i>	1.3	<i>ND</i>	<i>12</i>	16	<i>35</i>	<i>1.4</i>	1.7	<i>100</i>
>70 y	<i>75</i>	90	<i>2000</i>	<i>1.0</i>	1.2	<i>ND</i>	<i>1.1</i>	1.3	<i>ND</i>	<i>12</i>	16	<i>35</i>	<i>1.4</i>	1.7	<i>100</i>
Females															
9-13 y	<i>39</i>	45	<i>1200</i>	<i>0.7</i>	0.9	<i>ND</i>	<i>0.8</i>	0.9	<i>ND</i>	<i>9</i>	12	<i>20</i>	<i>0.8</i>	1.0	<i>60</i>
14-18 y	<i>56</i>	65	<i>1800</i>	<i>0.9</i>	1.0	<i>ND</i>	<i>0.9</i>	1.0	<i>ND</i>	<i>11</i>	14	<i>30</i>	<i>1.0</i>	1.2	<i>80</i>
19-30 y	<i>60</i>	75	<i>2000</i>	<i>0.9</i>	1.1	<i>ND</i>	<i>0.9</i>	1.1	<i>ND</i>	<i>11</i>	14	<i>35</i>	<i>1.1</i>	1.3	<i>100</i>
31-50 y	<i>60</i>	75	<i>2000</i>	<i>0.9</i>	1.1	<i>ND</i>	<i>0.9</i>	1.1	<i>ND</i>	<i>11</i>	14	<i>35</i>	<i>1.1</i>	1.3	<i>100</i>
51-70 y	<i>60</i>	75	<i>2000</i>	<i>0.9</i>	1.1	<i>ND</i>	<i>0.9</i>	1.1	<i>ND</i>	<i>11</i>	14	<i>35</i>	<i>1.3</i>	1.5	<i>100</i>
>70 y	<i>60</i>	75	<i>2000</i>	<i>0.9</i>	1.1	<i>ND</i>	<i>0.9</i>	1.1	<i>ND</i>	<i>11</i>	14	<i>35</i>	<i>1.3</i>	1.5	<i>100</i>
Pregnancy															
< 18 y	<i>66</i>	80	<i>1800</i>	<i>1.2</i>	1.4	<i>ND</i>	<i>1.2</i>	1.4	<i>ND</i>	<i>14</i>	18	<i>30</i>	<i>1.6</i>	1.9	<i>80</i>
19-30 y	<i>70</i>	85	<i>2000</i>	<i>1.2</i>	1.4	<i>ND</i>	<i>1.2</i>	1.4	<i>ND</i>	<i>14</i>	18	<i>35</i>	<i>1.6</i>	1.9	<i>100</i>
31-50 y	<i>70</i>	85	<i>2000</i>	<i>1.2</i>	1.4	<i>ND</i>	<i>1.2</i>	1.4	<i>ND</i>	<i>14</i>	18	<i>35</i>	<i>1.6</i>	1.9	<i>100</i>
Lactation															
< 18 y	<i>96</i>	115	<i>1800</i>	<i>1.2</i>	1.4	<i>ND</i>	<i>1.3</i>	1.6	<i>ND</i>	<i>13</i>	17	<i>30</i>	<i>1.7</i>	2.0	<i>80</i>
19-30 y	<i>100</i>	120	<i>2000</i>	<i>1.2</i>	1.4	<i>ND</i>	<i>1.3</i>	1.6	<i>ND</i>	<i>13</i>	17	<i>35</i>	<i>1.7</i>	2.0	<i>100</i>
31-50 y	<i>100</i>	120	<i>2000</i>	<i>1.2</i>	1.4	<i>ND</i>	<i>1.3</i>	1.6	<i>ND</i>	<i>13</i>	17	<i>35</i>	<i>1.7</i>	2.0	<i>100</i>

This table presents *Estimated Average Requirements (EARs) in italics, Recommended Dietary Allowances (RDAs) in bold type and Adequate Intakes (AIs) in ordinary type followed by an asterisk (*)*. Tolerable Upper Intake Levels (ULs) are in shaded columns.

⁸ Because smoking increases oxidative stress and metabolic turnover of vitamin C, the requirement for smokers is increased by 35 mg/day.

⁹ Due to lack of suitable data, ULs could not be established for thiamin and riboflavin. This does not mean that there is no potential for adverse effects resulting from high intakes.

¹⁰ As Niacin Equivalents (NE). See conversion factors for more details.

¹¹ The UL for niacin applies only to synthetic forms obtained from supplements, fortified foods, or a combination of the two.

^a As preformed niacin, not NE, for this age group.

NOTE: These are reference values for normal, apparently healthy individuals eating a typical mixed North American diet. An individual may have physiological, health, or lifestyle characteristics that may require tailoring of specific nutrient values.

Unit	Folate ¹²			Vitamin B12			Pantothenic Acid		Biotin		Choline ¹⁵	
	µg/day (DFE)			µg/day			mg/day		µg/day		mg/day	
	EAR	RDA/AI	UL ¹³	EAR	RDA/AI	UL ¹⁴	AI	UL ¹⁴	AI	UL ¹⁴	AI	UL
Infants												
0-6 mo	<i>ND</i>	65*	ND	<i>ND</i>	0.4*	ND	1.7*	ND	5*	ND	125*	ND
7-12 mo	<i>ND</i>	80*	ND	<i>ND</i>	0.5*	ND	1.8*	ND	6*	ND	150*	ND
Children												
1-3 y	<i>120</i>	150	300	<i>0.7</i>	0.9	ND	2*	ND	8*	ND	200*	1000
4-8 y	<i>160</i>	200	400	<i>1.0</i>	1.2	ND	3*	ND	12*	ND	250*	1000
Males												
9-13 y	<i>250</i>	300	600	<i>1.5</i>	1.8	ND	4*	ND	20*	ND	375*	2000
14-18 y	<i>330</i>	400	800	<i>2.0</i>	2.4	ND	5*	ND	25*	ND	550*	3000
19-30 y	<i>320</i>	400	1000	<i>2.0</i>	2.4	ND	5*	ND	30*	ND	550*	3500
31-50 y	<i>320</i>	400	1000	<i>2.0</i>	2.4	ND	5*	ND	30*	ND	550*	3500
51-70 y	<i>320</i>	400	1000	<i>2.0</i>	2.4^d	ND	5*	ND	30*	ND	550*	3500
>70 y	<i>320</i>	400	1000	<i>2.0</i>	2.4^d	ND	5*	ND	30*	ND	550*	3500
Females												
9-13 y	<i>250</i>	300	600	<i>1.5</i>	1.8	ND	4*	ND	20*	ND	375*	2000
14-18 y	<i>330</i>	400^b	800	<i>2.0</i>	2.4	ND	5*	ND	25*	ND	400*	3000
19-30 y	<i>320</i>	400^b	1000	<i>2.0</i>	2.4	ND	5*	ND	30*	ND	425*	3500
31-50 y	<i>320</i>	400^b	1000	<i>2.0</i>	2.4	ND	5*	ND	30*	ND	425*	3500
51-70 y	<i>320</i>	400	1000	<i>2.0</i>	2.4^d	ND	5*	ND	30*	ND	425*	3500
>70 y	<i>320</i>	400	1000	<i>2.0</i>	2.4^d	ND	5*	ND	30*	ND	425*	3500
Pregnancy												
≤ 18 y	<i>520</i>	600^c	800	<i>2.2</i>	2.6	ND	6*	ND	30*	ND	450*	3000
19-30 y	<i>520</i>	600^c	1000	<i>2.2</i>	2.6	ND	6*	ND	30*	ND	450*	3500
31-50 y	<i>520</i>	600^c	1000	<i>2.2</i>	2.6	ND	6*	ND	30*	ND	450*	3500
Lactation												
≤ 18 y	<i>450</i>	500	800	<i>2.4</i>	2.8	ND	7*	ND	35*	ND	550*	3000
19-30 y	<i>450</i>	500	1000	<i>2.4</i>	2.8	ND	7*	ND	35*	ND	550*	3500
31-50 y	<i>450</i>	500	1000	<i>2.4</i>	2.8	ND	7*	ND	35*	ND	550*	3500

This table presents *Estimated Average Requirements (EARs) in italics, Recommended Dietary Allowances (RDAs) in bold type* and Adequate Intakes (AIs) in ordinary type followed by an asterisk (*). Tolerable Upper Intake Levels (ULs) are in shaded columns.

¹² As Dietary Folate Equivalents (DFE). See conversion factors for more details.

¹³ The UL for folate applies only to synthetic forms obtained from supplements, fortified foods, or a combination of the two.

¹⁴ Due to lack of suitable data, ULs could not be established for vitamin B12, pantothenic acid or biotin. This does not mean that there is no potential for adverse effects resulting from high intakes.

¹⁵ Although AIs have been set for choline, there are few data to assess whether a dietary supply of choline is needed at all stages of the life cycle, and it may be that the choline requirement can be met by endogenous synthesis at some of these stages.

^b In view of evidence linking the use of supplements containing folic acid before conception and during early pregnancy with reduced risk of neural tube defects in the fetus, it is recommended that all women capable of becoming pregnant take a supplement containing 400µg of folic acid every day, in addition to the amount of folate found in a healthy diet.

^c It is assumed that women will continue consuming 400 µg folic acid from supplements until their pregnancy is confirmed and they enter prenatal care. The critical time for formation of the neural tube is shortly after conception.

^d Because 10 to 30 percent of older people may malabsorb food-bound vitamin B12, it is advisable for those older than 50 years to meet the RDA mainly by consuming foods fortified with vitamin B12 or a supplement containing vitamin B12.

NOTE: These are reference values for normal, apparently healthy individuals eating a typical mixed North American diet. An individual may have physiological, health, or lifestyle characteristics that may require tailoring of specific nutrient values.

Unit	Arsenic ¹⁶		Boron		Calcium ^{**}			Chromium		Copper			Fluoride		Iodine		
	N/A		mg/day		mg/day			µg/day		µg/day			mg/day		µg/day		
	AI	UL ¹⁷	AI	UL	EAR	RDA/AI	UL	AI	UL ¹⁷	EAR	RDA/AI	UL	AI	UL	EAR	RDA/AI	UL
Infants																	
0-6 mo	ND	ND	ND	ND	<i>ND</i>	200*	1000	0.2*	ND	<i>ND</i>	200*	ND	0.01*	0.7	<i>ND</i>	110*	ND
7-12 mo	ND	ND	ND	ND	<i>ND</i>	260*	1500	5.5*	ND	<i>ND</i>	220*	ND	0.5*	0.9	<i>ND</i>	130*	ND
Children																	
1-3 y	ND	ND	ND	3	<i>500</i>	700	2500	11*	ND	260	340	1000	0.7*	1.3	65	90	200
4-8 y	ND	ND	ND	6	<i>800</i>	1000	2500	15*	ND	340	440	3000	1*	2.2	65	90	300
Males																	
9-13 y	ND	ND	ND	11	<i>1100</i>	1300	3000	25*	ND	540	700	5000	2*	10	73	120	600
14-18 y	ND	ND	ND	17	<i>1100</i>	1300	3000	35*	ND	685	890	8000	3*	10	95	150	900
19-30 y	ND	ND	ND	20	<i>800</i>	1000	2500	35*	ND	700	900	10000	4*	10	95	150	1100
31-50 y	ND	ND	ND	20	<i>800</i>	1000	2500	35*	ND	700	900	10000	4*	10	95	150	1100
51-70 y	ND	ND	ND	20	<i>800</i>	1000	2000	30*	ND	700	900	10000	4*	10	95	150	1100
>70 y	ND	ND	ND	20	<i>1000</i>	1200	2000	30*	ND	700	900	10000	4*	10	95	150	1100
Females																	
9-13 y	ND	ND	ND	11	<i>1100</i>	1300	3000	21*	ND	540	700	5000	2*	10	73	120	600
14-18 y	ND	ND	ND	17	<i>1100</i>	1300	3000	24*	ND	685	890	8000	3*	10	95	150	900
19-30 y	ND	ND	ND	20	<i>800</i>	1000	2500	25*	ND	700	900	10000	3*	10	95	150	1100
31-50 y	ND	ND	ND	20	<i>800</i>	1000	2500	25*	ND	700	900	10000	3*	10	95	150	1100
51-70 y	ND	ND	ND	20	<i>1000</i>	1200	2000	20*	ND	700	900	10000	3*	10	95	150	1100
>70 y	ND	ND	ND	20	<i>1000</i>	1200	2000	20*	ND	700	900	10000	3*	10	95	150	1100
Pregnancy																	
≤ 18 y	ND	ND	ND	17	<i>1100</i>	1300	3000	29*	ND	785	1000	8000	3*	10	160	220	900
19-30 y	ND	ND	ND	20	<i>800</i>	1000	2500	30*	ND	800	1000	10000	3*	10	160	220	1100
31-50 y	ND	ND	ND	20	<i>800</i>	1000	2500	30*	ND	800	1000	10000	3*	10	160	220	1100
Lactation																	
≤ 18 y	ND	ND	ND	17	<i>1100</i>	1300	3000	44*	ND	985	1300	8000	3*	10	209	290	900
19-30 y	ND	ND	ND	20	<i>800</i>	1000	2500	45*	ND	1000	1300	10000	3*	10	209	290	1100
31-50 y	ND	ND	ND	20	<i>800</i>	1000	2500	45*	ND	1000	1300	10000	3*	10	209	290	1100

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^{**} New 2010 values have replaced previous 1997 values.

¹⁶ Although a UL was not determined for arsenic, there is no justification for adding arsenic to food or supplements.

¹⁷ Due to lack of suitable data, ULs could not be established for arsenic and chromium. This does not mean that there is no potential for adverse effects resulting from high intakes.

NOTE: These are reference values for normal, apparently healthy individuals eating a typical mixed North American diet. An individual may have physiological, health, or lifestyle characteristics that may require tailoring of specific nutrient values.

Unit	Iron ¹⁸			Magnesium			Manganese		Molybdenum			Nickel		Phosphorus		
	mg/day			mg/day			mg/day		µg/day			mg/day		mg/day		
	EAR	RDA/AI	UL	EAR	RDA/AI	UL ¹⁹	AI	UL	EAR	RDA/AI	UL	AI	UL	EAR	RDA/AI	UL
Infants																
0-6 mo	<i>ND</i>	0.27*	40	<i>ND</i>	30*	<i>ND</i>	0.003*	<i>ND</i>	<i>ND</i>	2*	<i>ND</i>	<i>ND</i>	<i>ND</i>	<i>ND</i>	100*	<i>ND</i>
7-12 mo	6.9	11	40	<i>ND</i>	75*	<i>ND</i>	0.6*	<i>ND</i>	<i>ND</i>	3*	<i>ND</i>	<i>ND</i>	<i>ND</i>	<i>ND</i>	275*	<i>ND</i>
Children																
1-3 y	3.0	7	40	65	80	65	1.2*	2	13	17	300	<i>ND</i>	0.2	380	460	3000
4-8 y	4.1	10	40	110	130	110	1.5*	3	17	22	600	<i>ND</i>	0.3	405	500	3000
Males																
9-13 y	5.9	8	40	200	240	350	1.9*	6	26	34	1100	<i>ND</i>	0.6	1055	1250	4000
14-18 y	7.7	11	45	340	410	350	2.2*	9	33	43	1700	<i>ND</i>	1.0	1055	1250	4000
19-30 y	6	8	45	330	400	350	2.3*	11	34	45	2000	<i>ND</i>	1.0	580	700	4000
31-50 y	6	8	45	350	420	350	2.3*	11	34	45	2000	<i>ND</i>	1.0	580	700	4000
51-70 y	6	8	45	350	420	350	2.3*	11	34	45	2000	<i>ND</i>	1.0	580	700	4000
>70 y	6	8	45	350	420	350	2.3*	11	34	45	2000	<i>ND</i>	1.0	580	700	3000
Females																
9-13 y	5.7 ^e	8^e	40	200	240	350	1.6*	6	26	34	1100	<i>ND</i>	0.6	1055	1250	4000
14-18 y	7.9 ^e	15^e	45	300	360	350	1.6*	9	33	43	1700	<i>ND</i>	1.0	1055	1250	4000
19-30 y	8.1 ^e	18^e	45	255	310	350	1.8*	11	34	45	2000	<i>ND</i>	1.0	580	700	4000
31-50 y	8.1 ^e	18^e	45	265	320	350	1.8*	11	34	45	2000	<i>ND</i>	1.0	580	700	4000
51-70 y	5 ^e	8^e	45	265	320	350	1.8*	11	34	45	2000	<i>ND</i>	1.0	580	700	4000
>70 y	5 ^e	8^e	45	265	320	350	1.8*	11	34	45	2000	<i>ND</i>	1.0	580	700	3000
Pregnancy																
≤18 y	23	27	45	335	400	350	2.0*	9	40	50	1700	<i>ND</i>	1.0	1055	1250	3500
19-30 y	22	27	45	290	350	350	2.0*	11	40	50	2000	<i>ND</i>	1.0	580	700	3500
31-50 y	22	27	45	300	360	350	2.0*	11	40	50	2000	<i>ND</i>	1.0	580	700	3500
Lactation																
≤18 y	7	10	45	300	360	350	2.6*	9	35	50	1700	<i>ND</i>	1.0	1055	1250	4000
19-30 y	6.5	9	45	255	310	350	2.6*	11	36	50	2000	<i>ND</i>	1.0	580	700	4000
31-50 y	6.5	9	45	265	320	350	2.6*	11	36	50	2000	<i>ND</i>	1.0	580	700	4000

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¹⁸ The requirement for iron is 1.8 times higher for vegetarians due to the lower bioavailability of iron from a vegetarian diet.

¹⁹ The UL for magnesium represents intake from a pharmacological agent only and does not include intake from food and water.

^e For the EAR and RDA, it is assumed that girls younger than 14 years do not menstruate and that girls 14 years and older do menstruate. It is assumed that women 51 years and older are post-menopausal.

NOTE: These are reference values for normal, apparently healthy individuals eating a typical mixed North American diet. An individual may have physiological, health, or lifestyle characteristics that may require tailoring of specific nutrient values.

Unit	Selenium			Silicon ²⁰		Vanadium ²²		Zinc ²³			Potassium ²⁴		Sodium ²⁵		Chloride ²⁶		Sulfate ²⁷	
	µg/day			N/A		mg/day		mg/day			mg/day		mg/day		mg/day		N/A	
	EAR	RDA/AI	UL	AI	UL ²¹	AI	UL	EAR	RDA/AI	UL	AI	UL ²¹	AI	UL	AI	UL	AI	UL ²¹
Infants																		
0-6 mo	<i>ND</i>	15*	45	ND	ND	ND	ND	<i>ND</i>	2*	4	400*	ND	120*	ND	180*	ND	ND	ND
7-12 mo	<i>ND</i>	20*	60	ND	ND	ND	ND	2.5	3	5	700*	ND	370*	ND	570*	ND	ND	ND
Children																		
1-3 y	17	20	90	ND	ND	ND	ND	2.5	3	7	3000*	ND	1000*	1500	1500*	2300	ND	ND
4-8 y	23	30	150	ND	ND	ND	ND	4.0	5	12	3800*	ND	1200*	1900	1900*	2900	ND	ND
Males																		
9-13 y	35	40	280	ND	ND	ND	ND	7.0	8	23	4500*	ND	1500*	2200	2300*	3400	ND	ND
14-18 y	45	55	400	ND	ND	ND	ND	8.5	11	34	4700*	ND	1500*	2300	2300*	3600	ND	ND
19-30 y	45	55	400	ND	ND	ND	1.8	9.4	11	40	4700*	ND	1500*	2300	2300*	3600	ND	ND
31-50 y	45	55	400	ND	ND	ND	1.8	9.4	11	40	4700*	ND	1500*	2300	2300*	3600	ND	ND
51-70 y	45	55	400	ND	ND	ND	1.8	9.4	11	40	4700*	ND	1300*	2300	2000*	3600	ND	ND
>70 y	45	55	400	ND	ND	ND	1.8	9.4	11	40	4700*	ND	1200*	2300	1800*	3600	ND	ND
Females																		
9-13 y	35	40	280	ND	ND	ND	ND	7.0	8	23	4500*	ND	1500*	2200	2300*	3400	ND	ND
14-18 y	45	55	400	ND	ND	ND	ND	7.3	9	34	4700*	ND	1500*	2300	2300*	3600	ND	ND
19-30 y	45	55	400	ND	ND	ND	1.8	6.8	8	40	4700*	ND	1500*	2300	2300*	3600	ND	ND
31-50 y	45	55	400	ND	ND	ND	1.8	6.8	8	40	4700*	ND	1500*	2300	2300*	3600	ND	ND
51-70 y	45	55	400	ND	ND	ND	1.8	6.8	8	40	4700*	ND	1300*	2300	2000*	3600	ND	ND
>70 y	45	55	400	ND	ND	ND	1.8	6.8	8	40	4700*	ND	1200*	2300	1800*	3600	ND	ND
Pregnancy																		
< 18 y	49	60	400	ND	ND	ND	ND	10.5	12	34	4700*	ND	1500*	2300	2300*	3600	ND	ND
19-30 y	49	60	400	ND	ND	ND	ND	9.5	11	40	4700*	ND	1500*	2300	2300*	3600	ND	ND
31-50 y	49	60	400	ND	ND	ND	ND	9.5	11	40	4700*	ND	1500*	2300	2300*	3600	ND	ND
Lactation																		
< 18 y	59	70	400	ND	ND	ND	ND	10.9	13	34	5100*	ND	1500*	2300	2300*	3600	ND	ND
19-30 y	59	70	400	ND	ND	ND	ND	10.4	12	40	5100*	ND	1500*	2300	2300*	3600	ND	ND
31-50 y	59	70	400	ND	ND	ND	ND	10.4	12	40	5100*	ND	1500*	2300	2300*	3600	ND	ND

This table presents *Estimated Average Requirements (EARs)* in italics, **Recommended Dietary Allowances (RDAs)** in bold type and Adequate Intakes (AIs) in ordinary type followed by an asterisk (*). Tolerable Upper Intake Levels (ULs) are in shaded columns.

²⁰ Although silicon has not been shown to cause adverse effects in humans, there is no justification for adding silicon to supplements.

²¹ Due to lack of suitable data, ULs could not be established for silicon, potassium, and sulfate. This does not mean that there is no potential for adverse effects resulting from high intakes.

²² Although vanadium in food has not been shown to cause adverse effects in humans, there is no justification for adding vanadium to food and vanadium supplements should be used with caution. The UL is based on adverse effects in laboratory animals and this data could be used to set a UL for adults but not children and adolescents.

²³ The requirement for zinc may be as much as 50 percent greater for vegetarians, particularly for strict vegetarians whose major food staples are grains and legumes, due to the lower bioavailability of zinc from a vegetarian diet.

²⁴ The beneficial effects of potassium appear to be mainly from the forms of potassium found naturally in foods such as fruits and vegetables. Supplemental potassium should only be provided under medical supervision because of the well-documented potential for toxicity.

²⁵ Grams of sodium × 2.53 = grams of salt.

²⁶ Sodium and chloride are normally found in foods together as sodium chloride (table salt). For this reason, the AI and UL for chloride are set at a level equivalent on a molar basis to those for sodium, since almost all dietary chloride comes with sodium added during processing or consumption of foods.

²⁷ An AI for sulfate was not established because sulfate requirements are met when dietary intakes contain recommended levels of sulfur amino acids (protein).

NOTE: These are reference values for normal, apparently healthy individuals eating a typical mixed North American diet. An individual may have physiological, health, or lifestyle characteristics that may require tailoring of specific nutrient values.

Unit	Carbohydrate (Digestible)			Total Protein ²⁹				Total Fat		Linoleic Acid (n-6)		α-linolenic Acid (n-3)		Total Fibre ³¹		Total Water ³³	
	g/day			g/kg/day		g/day ³⁰		g/day		g/day		g/day		g/day		Litres/day	
	EAR	RDA/AI	UL ²⁸	EAR	RDA/AI	RDA/AI	UL ²⁸	AI	UL ²⁸	AI	UL ²⁸	AI	UL ²⁸	AI ³²	UL ²⁸	AI	UL ²⁸
Infants																	
0-6 mo	<i>ND</i>	60*	ND	<i>ND</i>	1.52*	9.1*	ND	31*	ND	4.4*	ND	0.5*	ND	ND	ND	0.7*	ND
7-12 mo	<i>ND</i>	95*	ND	<i>1.0</i>	1.2	11.0	ND	30*	ND	4.6*	ND	0.5*	ND	ND	ND	0.8*	ND
Children																	
1-3 y	<i>100</i>	130	ND	<i>0.87</i>	1.05	13	ND	ND	ND	7*	ND	0.7*	ND	19*	ND	1.3*	ND
4-8 y	<i>100</i>	130	ND	<i>0.76</i>	0.95	19	ND	ND	ND	10*	ND	0.9*	ND	25*	ND	1.7*	ND
Males																	
9-13 y	<i>100</i>	130	ND	<i>0.76</i>	0.95	34	ND	ND	ND	12*	ND	1.2*	ND	31*	ND	2.4*	ND
14-18 y	<i>100</i>	130	ND	<i>0.73</i>	0.85	52	ND	ND	ND	16*	ND	1.6*	ND	38*	ND	3.3*	ND
19-30 y	<i>100</i>	130	ND	<i>0.66</i>	0.80	56	ND	ND	ND	17*	ND	1.6*	ND	38*	ND	3.7*	ND
31-50 y	<i>100</i>	130	ND	<i>0.66</i>	0.80	56	ND	ND	ND	17*	ND	1.6*	ND	38*	ND	3.7*	ND
51-70 y	<i>100</i>	130	ND	<i>0.66</i>	0.80	56	ND	ND	ND	14*	ND	1.6*	ND	30*	ND	3.7*	ND
>70 y	<i>100</i>	130	ND	<i>0.66</i>	0.80	56	ND	ND	ND	14*	ND	1.6*	ND	30*	ND	3.7*	ND
Females																	
9-13 y	<i>100</i>	130	ND	<i>0.76</i>	0.95	34	ND	ND	ND	10*	ND	1.0*	ND	26*	ND	2.1*	ND
14-18 y	<i>100</i>	130	ND	<i>0.71</i>	0.85	46	ND	ND	ND	11*	ND	1.1*	ND	26*	ND	2.3*	ND
19-30 y	<i>100</i>	130	ND	<i>0.66</i>	0.80	46	ND	ND	ND	12*	ND	1.1*	ND	25*	ND	2.7*	ND
31-50 y	<i>100</i>	130	ND	<i>0.66</i>	0.80	46	ND	ND	ND	12*	ND	1.1*	ND	25*	ND	2.7*	ND
51-70 y	<i>100</i>	130	ND	<i>0.66</i>	0.80	46	ND	ND	ND	11*	ND	1.1*	ND	21*	ND	2.7*	ND
>70 y	<i>100</i>	130	ND	<i>0.66</i>	0.80	46	ND	ND	ND	11*	ND	1.1*	ND	21*	ND	2.7*	ND
Pregnancy																	
< 18 y	<i>135</i>	175	ND	<i>0.88^f</i>	1.1^f	71^f	ND	ND	ND	13*	ND	1.4*	ND	28*	ND	3.0*	ND
19-30 y	<i>135</i>	175	ND	<i>0.88^f</i>	1.1^f	71^f	ND	ND	ND	13*	ND	1.4*	ND	28*	ND	3.0*	ND
31-50 y	<i>135</i>	175	ND	<i>0.88^f</i>	1.1^f	71^f	ND	ND	ND	13*	ND	1.4*	ND	28*	ND	3.0*	ND
Lactation																	
< 18 y	<i>160</i>	210	ND	<i>1.05</i>	1.3	71	ND	ND	ND	13*	ND	1.3*	ND	29*	ND	3.8*	ND
19-30 y	<i>160</i>	210	ND	<i>1.05</i>	1.3	71	ND	ND	ND	13*	ND	1.3*	ND	29*	ND	3.8*	ND
31-50 y	<i>160</i>	210	ND	<i>1.05</i>	1.3	71	ND	ND	ND	13*	ND	1.3*	ND	29*	ND	3.8*	ND

This table presents *Estimated Average Requirements (EARs) in italics, Recommended Dietary Allowances (RDAs) in bold type* and Adequate Intakes (AIs) in ordinary type followed by an asterisk (*). Tolerable Upper Intake Levels (ULs) are in shaded columns.

²⁸ Although a UL was not set for any of the macronutrients, the absence of definitive data does not signify that people can tolerate chronic intakes of these substances at high levels.

²⁹ Available evidence does not support recommending a separate protein requirement for vegetarians who consume complimentary mixtures of plant proteins, as these can provide the same quality of protein as that from animal proteins.

³⁰ Recommendations for total protein are determined as the amount needed per kg body weight multiplied by the reference weight.

³¹ Total fibre is defined as the sum of dietary fibre and functional fibre. See definitions for further details.

³² The AI for total fibre is based on 14 g/1000 kcal multiplied by the median usual daily energy intake from the Continuing Survey of Food Intakes by Individuals (CSFII 1994-1996, 1998).

³³ Total water includes drinking water, water in beverages, and water that is part of food.

^f The EAR and RDA for pregnancy are only for the second half of pregnancy. For the first half of pregnancy, protein requirements are the same as those of the nonpregnant woman.

NOTE: These are reference values for normal, apparently healthy individuals eating a typical mixed North American diet. An individual may have physiological, health, or lifestyle characteristics that may require tailoring of specific nutrient values.

Source : Health Canada. Dietary Reference Intakes Tables [Cited 2016 Mar 23]. Available from: <http://www.hc-sc.gc.ca/fn-an/nutrition/reference/table/index-eng.php>

Appendix C: Dietary Reference Intake acceptable macronutrient distribution ranges

Males & Females ³⁴	Total Carbohydrate	Total Protein	Total Fat	n-6 polyunsaturated fatty acids (linoleic acid)	n-3 polyunsaturated fatty acids (α-linolenic acid)
	Percent of Energy	Percent of Energy	Percent of Energy	Percent of Energy	Percent of Energy ³⁵
1-3 years	45 – 65 %	5 – 20 %	30 – 40 %	5 – 10 %	0.6 – 1.2 %
4-18 years	45 – 65 %	10 – 30 %	25 – 35 %	5 – 10 %	0.6 – 1.2 %
19 years and over	45 – 65 %	10 – 35 %	20 – 35 %	5 – 10 %	0.6 – 1.2 %

³⁴ Includes pregnant and lactating women.

³⁵ Up to 10% of the AMDR can be consumed as eicosapentaenoic acid (EPA) and/or docosahexaenoic acid (DHA).

Additional Macronutrient Recommendations

Saturated fatty acids	As low as possible while consuming a nutritionally adequate diet
Trans fatty acids	

A UL was not set for saturated fatty acids or trans fatty acids

Adapted from source : Health Canada. Dietary Reference Intakes Tables [Cited 2016 Mar 23]. Available from: <http://www.hc-sc.gc.ca/fn-an/nutrition/reference/table/index-eng.php>

Appendix D: Canadian Nutrient File/ Canada's Food Guide classification of foods within each food group

Below are examples of the types of foods within each of the four tiers in the food groups, using the CNF/CFG classification. Foods in Tier 1 and Tier 2 are grouped as foods “in line” with CFG guidance. Both tiers include the types of food recommended in the Food Guide, and are lower in fat, sugar, and salt. In contrast, foods in Tier 3 are higher in fat, sugar, or salt. Since the Food Guide promotes food choices lower in fat, sugar, and salt, Tier 3 foods are described as Foods “partially in line” with CFG guidance. Foods in Tier 4 are described as Foods that are “not in line” with CFG guidance. These foods should be limited in the diet.

a. Classification in the vegetables and fruit group

TIER 1

Fresh, frozen, dried, canned, or cooked vegetables and fruit prepared with little or no added fat, sugars and sodium

- “frozen, unsweetened” or “dried, unsweetened”
- canned, “low sodium”
- canned in “water pack,” “juice packed,” or “extra-light syrup pack”

TIER 2

Fresh, frozen, dried, canned, or cooked vegetables and fruit and their juice prepared with some added fat, sugars, and sodium

- most vegetables that are “boiled, drained, with salt”
- “cooked, sugar added,” or “stewed, sugar added”
- “dried, sweetened” or “dried, cooked/stewed, added sugar”
- canned in “light syrup pack” or “syrup” pack
- fruit “juice” or low sodium vegetable “juice cocktail”

TIER 3

Fresh, frozen, dried, canned, or cooked vegetables and fruit that are high in either total fat, saturated fat, sugars, or sodium

- canned in “heavy syrup pack” or “extra heavy syrup pack”
- includes those naturally high in fat such as avocado
- fruit “nectar” or “juice, sugar added”
- “frozen, sweetened” or “frozen, cooked, sugar added”
- vegetable “juice cocktail”

TIER 4

Fresh, frozen, dried, canned, or cooked vegetables and fruit that are high in two or more of total fat, saturated fat, sodium

- most deep-fried or battered and fried foods
- snack foods high in fat, saturated fat, and/or sodium

b. Classification in the grain products group

TIER 1

Whole grain and enriched, non-whole grain products that contain little or no added fat, sugars, and sodium

- whole grains low in sodium and sugar such as amaranth, buckwheat, bulgur, millet, oats, kamut, quinoa, brown or enriched rice, sorghum, whole wheat or enriched pasta, some cereals, a few low sodium breads, popcorn

TIER 2

Whole grain products and non-whole grain products that contain some added fat, sugars and sodium

- most breads, tortillas
- couscous
- some breakfast cereals
- some granola bars, crackers, and muffins

TIER 3

Whole grain products and non-whole grain products that are high in either total fat, saturated fat, sugars, or sodium

- some breakfast cereals, granola bars, cakes, cookies, crackers, breads, biscuits, muffins

TIER 4

Whole grain and non-whole grain products that are high in two or more of total fat, saturated fat, sugars, sodium

- most cakes, cookies, pastries, doughnuts
- some crackers and grain-based snacks
- some breakfast cereals

c. Classification in the milk and alternatives group

TIER 1
<p>Milk and alternatives low in fat, saturated fat, sugars, and sodium</p> <ul style="list-style-type: none"> • skim and 1% M.F.* milk • a few reduced fat (<0.5 % M.F.) and reduced sodium cheeses
TIER 2
<p>Milk and milk alternatives that contain some fat, sugars, and sodium</p> <ul style="list-style-type: none"> • 2% M.F. milk • a few fortified plant-based beverages • a few low fat and low sugar yogurts • a few low fat cheeses • some puddings made with milk (<2% M.F.)
TIER 3
<p>Milk and alternatives high in one of: total fat, sugars, or sodium</p> <ul style="list-style-type: none"> • whole milk • most flavoured milks (such as 1% M.F. chocolate milk) • most milk-based desserts and puddings • most cheeses
TIER 4
<p>Milk and alternatives high in two or more of: total fat, sugars, sodium</p> <ul style="list-style-type: none"> • some cheeses • some milk-based desserts

*M.F. = Milk fat

d. Classification in the meat and alternatives group

TIER 1
<p>Meat and alternatives low in fat, sugars, and sodium</p> <ul style="list-style-type: none"> • legumes low in sodium • plain tofu and soybean products • lean meats and poultry • most baked or broiled fish • some plain nuts, seeds and soy products low in saturated fat
TIER 2
<p>Meat alternatives with some fat, sugars, and sodium</p> <ul style="list-style-type: none"> • some higher-fat fish and seafood (naturally occurring oils) • some plain nuts, seeds, and soy products low in saturated fat • most eggs
TIER 3
<p>Meat alternatives high in one of: total fat, sugars, or sodium</p> <ul style="list-style-type: none"> • most nuts, seeds, and peanut butter • most canned legumes and boiled legumes with salt • meats high in fat or sodium • some seafood • some deli meats
TIER 4
<p>Meat and alternatives high in two or more of: total fat, sugars, sodium</p> <ul style="list-style-type: none"> • most deep-fried or battered and fried meat and alternatives • some deli meats and most sausages • sweetened, canned baked beans

Appendix E: Acknowledgement of external expert reviewers

Health Canada would like to acknowledge the contribution of the external expert reviewers who provided valuable input during this process.

The selection process for external expert reviewers aimed to have a balanced representation of the following areas of expertise: cardiovascular disease and/or coronary heart disease, type 2 diabetes, cancer, osteoporosis/bone health, metabolic syndrome, weight gain, adiposity and obesity, and high blood pressure. Also considered were availability and willingness of the expert to disclose affiliations and interests. The final selection was completed by Health Canada.

Selection criteria

Expert input was sought from individuals who:

- were familiar with the translation of evidence into policy, practice, or regulatory processes
- had published in the past 5 years on diet and the prevention of chronic disease
- had expertise in at least one of: cardiovascular disease and/or coronary heart disease, type 2 diabetes, cancer, osteoporosis/bone health, metabolic syndrome, weight gain, adiposity and obesity, and high blood pressure. Other areas of expertise were also considered, such as nutrition epidemiology, energy balance, nutritional biochemistry, and physiology.
- had the broadest experience in the areas of interest.

Experience in reviewing, assessing, or completing systematic reviews was considered an asset, as was credible professional and research affiliations.

Identifying potential reviewers

As an initial step, ONPP considered the list of experts consulted on the 2013 Australian Dietary Guidelines, the 2010 US Dietary Guidelines Advisory Committee report, and the World Cancer Research Fund/American Institute for Cancer Research CUP reports. After reviewing biographies online, the list was narrowed if the biography was not available in English or French, was not comprehensive, primary research was related to treatment or management of chronic disease, or primary research focus was not nutrition-related.

A list of Canadian experts was created by completing a review of the list of researchers at Canadian Universities that conduct research on diet and chronic disease prevention. Key researchers who met the above selection criteria were retained and contacted for participation as potential academic reviewers. Although the reviewers provided many constructive comments and suggestions, they were not asked to endorse the draft document or its findings.

Final list of experts

NAME	UNIVERSITY AND CONTACT INFORMATION	RESEARCH INTERESTS
CANADA		
*Nancy Kreiger, MPH, M.PHIL., Ph.D.	University of Toronto Dalla Lana School of Public Health Professor and Head of the Epidemiology Division	Cancer epidemiology, epidemiology of osteoporosis, measurement, research ethics, community-based prevention trials, behavioural risk factors for chronic diseases, population health
*Mary R. L'Abbé, Ph.D.	University of Toronto Earle W. McHenry Professor and Chair, Department of Nutritional Sciences	Nutrition, minerals, food fortification, elaboration of national nutrition policies.
**David J.A. Jenkins, M.D., Ph.D., D.Sc.	University of Toronto University Professor, Departments of Nutritional Sciences and Medicine, Canada Research Chair in Nutrition and Metabolism Director, Clinical Nutrition and Risk Modification Centre, St. Michael's Hospital	Diet to prevent and treat chronic diseases (primarily heart disease, cancer, and diabetes), nutritional management of diabetes and hyperlipoproteinaemia, metabolic and intestinal effects of starch and fibre.
*Benoît Lamarche, Ph.D., FAFA	Université Laval University Professor Department of Food Science and Nutrition	Nutrition, metabolic syndrome, obesity, cardiovascular disease
INTERNATIONAL EXPERTS		
UNITED STATES OF AMERICA		
**Elisa V. Bandera, M.D., Ph.D.	Professor of Epidemiology and Medicine Rutgers Cancer Institute of New Jersey Rutgers School of Public Health Robert Wood Johnson Medical School	Nutrition and cancer epidemiology, systematic literature review and meta-analysis to support dietary guidelines for cancer prevention
*Dariush Mozaffarian, M.D., M.P.H., Ph.D.	(Affiliation at the time of the review) Harvard University, USA Associate Professor Harvard School of Public Health (Present affiliation) Dean, Tufts Friedman School of Nutrition Science & Policy	Behavior and lifestyle, particularly dietary habits, on primary risk and secondary prevention of cardiovascular and metabolic diseases. Also experienced in policy issues. Areas of specific interest include: effects of omega-3 and trans fatty acids on cardiovascular outcomes, policy issues related to fat consumption in developed and developing nations, quantitative analyses of risks and benefits of fish consumption, global cardiovascular health, the combined impact of multiple dietary and other lifestyle behaviours on cardiovascular and metabolic risk
UNITED KINGDOM		
**Lee Hooper, R.D., Ph.D.	University of East Anglia, UK Reader in Research Synthesis and Nutrition	Dietitian and systematic reviewer with a focus on hydration, food and older people, diet, and CVD

*Provided comments on methods and preliminary findings for the Scientific Basis section

**Provided comments on preliminary documentation and final report

Appendix F: Characteristics of reports included in the food and health scan

REPORT	AMERICAN COLLEGE OF CARDIOLOGY/ AMERICAN HEART ASSOCIATION	CANADIAN CARDIOVASCULAR SOCIETY	HEALTH CANADA HEALTH CLAIM ASSESSMENTS	THE FOOD AND AGRICULTURE ORGANIZATION REPORT- FATS & FATTY ACIDS IN HUMAN NUTRITION (CHAPTERS 9-11)	NATIONAL HEALTH AND MEDICAL RESEARCH COUNCIL GUIDELINES	US DIETARY GUIDELINES ADVISORY COMMITTEE	WORLD CANCER RESEARCH FUND/ AMERICAN INSTITUTE FOR CANCER RESEARCH	WORLD HEALTH ORGANIZATION
Target population	Americans	Canadians	Canadians	Global	Australians	Americans	Global	Global
Goal	To develop clinical practice guidelines for assessment of cardiovascular risk, lifestyle modifications to reduce cardiovascular risk, management of blood cholesterol in adults, and management of overweight and obesity in adults	To provide a reasonable and practical approach to care for specialists and allied health professionals obliged with the duty of bestowing optimal care to patients and families	To determine whether or not evidence supported acceptance of a health claim	To provide science-based guidance on food and nutrition to national governments and international community	To support revision of the Dietary Guidelines for Australians	To support revision of the Dietary Guidelines for Americans	To provide up-to-date evidence on how people can reduce their cancer risk through diet and physical activity	To provide recommendations on consumption of specific foods or nutrients to reduce noncommunicable diseases in adults and children
Data collection methodology	Rigorous systematic evidence reviews for each topic by expert panels convened to develop critical questions, interpret the evidence, and craft recommendations	Statements were developed following a thorough consideration of medical literature and the best available evidence and clinical experience. They represent the consensus of a multidisciplinary panel comprised of experts on the topic with a mandate to formulate disease-specific recommendations.	Health Canada evaluates evidence review from petitioner, who would follow the method in the HC Guidance Document for Preparing a Submission for Food Health Claims.	Background review papers commissioned by FAO found in Annals of Nutrition & Metabolism, vol. 55, issue 1-3; 2009	Systematic reviews following the NHMRC methods for literature review (from 2002 to April 2009)	NEL systematic reviews conducted by multidisciplinary research team, review of high quality reports, USDA modeling work to inform some DGAC conclusions (varies)	Systematic reviews prepared by research team at Imperial College London	Systematic reviews and meta-analyses, with support from external experts
Grading methodology	NHLBI Quality Rating of the Strength of Evidence	Based on the grades of evidence set by the GRADE Working Group.	Graded 'sufficient' or 'insufficient' based on submission from petitioner and additional Health Canada review	Follows the same criteria employed in the report Diet, Nutrition, and the Prevention of Chronic Diseases- Report of a Joint WHO/ FAO Expert Consultation (WHO, 2003), which based its criteria on a modified version of that used by the World Cancer Research Fund (WICF/AICF, 2007).	NHMRC grading criteria	NEL grading rubric, rubric to grade conclusions in existing reports	A World Cancer Research Fund (WCRF) panel developed criteria for grading evidence to support a judgement of a relationship with cancer. The criteria are derived from human studies and biological evidence.	Based on the grades of evidence set by the GRADE Working Group.

Appendix G: Direction of risk and grade for retained food and health topics

CATEGORY	TOPIC (BROADLY GROUPED, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE
Beverages	100% fruit juice	Cancer	Bladder	NC	Insufficient	WCRF 2007
			Stomach	NC	Insufficient	WCRF 2007
	100% fruit juice	CVD/CHD	CVD/CHD	↓	Insufficient	HC 2015a
	100% fruit juice	Obesity	Weight gain (children)	-	Insufficient	NHMRC
			Adiposity (children)	-	Insufficient	DGAC 2010
			Weight gain, overweight, obesity (adults and children)	NC	Insufficient	WCRF 2007
	Alcohol	Cancer	Breast	↑	Convincing	WCRF 2010
			Colon and rectum (men)	↑	Convincing	WCRF 2011
			Mouth, pharynx, larynx	↑	Convincing	WCRF 2007
			Oesophagus	↑	Convincing	WCRF 2007
			Liver	↑	Convincing	WCRF 2015
	Alcohol	Cancer	Colon and rectum (women)	↑	Probable	WCRF 2010
	Alcohol	Cancer	Pancreas	↑	Possible	WCRF 2012
	Alcohol	Cancer	Endometrium	NC	Insufficient	WCRF 2013
			Ovarian and cervix	NC	Insufficient	WCRF 2014
			Bladder	NC	Insufficient	WCRF 2007
			Kidney (protective effect)	NC	Insufficient	WCRF 2007
			Lung	NC	Insufficient	WCRF 2007
			Nasopharynx	NC	Insufficient	WCRF 2007
			Stomach	NC	Insufficient	WCRF 2007
Prostate			NC	Insufficient	WCRF 2014	
Gallbladder			NC	Insufficient	WCRF 2015	
Alcohol	Cancer	Kidney (adverse effect)	-	Convincing	WCRF 2007	
Alcohol	Cancer	non-Hodgkins lymphoma	↓	Insufficient	NHMRC	
Alcohol	CVD/CHD	CVD/CHD	↓	Convincing	DGAC 2010	
		CVD/CHD	↓	Probable	NHMRC	
		CVD (drinking pattern)	NC	Insufficient	DGAC 2010	
Alcohol	CVD/CHD	Blood lipids (HDL)	↑	Probable	NHMRC	
Alcohol	Obesity	Weight gain (moderate drinking)	-	Probable	DGAC 2010	
		Weight gain (heavy drinking)	↑	Probable	DGAC 2010	

CATEGORY	TOPIC (BROADLY GROUPED, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE
	Alcohol	Obesity	Weight gain	NC	Insufficient	WCRF 2007
			Waist circumference or weight change	NC	Insufficient	DGAC 2010
	Alcohol	T2D	T2D	-	Insufficient	NHMRC
	Alcohol	Osteoporosis / bone health	Fractures and bone health	↑	Probable	DGAC 2010
	Coffee	Cancer	Pancreas	-	Convincing	WCRF 2007
			Kidney	-	Convincing	WCRF 2007
	Coffee	Cancer	Liver	↓	Probable	WCRF 2015
	Coffee	Cancer	Endometrial	↓	Probable	WCRF 2013
	Coffee	Cancer	Bladder	NC	Insufficient	WCRF 2007
			Lung	NC	Insufficient	WCRF 2007
			Mouth, pharynx, larynx	NC	Insufficient	WCRF 2007
			Ovarian or cervix	NC	Insufficient	WCRF 2014
			Skin	NC	Insufficient	WCRF 2007
			Stomach	NC	Insufficient	WCRF 2007
			Prostate	NC	Insufficient	WCRF 2014
			Gallbladder	NC	Insufficient	WCRF 2015
	Coffee	CVD/CHD	CVD/CHD	-	Possible	NHMRC
	Coffee	CVD/CHD	Blood pressure	↑	Insufficient	NHMRC
	Coffee	Obesity	Weight gain, overweight, obesity	NC	Insufficient	WCRF 2007
	Coffee	T2D	T2D	↓	Probable	NHMRC
Diet drinks	Cancer	Bladder	NC	Insufficient	WCRF 2007	
High-temperature drinks	Cancer	Oesophagus	↑	Possible	WCRF 2007	
Sugar sweetened beverages/soft drinks	Cancer	Pancreas	NC	Insufficient	WCRF 2015	
		Lung	NC	Insufficient	WCRF 2007	
		Kidney	NC	Insufficient	WCRF 2007	
		Bladder	NC	Insufficient	WCRF 2007	
Sugar sweetened beverages/soft drinks	Obesity	Weight gain, overweight, obesity	↑	Probable	WCRF 2007 DGAC 2010 NHMRC DGAC 2010	
Sugar sweetened beverages/soft drinks	Obesity (children)	Adiposity	↑	Convincing	DGAC 2010	
Sugar sweetened beverages/soft drinks	Osteoporosis / bone health	Bone strength	↑	Possible	NHMRC	

CATEGORY	TOPIC (BROADLY GROUPED, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE
	Tea	Cancer	Bladder	NC	Insufficient	WCRF 2007
			Kidney	NC	Insufficient	WCRF 2007
			Lung	NC	Insufficient	WCRF 2013
			Mouth, pharynx, larynx	NC	Insufficient	WCRF 2007
			Nasopharynx	NC	Insufficient	WCRF 2007
			Ovarian or cervix	NC	Insufficient	WCRF 2014
			Pancreas	NC	Insufficient	WCRF 2012
			Skin	NC	Insufficient	WCRF 2007
			Stomach	NC	Insufficient	WCRF 2007
			Liver	NC	Insufficient	WCRF 2015
	Tea	CVD/CHD	Stroke	↓	Possible	NHMRC
	Tea	CVD/CHD	CVD/CHD	-	Possible	NHMRC
	Total fluid intake	Cancer	Bladder	NC	Insufficient	WCRF 2007
	Water	Cancer	Liver	NC	Insufficient	WCRF 2007
	Carbohydrates	Carbohydrate	Cancer	Pancreas	NC	Insufficient
Ovarian or cervix				NC	Insufficient	WCRF 2014
Lung				NC	Insufficient	WCRF 2007
Kidney				NC	Insufficient	WCRF 2007
Bladder				NC	Insufficient	WCRF 2007
Carbohydrate		CVD/CHD	Blood lipids (replacing with protein or unsaturated fatty acids)	↓	Probable	ACA/AHA 2013 x2
		CVD/CHD	Blood pressure (replacing with protein)	↓	Probable	ACA/AHA 2013
Dietary fibre		Cancer	Colon and rectum	↓	Convincing	WCRF 2011
Dietary fibre		Cancer	Oesophagus	↓	Possible	WCRF 2007
Dietary fibre		Cancer	Breast	NC	Insufficient	WCRF 2010
			Endometrium	NC	Insufficient	WCRF 2013
			Ovarian or cervix	NC	Insufficient	WCRF 2014
			Mouth, pharynx, larynx, nasopharynx	NC	Insufficient	WCRF 2007
	Lung		NC	Insufficient	WCRF 2007	
	Stomach		NC	Insufficient	WCRF 2007	
Dietary fibre	CVD/CHD	Prostate	NC	Insufficient	WCRF 2014	
		Blood lipids (psyllium)	↓	Convincing	HC 2011	
		CVD/CHD (esp. fibre from oats and barley)	↓	Probable	NHMRC	
			CVD/CHD (fibre from whole foods)	↓	Probable	DGAC 2010

CATEGORY	TOPIC (BROADLY GROUPED, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE
	Dietary fibre	Obesity	Obesity (adults)	↓	Probable	DGAC 2010
			Adiposity (children)	NC	Insufficient	DGAC 2010
	Dietary fibre	T2D	T2D (fibre from whole foods)	↓	Probable	DGAC 2010
	Glycemic Index (GI) / Glycemic Load (GL)	Cancer	Endometrium (glycemic load)	↑	Probable	WCRF 2013
	Glycemic Index (GI) / Glycemic Load (GL)	Cancer	Colon and rectum	NC	Insufficient	WCRF 2011
			Breast	NC	Insufficient	WCRF 2010
			Pancreas	NC	Insufficient	WCRF 2012
			Endometrium (glycemic index)	NC	Insufficient	WCRF 2013
			Liver	NC	Insufficient	WCRF 2015
	Glycemic Index (GI) / Glycemic Load (GL)	CVD/CHD	CVD/CHD (GI or GL)	NC	Insufficient	DGAC 2010
			Blood lipids (low and high glycemic)	NC	Insufficient	ACC/AHA 2013
			Blood pressure (low and high glycemic)	NC	Insufficient	ACC/AHA 2013
	Glycemic Index (GI) / Glycemic Load (GL)	Obesity	Body weight (GI and/or GL)	-	Convincing	DGAC 2010
	Glycemic Index (GI) / Glycemic Load (GL)	T2D	T2D (GI)	↑	Probable	DGAC 2010
			T2D (GL)	-	Convincing	DGAC 2010
	Free sugars	Obesity	Body weight (adults)	↑	Probable	WHO 2015 (based on Te Morenga)
	Free sugars	Obesity	Body weight (children)	↑	Probable	WHO 2015 (based on Te Morenga)
	Fructose (foods and beverages containing)	Cancer	Pancreas	↑	Possible	WCRF 2011
	Lactose	Cancer	Ovarian or cervix	NC	Insufficient	WCRF 2007
	Sugars (includes added)	Cancer	Cancer (sucrose)	-	Possible	NHMRC
Sugars (includes added)	Cancer	Colon and rectum	NC	Insufficient	WCRF 2011	
		Pancreas	NC	Insufficient	WCRF 2012	
		Stomach (sugars, sucrose, sweeteners)	NC	Insufficient	WCRF 2007 x3	
		Prostate	NC	Insufficient	WCRF 2014	
		Gallbladder	NC	Insufficient	WCRF 2015	
Sugars (includes added)	CVD/CHD	CVD/CHD outcomes (particularly SSBs)	↑	Probable	DGAC 2015	
Sugars (includes added)	Obesity	Body weight (added sugar and/or SSBs)	↑	Convincing	DGAC 2015	
		Body weight and/or body fat	↑	Insufficient	NHMRC x2	
Sugars (includes added)	T2D	T2D (especially SSBs)	↑	Convincing	DGAC 2015	
Dietary behaviours	Breakfast	Obesity	Overweight and obesity	↓	Possible	NHMRC
			Overweight and obesity (skipping breakfast, children and adults)	↑	Probable	DGAC 2010 x2

CATEGORY	TOPIC (BROADLY GROUPED, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE
	Eating frequency	Cancer	Stomach	NC	Insufficient	WCRF 2007
	Eating frequency	Obesity	Overweight (children and adults)	NC	Insufficient	DGAC 2010
	Eating out	Obesity	Body weight (children and adults, not fast food)	↑	Insufficient	DGAC 2015
	Eating speed	Cancer	Stomach	NC	Insufficient	WCRF 2007
	Family shared meals	Obesity	Body weight (children and adults)	NC	Insufficient	DGAC 2015
	Fast food consumption	Obesity	Weight gain	↑	Convincing	DGAC 2010
			Weight gain	↑	Probable	WCRF 2007
			Body weight, BMI, obesity (adults)	↑	Probable	DGAC 2015
			Adiposity, BMI z-score, obesity (children)	↑	Insufficient	DGAC 2015
	Portion sizes	Obesity	Body weight	↑	Convincing	DGAC 2010
	Preservation, processing, and preparation and their by-products	Cancer	Stomach (grilled, barbequed, smoked)	↑	Possible	WCRF 2007 x 3
			Oesophagus (frying, grilling, BBQ)	↑	Possible	
	Preservation, processing, and preparation and their by-products	Cancer	Endometrium	NC	Insufficient	WCRF 2013
			Ovarian or cervix	NC	Insufficient	WCRF 2014
			Mouth, pharynx, larynx (frying)	NC	Insufficient	WCRF 2007
			Mouth, pharynx, larynx (grilling, BBQ)	NC	Insufficient	WCRF 2007
			Mouth, pharynx, larynx (fermenting, pickling)	NC	Insufficient	WCRF 2007
			Stomach (dried, drying)	NC	Insufficient	WCRF 2007
			Stomach (nitrates)	NC	Insufficient	WCRF 2007
			Stomach (N-nitrosodimethylamine)	NC	Insufficient	WCRF 2007
Bladder (frying)			NC	Insufficient	WCRF 2007	
Lung			NC	Insufficient	WCRF 2007	
Oesophagus (nitrates)	NC	Insufficient	WCRF 2007			
Snacking	Obesity	Body weight	↑	Insufficient	DGAC 2010	

CATEGORY	TOPIC (BROADLY GROUPED, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE
	Total energy intake	Cancer	Breast	NC	Insufficient	WCRF 2010
			Ovarian or cervix	NC	Insufficient	WCRF 2014
			Mouth, pharynx, larynx, nasopharynx	NC	Insufficient	WCRF 2007
			Oesophagus	NC	Insufficient	WCRF 2007
			Lung	NC	Insufficient	WCRF 2007
			Stomach	NC	Insufficient	WCRF 2007
			Kidney	NC	Insufficient	WCRF 2007
			Bladder	NC	Insufficient	WCRF 2007
			Skin	NC	Insufficient	WCRF 2007
			Prostate	NC	Insufficient	WCRF 2014
	Total energy intake	Obesity	Adiposity (children)	↑	Probable	DGAC 2010
Dietary patterns	Energy density	Obesity	Weight gain, overweight, adiposity (children and adults)	↑	Probable	WCRF 2007 WCRF 2007 DGAC 2010
	Energy density	T2D	T2D	↑	Insufficient	DGAC 2010
	Dietary Approach to Stop Hypertension (DASH) pattern	CVD/CHD	Blood lipids	↓	Convincing	ACC/AHA 2013
			Blood pressure	↓	Convincing	ACC/AHA 2013
			Blood pressure	↓	Convincing	DGAC 2015
			Blood lipids (↓LDL similar across sub-groups)	↓	Possible	ACC/AHA 2013
	Mediterranean pattern	CVD/CHD	Blood lipids	↓	Possible	ACC/AHA 2013
			Blood pressure	NC	Insufficient	ACC/AHA 2013
Mediterranean, Portfolio, or DASH diets	CVD/CHD	Blood lipids or CVD risk	↓	Convincing	CCS 2012	
Other dietary pattern	Cancer	Lung (culturally defined diets)	NC	Insufficient	WCRF 2007	
		Stomach (culturally defined diets)			WCRF 2007	
		Kidney (Seventh-day Adventist diets)			WCRF 2007	
Other dietary pattern	CVD/CHD	Blood pressure	NC	Insufficient	DGAC 2015	
		Blood lipids	NC	Insufficient	DGAC 2015	

CATEGORY	TOPIC (BROADLY GROUPED, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE
	Overall healthy eating habits (moderate energy (caloric) intake to achieve and maintain a healthy body weight, diet rich in vegetables, fruit, whole-grain cereals, and polyunsaturated and monounsaturated oils, including omega-3 fatty acids—particularly from fish, avoid trans fats, limit saturated and total fats to <7% and <30% of daily total energy intake respectively, increase daily fibre intake to > 30 g, limit cholesterol intake to 200 mg daily for individuals with dyslipidemia or at increased CVD risk)	CVD/CHD	CVD	↓	Probable	CCS 2013
	Vegetarian	Cancer	Ovarian or cervix Prostate	NC NC	Insufficient Insufficient	WCRF 2014 WCRF 2014
	Vegetarian	CVD/CHD	Blood pressure Blood pressure/blood lipids	↓ NC	Insufficient Insufficient	DGAC 2010 DGAC 2015 x2
	Vegetarian	Obesity	BMI	↓	Insufficient	DGAC 2010
	Vegetarian	Osteoporosis/ bone health	Fractures (vegan)	↑	Insufficient	DGAC 2010
Dietary patterns/ behaviours	Dietary patterns/behaviours	Cancer	Colon and rectum	↓	Probable	DGAC 2015
			Breast (limited for premenopausal)	↓	Probable	DGAC 2015
	Dietary patterns/behaviours	Cancer	Endometrium	NC	Insufficient	WCRF 2013
			Lung Prostate	NC NC	Insufficient Insufficient	DGAC 2015 WCRF 2014
	Dietary patterns/behaviours	CVD/CHD	CVD/CHD	↓	Convincing	DGAC 2015
	Dietary patterns/behaviours	Obesity	Obesity	↓	Probable	DGAC 2015
			Obesity (children)	↓	Insufficient	DGAC 2015
	Dietary patterns/behaviours	Osteoporosis/ bone health	Bone health (adults)	↓	Insufficient	DGAC 2015x2
Dietary patterns/behaviours	T2D	T2D	↓	Probable	DGAC 2015	

CATEGORY	TOPIC (BROADLY GROUPED, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE
Fats	Animal fats	Cancer	Colon and rectum	↑	Possible	WCRF 2011
	Animal fats	Cancer	Endometrium	NC	Insufficient	WCRF 2013
			Lung	NC	Insufficient	WCRF 2007
			Mouth, pharynx, larynx, nasopharynx	NC	Insufficient	WCRF 2007
	Butter	Cancer	Lung	↑	Possible	WCRF 2007
			Bladder	↑	Possible	WCRF 2007
	Dietary Cholesterol	Cancer	Pancreas	NC	Insufficient	WCRF 2012
			Endometrium	NC	Insufficient	WCRF 2013
			Ovarian or cervix	NC	Insufficient	WCRF 2014
			Stomach	NC	Insufficient	WCRF 2007
	Dietary Cholesterol	CVD/CHD	CVD/CHD (particularly in T2D)	↑	Probable	DGAC 2010
	Dietary Cholesterol	CVD/CHD	Blood lipids	↑	Insufficient	ACC/AHA 2013
	Fats	Cancer	Stomach	NC	Insufficient	WCRF 2007
			Prostate	NC	Insufficient	WCRF 2014
	Fats	CVD/CHD	CVD/CHD (replacement with unsaturated fatty acids, particularly PUFA for SFA)	↓	Probable	WHO 2015 (Cochrane review)
	Low fat / Reduced fat	Cancer	Colon and rectum	NC	Insufficient	WCRF 2011
			Liver	NC	Insufficient	WCRF 2015
			Gallbladder	NC	Insufficient	WCRF 2015
	Low fat / Reduced fat	Obesity	Weight gain	-	Insufficient	NHMRC
	MUFA	Cancer	Pancreas	NC	Insufficient	FAO 2010
Endometrium			NC	Insufficient	WCRF 2012	
Ovarian or cervix			NC	Insufficient	WCRF 2014	
Oesophagus			NC	Insufficient	WCRF 2007	
Stomach			NC	Insufficient	WCRF 2007	
MUFA	CVD/CHD	Intermediate markers and CVD (MUFA and replacement MUFA for SFA)	↓	Convincing	DGAC 2010	
		Overall CVD benefit	↓	Insufficient	DGAC 2015	
MUFA	Obesity	Adiposity	-	Insufficient	FAO 2010	
MUFA	T2D	T2D (improved lipids related to T2D and replacement MUFA for SFA)	↓	Convincing	DGAC 2010	
		T2D	NC	Insufficient	FAO 2010	
Plant n-3 fatty acids	CVD/CHD	CVD/CHD	↓	Insufficient	DGAC 2010	
PUFA n-6 or total PUFA	Cancer	Pancreas	NC	Insufficient	WCRF 2012	
		Ovarian or cervix	NC	Insufficient	WCRF 2014	
		Oesophagus	NC	Insufficient	WCRF 2007	
		Overall cancer (n-6 and total PUFA)	NC	Insufficient	FAO 2010 x2	

CATEGORY	TOPIC (BROADLY GROUPED, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE
	PUFA n-6 or total PUFA	CVD/CHD	CVD/CHD (particularly with SFA replacement)	↓	Convincing	DGAC 2010
	PUFA n-6 or total PUFA	Obesity	Body weight, adiposity (n-6 or total PUFA)	NC	Insufficient	FAO 2010 x2
	PUFA n-6 or total PUFA	T2D	T2D (n-6)	↓	Convincing	DGAC 2010
T2D (n-6)			↓	Probable	FAO 2010	
T2D (total PUFA)			↓	Possible	FAO 2010	
SFA	Cancer		Pancreas	NC	Insufficient	WCRF 2012
			Oesophagus	NC	Insufficient	WCRF 2007
SFA	CVD/CHD		CVD/CHD (replaced with PUFA)	↓	Convincing	DGAC 2015
			CVD/CHD (replaced with carbohydrate)	-	Convincing	DGAC 2015
SFA	Blood lipids		Replacing TFA with SFA	↓	Convincing	FAO 2010
			Replacing with unsaturated fatty acid or carbohydrate	↓	Convincing	FAO 2010
			Replacing with unsaturated fatty acid	↓	Convincing	HC 2012a
			SFA alone	↑	Convincing	DGAC 2010
			Replacing with unsaturated fatty acid, especially PUFA	↓	Convincing	DGAC 2015
			Replacing with carbohydrate	↓	Convincing	DGAC 2015
			Replacing with carbohydrate, MUFA or PUFA	↓	Convincing	ACC/AHA 2013
SFA	Blood lipids		Replacing with carbohydrate	↓	Probable	FAO 2010
SFA	CVD/CHD		Blood pressure	NC	Insufficient	FAO 2010
SFA	Obesity		Body weight, adiposity	NC	Insufficient	FAO 2010
SFA	T2D		T2D (replace with unsaturated fatty acids)	↓	Convincing	DGAC 2010
			T2D	↑	Convincing	DGAC 2010
			T2D	↑	Possible	FAO 2010
Seafood n-3 fatty acids or long-chain PUFA	CVD/CHD		CVD/CHD	↓	Convincing	FAO 2010
Seafood n-3 fatty acids or long-chain PUFA	T2D		T2D	-	Possible	NHMRC
Stearic acid	CVD/CHD		Blood lipids (replacement with other SFA or TFA/CHO)	-	Probable	DGAC 2010
			Replacement with MUFA or PUFA	↓	Probable	DGAC 2010
Total fat	Cancer		Cancer (subtypes)	-	Probable	FAO 2010
Total fat	Cancer		Lung	↑	Possible	WCRF 2007

CATEGORY	TOPIC (BROADLY GROUPEd, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE
	Total fat	Cancer	Breast	NC	Insufficient	WCRF 2010
			Endometrium	NC	Insufficient	WCRF 2013
			Ovarian or cervix	NC	Insufficient	WCRF 2014
			Oesophagus	NC	Insufficient	WCRF 2007
			Mouth, pharynx, larynx, nasopharynx	NC	Insufficient	WCRF 2007
			Stomach	NC	Insufficient	WCRF 2007
			Kidney	NC	Insufficient	WCRF 2007
			Bladder	NC	Insufficient	WCRF 2007
			Skin	NC	Insufficient	WCRF 2007
			Pancreas	NC	Insufficient	WCRF 2012
	Total fat	CVD/CHD	CVD/CHD	-	Probable	FAO 2010
	Total fat	CVD/CHD	Blood pressure (hypertension)	-	Possible	NHMRC
	Total fat	Obesity	Adiposity (children)	↑	Probable	DGAC 2010
			Body weight, adiposity	↑	Insufficient	FAO 2010
	Total fat	T2D	T2D	-	Possible	NHMRC
T2D			-	Insufficient	NHMRC	
T2D			-	Insufficient	FAO 2010	
TFA	Cancer	Ovarian or cervix	NC	Insufficient	WCRF 2013	
		Total cancer subtypes	NC	Insufficient	FAO 2010	
TFA	CVD/CHD	CVD/CHD	↑	Convincing	FAO 2010	
			↑	Probable	ACC/AHA 2013	
TFA	CVD/CHD	Blood lipids Blood lipids (replaced with MUFA or carbohydrate)	↑	Convincing	FAO 2010	
			↓	Probable	ACC/AHA 2013 x2	
TFA	Obesity	Weight gain, adiposity, obesity	NC	Insufficient	FAO 2010	
TFA	T2D	T2D	NC	Insufficient	FAO 2010	
Vegetable fat	Cancer	Ovarian or cervix	NC	Insufficient	WCRF 2014	
		Mouth, pharynx, larynx	NC	Insufficient	WCRF 2007	
		Nasopharynx	NC	Insufficient	WCRF 2007	
		Lung	NC	Insufficient	WCRF 2007	

CATEGORY	TOPIC (BROADLY GROUPED, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE
Grain products	Cereals	Cancer	Endometrium	NC	Insufficient	WCRF 2013
			Mouth, pharynx, larynx	NC	Insufficient	WCRF 2007
			Nasopharynx	NC	Insufficient	WCRF 2007
			Oesophagus	NC	Insufficient	WCRF 2007
			Lung	NC	Insufficient	WCRF 2007
			Stomach	NC	Insufficient	WCRF 2007
			Liver	NC	Insufficient	WCRF 2007
			Kidney	NC	Insufficient	WCRF 2007
			Bladder	NC	Insufficient	WCRF 2007
			Liver	NC	Insufficient	WCRF 2015
	Prostate	NC	Insufficient	WCRF 2014		
	Grain Products	Cancer	Stomach (refined grains)	NC	Insufficient	WCRF 2007
	Whole grains	CVD/CHD	CVD/CHD	↓	Probable	NHMRC
	Whole grains	CVD/CHD	Blood lipids	↓	Probable	DGAC 2010
Whole grains	CVD/CHD	Blood lipids – whole grains	-	Insufficient	HC 2012b	
		Blood lipids – barley, flaxseed, beta glucan oat fibre	↓	Convincing	HC 2012c HC 2013 HC 2014	
Whole grains	Obesity	Body weight	↓	Probable	DGAC 2010	
		Weight gain	↓	Probable	NHMRC	
Whole grains	T2D	T2D	↓	Probable	NHMRC	
		T2D (cereal foods, especially 3 serves a day of whole grains)	↓	Insufficient	DGAC 2010	
Macronutrients	Macronutrients	CVD/CHD	Blood lipids (dietary pattern with specific macronutrient profile)	↓	Convincing	ACC/AHA 2013
Meat and Alternatives	Animal proteins	Cancer	Liver	NC	Insufficient	WCRF 2015
	Animal proteins	CVD/CHD	CVD/CHD	↑	Insufficient	DGAC 2010
	Animal proteins	CVD/CHD	Blood pressure	NC	Probable	DGAC 2010
	Animal proteins	Obesity	Body weight	NC	Insufficient	DGAC 2010
	Animal proteins	T2D	T2D	NC	Insufficient	DGAC 2010

CATEGORY	TOPIC (BROADLY GROUPED, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE
	Eggs	Cancer	Pancreas	NC	Insufficient	WCRF 2012
			Endometrium	NC	Insufficient	WCRF 2013
			Ovarian or cervix	NC	Insufficient	WCRF 2014
			Mouth, pharynx, larynx	NC	Insufficient	WCRF 2007
			Nasopharynx	NC	Insufficient	WCRF 2007
			Lung	NC	Insufficient	WCRF 2007
			Stomach	NC	Insufficient	WCRF 2007
			Kidney	NC	Insufficient	WCRF 2007
			Bladder	NC	Insufficient	WCRF 2007
			Skin	NC	Insufficient	WCRF 2007
			Prostate	NC	Insufficient	WCRF 2014
	Eggs	CVD/CHD	CVD/CHD	-	Possible	NHMRC
	Fish	Cancer	Colon and rectum	↓	Possible	WCRF 2011
			Liver	↓	Possible	WCRF 2015
	Fish	Cancer	Breast	NC	Insufficient	WCRF 2010
			Pancreas	NC	Insufficient	WCRF 2012
			Endometrium	NC	Insufficient	WCRF 2013
			Ovarian or cervix	NC	Insufficient	WCRF 2014
			Mouth, pharynx, larynx	NC	Insufficient	WCRF 2007
			Nasopharynx	NC	Insufficient	WCRF 2007
Oesophagus			NC	Insufficient	WCRF 2007	
Lung			NC	Insufficient	WCRF 2007	
Kidney			NC	Insufficient	WCRF 2007	
Bladder			NC	Insufficient	WCRF 2007	
Skin			NC	Insufficient	WCRF 2007	
Liver (salted fish)			NC	Insufficient	WCRF 2015	
Prostate			NC	Insufficient	WCRF 2014	
Gallbladder	NC	Insufficient	WCRF 2015			
Fish	CVD/CHD	CVD/CHD (seafood)	↓	Probable	DGAC 2010	
		CVD	↓	Possible	NHMRC	

CATEGORY	TOPIC (BROADLY GROUPED, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE
	Fish	CVD/CHD	Stroke	↓	Possible	NHMRC
	Fish	Obesity	Weight gain, overweight obesity	NC	Insufficient	WCRF 2007
	Legumes	Cancer	Stomach	↓	Possible	WCRF 2007
			Endometrium	NC	Insufficient	WCRF 2013
			Ovarian or cervix	NC	Insufficient	WCRF 2014
			Mouth, pharynx, larynx, nasopharynx	NC	Insufficient	WCRF 2007
			Oesophagus	NC	Insufficient	WCRF 2007
			Lung	NC	Insufficient	WCRF 2007
			Bladder	NC	Insufficient	WCRF 2007
	Prostate	NC	Insufficient	WCRF 2014		
	Legumes	CVD/CHD	Blood lipids	↓	Insufficient	DGAC 2010
	Legumes	Obesity	Body weight	NC	Insufficient	DGAC 2010
	Legumes	T2D	T2D	NC	Insufficient	DGAC 2010
	Meat	Cancer	Mouth, pharynx, larynx	NC	Insufficient	WCRF 2007
			Nasopharynx	NC	Insufficient	WCRF 2007
			Breast	NC	Insufficient	WCRF 2010
			Stomach	NC	Insufficient	WCRF 2007
			Kidney	NC	Insufficient	WCRF 2007
			Bladder	NC	Insufficient	WCRF 2007
	Meat	Obesity	Weight gain	NC	Insufficient	WCRF 2007
Nuts and seeds	Cancer	Mouth, pharynx, larynx, nasopharynx	NC	Insufficient	WCRF 2007	
		Stomach	NC	Insufficient	WCRF 2007	
		Liver	NC	Insufficient	WCRF 2015	
Nuts and seeds	CVD/CHD	Blood lipids (unsalted peanuts and tree nuts)	↓	Probable	DGAC 2010	
		Blood lipids (nuts)	↓	Possible	NHMRC	
Nuts and seeds	Obesity	Weight gain	-	Possible	NHMRC	
Poultry	Cancer	Endometrium	NC	Insufficient	WCRF 2013	
		Ovarian or cervix	NC	Insufficient	WCRF 2014	
		Mouth, pharynx, larynx, nasopharynx	NC	Insufficient	WCRF 2007	
		Oesophagus	NC	Insufficient	WCRF 2007	
		Lung	NC	Insufficient	WCRF 2007	
		Stomach	NC	Insufficient	WCRF 2007	
		Kidney	NC	Insufficient	WCRF 2007	
		Bladder	NC	Insufficient	WCRF 2007	
Prostate	NC	Insufficient	WCRF 2014			

CATEGORY	TOPIC (BROADLY GROUPED, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE
	Processed meat	Cancer	Colon and rectum	↑	Convincing	WCRF 2011
	Processed meat	Cancer	Lung	↑	Possible	WCRF 2007
			Oesophagus	↑	Possible	WCRF 2007
			Pancreas	↑	Possible	WCRF 2012
			Stomach	↑	Possible	WCRF 2007
	Processed meat	Cancer	Endometrium	NC	Insufficient	WCRF 2013
			Ovarian or cervix	NC	Insufficient	WCRF 2014
			Prostate	NC	Insufficient	WCRF 2014
	Processed meat	CVD/CHD	CVD/CHD	NC	Insufficient	DGAC 2010
	Processed meat	T2D	T2D	↑	Insufficient	DGAC 2010
	Red meat	Cancer	Colon and rectum	↑	Convincing	WCRF 2011
	Red meat	Cancer	Lung,	↑	Possible	WCRF 2007
			Oesophagus	↑	Possible	WCRF 2007
			Kidney	↑	Possible	NHMRC
			Pancreas	↑	Possible	WCRF 2012
	Red meat	Cancer	Endometrium	NC	Insufficient	WCRF 2013
			Ovarian or cervix	NC	Insufficient	WCRF 2014
			Prostate	NC	Insufficient	WCRF 2014
Shellfish and seafood	Cancer	Mouth, pharynx, larynx, nasopharynx	NC	Insufficient	WCRF 2007	
Soya/soy products/soy protein	Cancer	Breast	NC	Insufficient	WCRF 2010	
		Endometrium	NC	Insufficient	WCRF 2013	
		Nasopharynx	NC	Insufficient	WCRF 2007	
		Oesophagus	NC	Insufficient	WCRF 2007	
Soya/soy products/soy protein	CVD/CHD	Blood lipids	↓	Convincing	HC 2015b	
			↓	Probable	DGAC 2010	
			↓	Possible	NHMRC	
Soya/soy products/soy protein	CVD/CHD	Blood pressure	NC	Insufficient	DGAC 2010	
Soya/soy products/soy protein	Obesity	Body weight	-	Probable	DGAC 2010	
Vegetable proteins	CVD/CHD	CVD/CHD	-	Insufficient	DGAC 2010	
Vegetable proteins	CVD/CHD	Blood pressure	↓	Probable	DGAC 2010	
Vegetable proteins	T2D	T2D	-	Insufficient	DGAC 2010	

CATEGORY	TOPIC (BROADLY GROUPED, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE
Milk and alternatives	Cheese	Cancer	Colon and rectum	↑	Possible	WCRF 2011
	Milk	Cancer	Colon and rectum	↓	Probable	WCRF 2011
	Milk	Cancer	Bladder	↓	Possible	WCRF 2007
	Milk	Cancer	Stomach	NC	Insufficient	WCRF 2007
	Milk	Cancer	Skin	NC	Insufficient	WCRF 2007
	Milk	Obesity	BMI (children)	-	Possible	NHMRC
	Milk	Obesity	Weight change, obesity	-	Possible	NHMRC
	Milk	Osteoporosis / bone health	Fractures	-	Possible	NHMRC
	Milk and dairy products	Cancer	Prostate	↑	Possible	WCRF 2014
	Milk and dairy products	Cancer	Mouth, pharynx, larynx, nasopharynx	NC	Insufficient	WCRF 2007
			Breast	NC	Insufficient	WCRF 2010
			Endometrium	NC	Insufficient	WCRF 2013
			Ovarian or cervix	NC	Insufficient	WCRF 2014
			Oesophagus	NC	Insufficient	WCRF 2007
			Lung	NC	Insufficient	WCRF 2007
			Stomach	NC	Insufficient	WCRF 2007
	Kidney	NC	Insufficient	WCRF 2007		
	Milk and dairy products	CVD/CHD	CVD/CHD	↓	Probable	DGAC 2010 NHMRC
	Milk and dairy products	CVD/CHD	Stroke	↓	Probable	NHMRC
	Milk and dairy products	CVD/CHD	Blood pressure	↓	Probable	NHMRCx2
Blood pressure (any dairy)			↓	Probable	DGAC 2010	
Milk and dairy products	CVD/CHD	Blood lipids	NC	Insufficient	DGAC 2010	
Milk and dairy products	Obesity	Weight gain, overweight, obesity (adult)	NC	Insufficient	WCRF 2007	
		Weight gain, overweight, obesity (child)	-	Insufficient	DGAC 2010	
Milk and dairy products	Obesity	Weight control (adults)	-	Convincing	DGAC 2010	
Milk and milk products	Osteoporosis / bone health	Bone health (children)	↓	Probable	DGAC 2010	
		Bone mineral density	↓	Possible	NHMRC	
Milk and milk products	Osteoporosis / bone health	Bone health (adults)	↓	Insufficient	DGAC 2010	
Milk and milk products	T2D	T2D	↓	Probable	DGAC 2010	
			↓	Possible	NHMRC	
Minerals	Calcium	Cancer	Colon and rectum	↓	Probable	WCRF 2011
	Calcium	Cancer	Prostate	↑	Possible	WCRF 2014

CATEGORY	TOPIC (BROADLY GROUPED, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE
	Calcium	Cancer	Breast	NC	Insufficient	WCRF 2010
			Oesophagus	NC	Insufficient	WCRF 2007
			Mouth, pharynx, larynx, nasopharynx	NC	Insufficient	WCRF 2007
			Lung	NC	Insufficient	WCRF 2007
			Stomach	NC	Insufficient	WCRF 2007
			Liver	NC	Insufficient	WCRF 2015
			Prostate (supplements)	NC	Insufficient	WCRF 2014
			Gallbladder	NC	Insufficient	WCRF 2015
	Calcium	CVD/CHD	Blood pressure	NC	Insufficient	ACC/AHA 2013
	Copper	Cancer	Lung	NC	Insufficient	WCRF 2007
	Iron	Cancer	Colon and rectum	↑	Possible	WCRF 2011
	Iron	Cancer	Oesophagus	NC	Insufficient	WCRF 2007
			Mouth, pharynx, larynx, nasopharynx	NC	Insufficient	WCRF 2007
			Lung	NC	Insufficient	WCRF 2007
			Stomach	NC	Insufficient	WCRF 2007
			Prostate	NC	Insufficient	WCRF 2014
Magnesium	CVD/CHD	Blood pressure	NC	Insufficient	ACC/AHA 2013	
Phosphorus	Cancer	Prostate	↑	Insufficient	WCRF 2014	
Potassium	CVD/CHD	CVD/CHD	NC -	Insufficient Insufficient	ACC/AHA 2013 WHO 2012b	
Potassium	CVD/CHD	Blood lipids	-	Convincing	WHO 2012b	
Potassium	CVD/CHD	Blood pressure	↓	Convincing	WHO 2012b	
		Blood pressure (children)	↓	Possible	WHO 2012b	
		Blood pressure (adults)	↓	Insufficient	ACC/AHA 2013 x2	
Potassium	CVD/CHD	Stroke	↓	Possible Possible	ACC/AHA 2013 WHO 2012b	
Selenium	Cancer	Stomach	↓	Possible	WCRF 2007	
		Prostate	↓	Possible	WCRF 2014	

CATEGORY	TOPIC (BROADLY GROUPED, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE	
	Selenium	Cancer	Skin	NC	Insufficient	WCRF 2007	
			Colon and rectum	NC	Insufficient	WCRF 2011	
			Breast	NC	Insufficient	WCRF 2010	
			Lung	NC	Insufficient	WCRF 2007	
			Mouth, pharynx, larynx, nasopharynx	NC	Insufficient	WCRF 2007	
			Stomach (supplements)	NC	Insufficient	WCRF 2007	
			Bladder	NC	Insufficient	WCRF 2007	
			Skin	NC	Insufficient	WCRF 2007	
				Prostate	NC	Insufficient	WCRF 2014
	Sodium	Cancer	Stomach	↑	Probable	WCRF 2007	
	Sodium	Cancer	Mouth, pharynx, larynx, nasopharynx	NC	Insufficient	WCRF 2007	
			Oesophagus	NC	Insufficient	WCRF 2007	
	Sodium	CVD/CHD	CVD/CHD	↓	Possible	ACC/AHA 2013 NHMRC	
	Sodium	CVD/CHD	Development of heart failure	NC	Insufficient	ACC/AHA 2013	
			CVD/CHD	-	Insufficient	WHO 2012a	
			CVD/CHD	NC	Insufficient	DGAC 2015	
	Sodium	CVD/CHD	Blood pressure	↑	Convincing	ACC/AHA 2013 x4 DGAC 2010 NHMRC WHO 2012ax3	
	Sodium	CVD/CHD	Blood pressure	↑	Probable	ACC/AHA 2013 DGAC 2010 DGAC 2015 NHMRC WHO 2012a	
	Sodium	CVD/CHD	Stroke	↑	Possible	ACC/AHA 2013 WHO 2012a	
	Sodium	CVD/CHD	Blood lipids	-	Convincing	WHO 2012a	
Sodium	Osteoporosis / bone health	Bone health (children)	↑	Probable	DGAC 2010		
Sodium	Osteoporosis / bone health	Bone mineral density	↑	Possible	NHMRC		
Sodium	Osteoporosis / bone health	Bone health (low sodium, postmenopausal women)	↓	Insufficient	NHMRC		
Interrelationship of sodium and potassium	CVD/CHD	Blood pressure, stroke	NC	Insufficient	DGAC 2015x2		
Zinc	Cancer	Oesophagus	NC	Insufficient	WCRF 2007		
		Lung	NC	Insufficient	WCRF 2007		
		Prostate	NC	Insufficient	WCRF 2014		

CATEGORY	TOPIC (BROADLY GROUPED, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE
Other	Caffeine	Cancer	Bladder	NC	Insufficient	WCRF 2007
	Chocolate (includes cocoa)	CVD/CHD	CVD/CHD	↓	Probable	DGAC 2010
	Dietetic foods	Cancer	Bladder	NC	Insufficient	WCRF 2007
	Herbs and spices (including garlic)	Cancer	Colon and rectum	↓	Probable	WCRF 2011
	Herbs and spices (including garlic)	Cancer	Mouth, pharynx, larynx, nasopharynx	NC	Insufficient	WCRF 2007
			Oesophagus	NC	Insufficient	WCRF 2007
			Gallbladder	NC	Insufficient	WCRF 2015
	Liquid vs. solid foods	Obesity	Body weight	NC	Insufficient	DGAC 2010
	Lycopene and other non-nutrient plant constituents	Cancer	Bladder (lycopene, lutein, beta-cryptoxanthin, zeaxanthin flavonoids)	NC	Insufficient	WCRF 2007x4
			Ovarian or cervix	NC	Insufficient	WCRF 2014
			Lung (lycopene, flavonoids)	NC	Insufficient	WCRF 2007
			Skin	NC	Insufficient	WCRF 2007
	Multivitamin	Cancer	Kidney (flavonol)	NC	Insufficient	WCRF 2007
			Pancreas	NC	Insufficient	WCRF 2012
Endometrium			NC	Insufficient	WCRF 2013	
Lung			NC	Insufficient	WCRF 2007	
Stomach			NC	Insufficient	WCRF 2007	
Bladder			NC	Insufficient	WCRF 2007	
Non-caloric sweeteners	Obesity	Skin	NC	Insufficient	WCRF 2007	
		Prostate	NC	Insufficient	WCRF 2014	
		Body weight and adiposity (when substituted for high calorie foods and beverages)	↓	Probable	DGAC 2015	
Non-caloric sweeteners	Obesity	Body weight (low-calorie vs. sugar containing sweeteners)	NC	Insufficient	WCRF 2007	
Non-caloric sweeteners	T2D	T2D	NC	Insufficient	DGAC 2015	
Protein	Protein	Cancer	Endometrium	NC	Insufficient	WCRF 2013
			Mouth, pharynx, larynx, nasopharynx	NC	Insufficient	WCRF 2007
			Lung	NC	Insufficient	WCRF 2007
			Kidney	NC	Insufficient	WCRF 2007
			Stomach	NC	Insufficient	WCRF 2007
			Ovarian or cervix	NC	Insufficient	WCRF 2014
			Skin	NC	Insufficient	WCRF 2007
			Bladder	NC	Insufficient	WCRF 2007
			Prostate	NC	Insufficient	WCRF 2014

CATEGORY	TOPIC (BROADLY GROUPED, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE
Vegetables & fruit	Fruit	Cancer	Nasopharynx	↓	Probable	WCRF 2007
			Oesophagus	↓	Probable	WCRF 2007
			Lung	↓	Probable	WCRF 2007
			Stomach	↓	Probable	WCRF 2007
	Fruit	Cancer	Colon and rectum	↓	Possible	WCRF 2011
			Nasopharynx	↓	Possible	WCRF 2007
	Fruit	Cancer	Pancreas	NC	Insufficient	WCRF 2012
			Endometrium	NC	Insufficient	WCRF 2013
			Ovarian or cervix	NC	Insufficient	WCRF 2014
			Kidney	NC	Insufficient	WCRF 2007
			Bladder	NC	Insufficient	WCRF 2007
			Skin	NC	Insufficient	WCRF 2007
			Liver	NC	Insufficient	WCRF 2015
	Prostate	NC	Insufficient	WCRF 2014		
	Fruit	Obesity	Weight gain, adiposity, obesity	↓	Possible	NHMRC
				NC	Insufficient	WCRF 2007
	Fruit	T2D	T2D	-	Possible	NHMRC
	Vegetables	Cancer	Mouth, pharynx, larynx (non-starchy vegetables)	↓	Probable	WCRF 2007
			Oesophagus (non-starchy vegetables)	↓	Probable	WCRF 2007
			Stomach (non-starchy, allium)	↓	Probable	WCRF 2007 x2
			Stomach (chili)	↑	Probable	WCRF 2007
	Vegetables	Cancer	Colon and rectum (non-starchy)	↓	Possible	WCRF 2011
			Nasopharynx (non-starchy)	↓	Possible	WCRF 2007
Vegetables	Cancer	Pancreas (non-starchy)	NC	Insufficient	WCRF 2012	
		Endometrium	NC	Insufficient	WCRF 2013	
		Ovarian or cervix	NC	Insufficient	WCRF 2014	
		Oesophagus (starchy roots, tubers and plantains)	NC	Insufficient	WCRF 2007	
		Mouth, pharynx, larynx(starchy roots, tubers and plantains)	NC	Insufficient	WCRF 2007	
		Lung (non-starchy, starchy)	NC	Insufficient	WCRF 2007x2	
		Stomach (potatoes, starchy roots, tubers and plantains)	NC	Insufficient	WCRF 2007x2	
		Kidney	NC	Insufficient	WCRF 2007	
		Bladder	NC	Insufficient	WCRF 2007	
		Skin (potatoes, starchy roots, tubers and plantains)	NC	Insufficient	WCRF 2007x2	

CATEGORY	TOPIC (BROADLY GROUPED, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE
	Vegetables	CVD/CHD	CVD/CHD Stroke	↓ ↓	Probable Probable	NHMRC NHMRC
	Vegetables	Obesity	Weight gain	↓	Possible	NHMRC
	Vegetables	Obesity	Weight gain, overweight, obesity (starchy veg)	NC	Insufficient	WCRF 2007
	Vegetables	T2D	T2D	-	Possible	NHMRC
	Non-starchy vegetables	Cancer	Liver Prostate	NC NC	Insufficient Insufficient	WCRF 2015 WCRF 2015
	Vegetables and fruit	Cancer	Breast	NC	Insufficient	WCRF 2010
	Vegetables and fruit	CVD/CHD	CVD/CHD	↓ ↓	Convincing Probable	HC 2015a NHMRC
	Vegetables and fruit	CVD/CHD	Blood lipids	NC	Insufficient	DGAC 2010
	Vegetables and fruit	CVD/CHD	Blood pressure	NC	Insufficient	DGAC 2010
	Vegetables and fruit	CVD/CHD	Stroke	↓	Probable	DGAC 2010
	Vegetables and fruit	Obesity	Body weight Adiposity (children)	↓ ↓	Probable Insufficient	DGAC 2010 DGAC 2010
	Vegetables and fruit	T2D	T2D	↓ -	Insufficient Insufficient	DGAC 2010 NHMRC
	Carotenoids	Cancer	Skin	-	Convincing	WCRF 2007
	Vitamins	Carotenoids	Cancer	Mouth, pharynx, larynx, nasopharynx	↓	Probable
Lung				↓	Probable	WCRF 2007
Oesophagus				↓	Probable	WCRF 2007
Carotenoids		Cancer	Bladder	NC	Insufficient	WCRF 2007
			Skin	NC	Insufficient	WCRF 2007
			Endometrium	NC	Insufficient	WCRF 2013
			Kidney	NC	Insufficient	WCRF 2007
			Bladder	NC	Insufficient	WCRF 2007
			Skin (alpha-carotene)	NC	Insufficient	WCRF 2007
			Stomach	NC	Insufficient	WCRF 2007
			Skin (beta-carotene)	NC	Insufficient	WCRF 2007
			Oesophagus	NC	Insufficient	WCRF 2007
			Lung	NC	Insufficient	WCRF 2007
			Prostate	NC	Insufficient	WCRF 2014

CATEGORY	TOPIC (BROADLY GROUPED, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE
	Folate	Cancer	Oesophagus	↓	Possible	WCRF 2007
	Folate	Cancer	Colon and rectum	NC	Insufficient	WCRF 2011
			Lung	NC	Insufficient	WCRF 2007
			Mouth, pharynx, larynx, nasopharynx	NC	Insufficient	WCRF 2007
			Bladder	NC	Insufficient	WCRF 2007
			Skin	NC	Insufficient	WCRF 2007
			Pancreas	NC	Insufficient	WCRF 2012
			Breast	NC	Insufficient	WCRF 2010
			Endometrium	NC	Insufficient	WCRF 2013
			Ovarian or cervix	NC	Insufficient	WCRF 2014
	Folate	CVD/CHD	Stroke	↓	Insufficient	DGAC 2010
	Niacin	Cancer	Mouth, pharynx, larynx, nasopharynx	NC	Insufficient	WCRF 2007
			Lung	NC	Insufficient	WCRF 2007
	Riboflavin	Cancer	Oesophagus	NC	Insufficient	WCRF 2007
			Mouth, pharynx, larynx, nasopharynx	NC	Insufficient	WCRF 2007
			Lung	NC	Insufficient	WCRF 2007
			Stomach	NC	Insufficient	WCRF 2007
	Thiamin	Cancer	Mouth, pharynx, larynx, nasopharynx	NC	Insufficient	WCRF 2007
			Oesophagus	NC	Insufficient	WCRF 2007
			Lung	NC	Insufficient	WCRF 2007
		Stomach	NC	Insufficient	WCRF 2007	
Vitamin A (includes retinol)	Cancer	Skin (retinol)	↓	Possible	WCRF 2007	
Vitamin A (includes retinol)	Cancer	Endometrium (retinol)	NC	Insufficient	WCRF 2013	
		Ovarian or cervix	NC	Insufficient	WCRF 2014	
		Mouth, pharynx, larynx (vitamin A and retinol)	NC	Insufficient	WCRF 2007	
		Oesophagus (vitamin A and retinol)	NC	Insufficient	WCRF 2007	
		Lung	NC	Insufficient	WCRF 2007	
		Kidney (vitamin A, retinol)	NC	Insufficient	WCRF 2007 x2	
		Bladder	NC	Insufficient	WCRF 2007	
		Skin	NC	Insufficient	WCRF 2007	
		Prostate	NC	Insufficient	WCRF 2014	
Vitamin B6	Cancer	Oesophagus	↓	Possible	WCRF 2007	
Vitamin B6	Cancer	Lung	NC	Insufficient	WCRF 2007	
Vitamin C	Cancer	Oesophagus	↓	Probable	WCRF 2007	

CATEGORY	TOPIC (BROADLY GROUPED, SEE SOURCE FOR SPECIFIC DETAILS)	HEALTH OUTCOME	HEALTH OUTCOME – SPECIFIC	DIRECTION OF RISK	ERC GRADE	SOURCE
	Vitamin C	Cancer	Pancreas	NC	Insufficient	WCRF 2012
			Colon and rectum	NC	Insufficient	WCRF 2011
			Stomach	NC	Insufficient	WCRF 2007
			Lung	NC	Insufficient	WCRF 2007
			Ovarian or cervix	NC	Insufficient	WCRF 2014
			Endometrium	NC	Insufficient	WCRF 2013
			Mouth, pharynx, larynx, nasopharynx	NC	Insufficient	WCRF 2007
			Kidney	NC	Insufficient	WCRF 2007
			Bladder	NC	Insufficient	WCRF 2007
			Skin	NC	Insufficient	WCRF 2007
			Liver	NC	Insufficient	WCRF 2015
	Gallbladder	NC	Insufficient	WCRF 2015		
	Vitamin D	Cancer	Colon and rectum	↓	Possible	WCRF 2011
	Vitamin D	Cancer	Breast	NC	Insufficient	WCRF 2010
			Stomach	NC	Insufficient	WCRF 2007
			Skin	NC	Insufficient	WCRF 2007
			Liver	NC	Insufficient	WCRF 2015
	Gallbladder	NC	Insufficient	WCRF 2015		
	Vitamin E	Cancer	Oesophagus	↓	Possible	WCRF 2007
			Prostate	↓	Possible	WCRF 2014
	Vitamin E	Cancer	Colon and rectum	NC	Insufficient	WCRF 2011
			Endometrium	NC	Insufficient	WCRF 2013
			Ovarian or cervix	NC	Insufficient	WCRF 2014
			Mouth, pharynx, larynx, nasopharynx	NC	Insufficient	WCRF 2007
			Lung	NC	Insufficient	WCRF 2007
			Kidney	NC	Insufficient	WCRF 2007
			Bladder	NC	Insufficient	WCRF 2007
Skin			NC	Insufficient	WCRF 2007	
Prostate (vit E supplements)			NC	Insufficient	WCRF 2014	

DASH: Dietary Approaches to Stop Hypertension

ERC: Evidence Review Cycle

MUFA: Monounsaturated fatty acids

NC: Evidence is so limited that no firm conclusion can be made (WCRF)

PUFA: Polyunsaturated fatty acids

SFA: Saturated fatty acids

SSB: Sugar sweetened beverages

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Appendix H: Search strategies for specific food and health topics

Saturated fat and CVD/CHD

Database(s): Embase 1974 to 2014 June 24
Search Strategy:

#	SEARCHES	RESULTS
1	exp saturated fatty acid/	9184
2	(saturat* adj2 (fat or fatty)).tw.	15835
3	or/1-2	19115
4	exp cardiovascular disease/	2972544
5	exp systematic review/ or meta analysis/ or ((systemat* adj2 review*) or metaanaly* or meta?analy* or (meta* adj2 analy*)).tw.	195611
6	3 and 4 and 5	165
7	limit 6 to (yr=2009-2014 and (english or french))	82

Database(s): Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily, Ovid MEDLINE(R) and Ovid OLDMEDLINE(R) 1946 to Present
Search Strategy:

#	SEARCHES	RESULTS
1	exp caprylates/ or exp butyrates/ or exp caproates/ or exp propionates/ or exp valerates/ or exp lauric acids/ or exp myristic acids/ or exp palmitic acids/ or exp stearic acids/	130707
2	(saturat* adj2 (fat or fatty)).tw.	13409
3	or/1-2	143184
4	exp cardiovascular disease/	1883706
5	meta analysis.pt. or meta analysis/ or ((systemat* adj2 review*) or metaanaly* or meta?analy* or (meta* adj2 analy*)).tw.	135109
6	3 and 4 and 5	131
7	limit 6 to (yr=2009-2014 and (english or french))	67

Database(s): CAB Abstracts 1973 to 2014 Week 24, Econlit 1886 to May 2014, Food Science and Technology Abstracts 1969 to 2014 June Week 4, Global Health 1973 to 2014 Week 24, International Pharmaceutical Abstracts 1970 to June 2014, PsycINFO 1806 to June Week 3 2014
Search Strategy:

#	SEARCHES	RESULTS
1	(saturat* adj2 (fat or fatty)).tw.	33003
2	(cardio* or vascul* or cvd or heart* or aorta* or stroke* or ischem* or myocard*).tw.	479233
3	((systemat* adj2 review*) or metaanaly* or meta?analy* or (meta* adj2 analy*)).tw.	79872
4	1 and 2 and 3	143
5	limit 4 to (yr=2006-2014 and (english or french))	106
6	remove duplicates from 5	67

Scopus

(TITLE-ABS-KEY(saturat* W/4 (fat OR fatty)) AND TITLE-ABS-KEY(cardio* OR vascul* OR cvd OR heart* OR aorta* OR stroke* OR ischem* OR myocard*) AND TITLE-ABS-KEY((systemat* W/2 review*) OR metaanaly* OR meta?analy* OR (meta* W/2 analy*))) AND PUBYEAR AFT 2008 AND (LIMIT-TO(LANGUAGE, "English"))

Monounsaturated fat and CVD/CHD

Database(s): Embase 1974 to 2014 June 24
Search Strategy:

#	SEARCHES	RESULTS
1	exp monounsaturated fatty acid/	4886
2	(monounsat* or (mono adj4 (unsaturat* or fat or fatty)) or mufa or mufas).tw.	7915
3	or/1-2	9678
4	exp cardiovascular disease/	2972544
5	exp systematic review/ or meta analysis/ or ((systemat* adj2 review*) or metaanaly* or meta?analy* or (meta* adj2 analy*)).tw.	195611
6	3 and 4 and 5	68
7	limit 6 to (yr=2009-2014 and (english or french))	39

Database(s): Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily, Ovid MEDLINE(R) and Ovid OLDMEDLINE(R) 1946 to Present
Search Strategy:

#	SEARCHES	RESULTS
1	exp Fatty Acids, Monounsaturated/	37945
2	(monounsat* or (mono adj4 (unsaturat* or fat or fatty)) or mufa or mufas).tw.	6866
3	or/1-2	43513
4	exp cardiovascular disease/	1883706
5	meta analysis.pt. or meta analysis/ or ((systemat* adj2 review*) or metaanaly* or meta?analy* or (meta* adj2 analy*)).tw.	135109
6	3 and 4 and 5	45
7	limit 6 to (yr=2009-2014 and (english or french))	19

Database(s): CAB Abstracts 1973 to 2014 Week 24, Econlit 1886 to May 2014, Food Science and Technology Abstracts 1969 to 2014 June Week 4, Global Health 1973 to 2014 Week 24, International Pharmaceutical Abstracts 1970 to June 2014, PsycINFO 1806 to June Week 3 2014
Search Strategy:

#	SEARCHES	RESULTS
1	(monounsat* or (mono adj4 (unsaturat* or fat or fatty)) or mufa or mufas).tw.	19531
2	(cardio* or vascul* or cvd or heart* or aorta* or stroke* or ischem* or myocard*).tw.	479233
3	((systemat* adj2 review*) or metaanaly* or meta?analy* or (meta* adj2 analy*)).tw.	79872
4	1 and 2 and 3	60
5	limit 4 to (yr=2009-2014 and (english or french))	33
6	remove duplicates from 5	21

Scopus

(TITLE-ABS-KEY((monounsaturat* OR (mono W/4 (unsaturat* OR fat OR fatty)) OR mufa OR mufas)) AND TITLE-ABS-KEY(cardio* OR vascul* OR cvd OR heart* OR aorta* OR stroke* OR ischem* OR myocard*) AND TITLE-ABS-KEY((systemat* W/2 review*) OR metaanaly* OR meta?analy* OR (meta* W/2 analy*))) AND PUBYEAR AFT 2008 AND (LIMIT-TO(LANGUAGE, "English"))

Legumes and CVD/CHD

Search strategy

Database(s): Embase 1974 to 2014 September 03

Search Strategy:

#	SEARCHES	RESULTS
1	exp legume/ or Fabaceae/	56503
2	exp cardiovascular disease/ or exp cardiovascular risk/	3032510
3	exp systematic review/ or meta analysis/ or ((systemat* adj2 review*) or metaanaly* or meta?analy* or (meta* adj2 analy*)).tw.	201713
4	1 and 2 and 3	96
5	limit 4 to (yr=2009-2014 and (english or french))	49

Database(s): Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily, Ovid MEDLINE(R) and Ovid OLDMEDLINE(R) 1946 to Present

Search Strategy:

#	SEARCHES	RESULTS
1	exp Fabaceae/	54913
2	(legume* or leguminos* or papilionac* or african yam* or sphenostylis stenocarp* or alfalfa or lucerne or medicago sativ* or barrel medic or barrel clover or medicago truncatul* or bean or beans or guar or clusterbean* or golden gram or green gram or phaseolus or vigna radiat* or cyamopsis tetragonol* or phaseolus vulgar* or soybean* or soyabean* or tofu or cowitch or velvetbean* or mucuna prurien* or horsebean or vicia faba or chickpea* or garbanzo* or cicer arietinum* or common vetch* or cowpea* or phaseolus unguiculat* or vigna sinens* or vigna unguiculat* or cyclopia* or lentil* or lupin* or pea or peas or peanut* or arachide or arachides or groundnut* or ricinus communis or fabacea*).tw.	89453
3	exp Cardiovascular Diseases/	1920089
4	meta analysis.pt. or meta analysis/ or ((systemat* adj2 review*) or metaanaly* or meta?analy* or (meta* adj2 analy*)).tw.	141951
5	(1 or 2) and 3 and 4	36
6	limit 5 to (yr=2009-2014 and (english or french))	22

Database(s): CAB Abstracts 1973 to 2014 Week 34, Econlit 1886 to August 2014, Food Science and Technology Abstracts 1969 to 2014 September Week 1, Global Health 1973 to 2014 Week 34, International Pharmaceutical Abstracts 1970 to August 2014, PsycINFO 1806 to August Week 4 2014
Search Strategy:

#	SEARCHES	RESULTS
1	(legume* or leguminos* or papilionac* or african yam* or sphenostylis stenocarp* or alfalfa or lucerne or medicago sativ* or barrel medic or barrel clover or medicago truncatul* or bean or beans or guar or clusterbean* or golden gram or green gram or phaseolus or vigna radiat* or cyamopsis tetragonol* or phaseolus vulgar* or soybean* or soyabean* or tofu or cowitch or velvetbean* or mucuna prurien* or horsebean or vicia faba or chickpea* or garbanzo* or cicer arietinum* or common vetch* or cowpea* or phaseolus unguiculat* or vigna sinens* or vigna unguiculat* or cyclopia* or lentil* or lupin* or pea or peas or peanut* or arachide or arachides or groundnut* or ricinus communis or fabacea*).tw.	666413
2	(cardio* or vascul* or cvd or heart* or aorta* or stroke* or ischem* or myocard* or hypertens* or blood press*).tw.	554378
3	((systemat* adj2 review*) or metaanaly* or meta?analy* or (meta* adj2 analy*)).tw.	82753
4	1 and 2 and 3	116
5	limit 4 to (yr=2009-2014 and (english or french))	72
6	remove duplicates from 5	43

Scopus

(TITLE-ABS-KEY(legume* OR leguminos* OR papilionac* OR "african yam*" OR "sphenostylis stenocarp*" OR alfalfa OR lucerne OR "medicago sativ*" OR "barrel medic" OR "barrel clover" OR "medicago truncatul*" OR bean OR beans OR guar OR clusterbean* OR "golden gram" OR "green gram" OR phaseolus OR "vigna radiat*" OR "cyamopsis tetragonol*" OR "phaseolus vulgar*" OR soybean* OR soyabean* OR tofu OR cowitch OR velvetbean* OR "mucuna pruriens*" OR horsebean OR "vicia faba" OR chickpea* OR garbanzo* OR "cicer arietinum*" OR "common vetch*" OR cowpea* OR "phaseolus unguiculat*" OR "vigna sinens*" OR "vigna unguiculat*" OR cyclopia* OR lentil* OR lupin* OR pea OR peas OR peanut* OR arachide OR arachides OR groundnut* OR "ricinus communis" OR fabacea*) AND (TITLE-ABS-KEY(cardio* OR vascul* OR cvd OR heart* OR aorta* OR stroke* OR ischem* OR myocard* OR hypertens* OR "blood press*")) AND (TITLE-ABS-KEY((systemat* W/2 review*) OR metaanaly* OR meta?analy* OR (meta* W/2 analy*))) AND PUBYEAR > 2008 AND (LIMIT-TO(LANGUAGE, "English") OR LIMIT-TO(LANGUAGE, "French"))

Processed meat and type 2 diabetes

Database(s): Embase 1974 to 2014 June 25
Search Strategy:

#	SEARCHES	RESULTS
1	((processed or lunch* or smok* or cured or product or products) adj2 (meat* or chicken* or poultry or beef or lamb or ham)) or bacon* or sausage* or salami* or pepperoni* or hot dog* or Braunschweiger or keilbasa or mortadella or Boerewors or mettwurst or teewurst or Droewors or meetvursti or Sucuk or Landjager or saumagen or blutwurst or klobasa or chorizo or merguez or schwenker or harissa or kamaboko or bangers or chipolata or bologna or capocola or frankfurters or pastrami or prosciutto or salsiccia or weiner or pepperette).tw.	13070
2	exp diabetes mellitus/ or exp cardiovascular disease/	3340966
3	exp systematic review/ or meta analysis/ or ((systemat* adj2 review*) or metaanaly* or meta?analy* or (meta* adj2 analy*)).tw.	195688
4	1 and 2 and 3	34
5	limit 4 to (yr=2009-2014 and (english or french))	31

Database(s): Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily, Ovid MEDLINE(R) and Ovid OLDMEDLINE(R) 1946 to Present
Search Strategy:

#	SEARCHES	RESULTS
1	exp meat products/	4614
2	((processed or lunch* or smok* or cured or product or products) adj2 (meat* or chicken* or poultry or beef or lamb or ham)) or bacon* or sausage* or salami* or pepperoni* or hot dog* or Braunschweiger or keilbasa or mortadella or Boerewors or mettwurst or teewurst or Droewors or meetvursti or Sucuk or Landjager or saumagen or blutwurst or klobasa or chorizo or merguez or schwenker or harissa or kamaboko or bangers or chipolata or bologna or capocola or frankfurters or pastrami or prosciutto or salsiccia or weiner or pepperette).tw.	11947
3	1 or 2	14067
4	exp diabetes mellitus/ or exp cardiovascular diseases/	2113592
5	meta analysis.pt. or meta analysis/ or ((systemat* adj2 review*) or metaanaly* or meta?analy* or (meta* adj2 analy*)).tw.	135324
6	3 and 4 and 5	20
7	limit 6 to (yr=2009-2014 and (english or french))	19

Database(s): CAB Abstracts 1973 to 2014 Week 24, Econlit 1886 to May 2014, Food Science and Technology Abstracts 1969 to 2014 June Week 4, Global Health 1973 to 2014 Week 24, International Pharmaceutical Abstracts 1970 to June 2014, PsycINFO 1806 to June Week 4 2014
Search Strategy:

#	SEARCHES	RESULTS
1	((processed or lunch* or smok* or cured or product or products) adj2 (meat* or chicken* or poultry or beef or lamb or ham)) or bacon* or sausage* or salami* or pepperoni* or hot dog* or Braunschweiger or keilbasa or mortadella or Boerewors or mettwurst or teewurst or Droewors or meetvursti or Sucuk or Landjager or saumagen or blutwurst or klobasa or chorizo or merguez or schwenker or harissa or kamaboko or bangers or chipolata or bologna or capocola or frankfurters or pastrami or prosciutto or salsiccia or weiner or pepperette).tw.	93127
2	(cardio* or vascul* or cvd or heart* or aorta* or stroke* or ischem* or myocard* or diabet* or pre?diabet* or (pre adj2 diabet*)).tw.	611990
3	((systemat* adj2 review*) or metaanaly* or meta?analy* or (meta* adj2 analy*)).tw.	79954
4	1 and 2 and 3	39
5	limit 4 to (yr=2009-2014 and (english or french))	36
6	remove duplicates from 5	22

Scopus

(TITLE-ABS-KEY((((processed OR lunch* OR smok* OR cured OR product OR products) W/2 (meat* OR chicken* OR poultry OR beef OR lamb OR ham)) OR bacon* OR sausage* OR salami* OR pepperoni* OR "hot dog*" OR braunschweiger OR keilbasa OR mortadella OR boerewors OR mettwurst OR teewurst OR "Droe wors" OR meetvursti OR sucuk OR landjager OR saumagen OR blutwurst OR klobasa OR chorizo OR merguez OR schwenker OR harissa OR kamaboko OR bangers OR chipolata OR bologna OR capocollo OR frankfurters OR pastrami OR prosciutto OR salsiccia OR weiner OR pepperette))) AND (TITLE-ABS-KEY(cardio* OR vascul* OR cvd OR heart* OR aorta* OR stroke* OR ischem* OR myocard* OR diabet* OR pre?diabet* OR (pre W/2 diabet*))) AND (TITLE-ABS-KEY((systemat* W/2 review* OR metaanaly* OR meta?analy* OR (meta* W/2 analy*))) AND PUBYEAR AFT 2008 AND (LIMIT-TO(LANGUAGE, "English")))

Processed meat and CVD/CHD

Database(s): Embase 1974 to 2014 June 25

Search Strategy:

#	SEARCHES	RESULTS
1	(((processed or lunch* or smok* or cured or product or products) adj2 (meat* or chicken* or poultry or beef or lamb or ham)) or bacon* or sausage* or salami* or pepperoni* or hot dog* or Braunschweiger or keilbasa or mortadella or Boerewors or mettwurst or teewurst or Droe wors or meetvursti or Sucuk or Landjager or saumagen or blutwurst or klobasa or chorizo or merguez or schwenker or harissa or kamaboko or bangers or chipolata or bologna or capocollo or frankfurters or pastrami or prosciutto or salsiccia or weiner or pepperette).tw.	13070
2	exp diabetes mellitus/ or exp cardiovascular disease/	3340966
3	exp systematic review/ or meta analysis/ or ((systemat* adj2 review*) or metaanaly* or meta?analy* or (meta* adj2 analy*)).tw.	195688
4	1 and 2 and 3	34
5	limit 4 to (yr=2009-2014 and (english or french))	31

Database(s): Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily, Ovid MEDLINE(R) and Ovid OLDMEDLINE(R) 1946 to Present

Search Strategy:

#	SEARCHES	RESULTS
1	exp meat products/	4614
2	(((processed or lunch* or smok* or cured or product or products) adj2 (meat* or chicken* or poultry or beef or lamb or ham)) or bacon* or sausage* or salami* or pepperoni* or hot dog* or Braunschweiger or keilbasa or mortadella or Boerewors or mettwurst or teewurst or Droe wors or meetvursti or Sucuk or Landjager or saumagen or blutwurst or klobasa or chorizo or merguez or schwenker or harissa or kamaboko or bangers or chipolata or bologna or capocollo or frankfurters or pastrami or prosciutto or salsiccia or weiner or pepperette).tw.	11947
3	1 or 2	14067
4	exp diabetes mellitus/ or exp cardiovascular diseases/	2113592
5	meta analysis.pt. or meta analysis/ or ((systemat* adj2 review*) or metaanaly* or meta?analy* or (meta* adj2 analy*)).tw.	135324
6	3 and 4 and 5	20
7	limit 6 to (yr=2009-2014 and (english or french))	19

Database(s): CAB Abstracts 1973 to 2014 Week 24, Econlit 1886 to May 2014, Food Science and Technology Abstracts 1969 to 2014 June Week 4, Global Health 1973 to 2014 Week 24, International Pharmaceutical Abstracts 1970 to June 2014, PsycINFO 1806 to June Week 4 2014

Search Strategy:

#	SEARCHES	RESULTS
1	(((processed or lunch* or smok* or cured or product or products) adj2 (meat* or chicken* or poultry or beef or lamb or ham)) or bacon* or sausage* or salami* or pepperoni* or hot dog* or Braunschweiger or keilbasa or mortadella or Boerewors or mettwurst or teewurst or Droe wors or meetvursti or Sucuk or Landjager or saumagen or blutwurst or klobasa or chorizo or merguez or schwenker or harissa or kamaboko or bangers or chipolata or bologna or capocollo or frankfurters or pastrami or prosciutto or salsiccia or weiner or pepperette).tw.	93127
2	(cardio* or vascul* or cvd or heart* or aorta* or stroke* or ischem* or myocard* or diabet* or pre?diabet* or (pre adj2 diabet*)).tw.	611990
3	((systemat* adj2 review*) or metaanaly* or meta?analy* or (meta* adj2 analy*)).tw.	79954
4	1 and 2 and 3	39
5	limit 4 to (yr=2009-2014 and (english or french))	36
6	remove duplicates from 5	22

Scopus

(TITLE-ABS-KEY((((processed OR lunch* OR smok* OR cured OR product OR products) W/2 (meat* OR chicken* OR poultry OR beef OR lamb OR ham)) OR bacon* OR sausage* OR salami* OR pepperoni* OR "hot dog*" OR braunschweiger OR keilbasa OR mortadella OR boerewors OR mettwurst OR teewurst OR "Droe wors" OR meetvursti OR sucuk OR landjager OR saumagen OR blutwurst OR klobasa OR chorizo OR merguez OR schwenker OR harissa OR kamaboko OR bangers OR chipolata OR bologna OR capocollo OR frankfurters OR pastrami OR prosciutto OR salsiccia OR weiner OR pepperette))) AND (TITLE-ABS-KEY(cardio* OR vascul* OR cvd OR heart* OR aorta* OR stroke* OR ischem* OR myocard* OR diabet* OR pre?diabet* OR (pre W/2 diabet*))) AND (TITLE-ABS-KEY((systemat* W/2 review* OR metaanaly* OR meta?analy* OR (meta* W/2 analy*))) AND PUBYEAR AFT 2008 AND (LIMIT-TO(LANGUAGE, "English")))

Dairy and osteoporosis

Database(s): Embase 1974 to 2014 June 25

Search Strategy:

#	SEARCHES	RESULTS
1	exp dairy product/	73138
2	(Dairy or milk* or butter* or margarine* or cheese* or curd* or paneer or quark or fromage* or cheddar* or mozzarella* or queso or emmental or gruyere or gouda or edam or jarlsberg or cantal or cascaval or colby or monterey jack or parmesan or pecorino romano or cream* or creme or smetana or kefir or whey or casein or yoghurt or yogurt or yoghourt or zabadi or kumislairag or dahl or rahmjoghurt or dovga or jameed or zabadi or raita or labneh or khoa or ricotta or ghee or smen or clabber or gelato or sherbet).tw.	179058
3	1 or 2	191289
4	exp bone demineralization/ or exp bone density/ or exp bone injury/ or exp bone densitometry/	295357
5	exp systematic review/ or meta analysis/ or ((systemat* adj2 review*) or metaanaly* or meta?analy* or (meta* adj2 analy*).tw.	195688
6	3 and 4 and 5	37
7	limit 6 to (yr=2009-2014 and (english or french))	18

Database(s): Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily, Ovid MEDLINE(R) and Ovid OLDMEDLINE(R) 1946 to Present
Search Strategy:

#	SEARCHES	RESULTS
1	exp dairy products/	73858
2	(Dairy or milk* or butter* or margarine* or cheese* or curd* or paneer or quark or fromage* or cheddar* or mozzarella* or queso or emmental or gruyere or gouda or edam or jarlsberg or cantal or cascaval or colby or monterey jack or parmesan or pecorino romano or cream* or creme or smetana or kefir or whey or casein or yoghurt or yogurt or yoghourt or zabadi or kumislairag or dahl or rahmjoghurt or dovga or jameed or zabadi or raita or labneh or khoa or ricotta or ghee or smen or clabber or gelato or sherbet).tw.	158171
3	or/1-2	173993
4	exp fractures, bone/ or exp osteoporosis/ or exp bone density/	194226
5	meta analysis.pt. or meta analysis/ or ((systemat* adj2 review*) or metaanaly* or meta?analy* or (meta* adj2 analy*).tw.	135324
6	3 and 4 and 5	14
7	limit 6 to (yr=2009-2014 and (english or french))	7

Database(s): CAB Abstracts 1973 to 2014 Week 24, Econlit 1886 to May 2014, Food Science and Technology Abstracts 1969 to 2014 June Week 4, Global Health 1973 to 2014 Week 24, International Pharmaceutical Abstracts 1970 to June 2014, PsycINFO 1806 to June Week 4 2014

Search Strategy:

#	SEARCHES	RESULTS
1	(Dairy or milk* or butter* or margarine* or cheese* or curd* or paneer or quark or fromage* or cheddar* or mozzarella* or queso or emmental or gruyere or gouda or edam or jarlsberg or cantal or cascaval or colby or monterey jack or parmesan or pecorino romano or cream* or creme or smetana or kefir or whey or casein or yoghurt or yogurt or yoghourt or zabadi or kumislairag or dahi or rahmjoghurt or dovga or jameed or zabadi or raita or labneh or khoa or ricotta or ghee or smen or clabber or gelato or sherbet).tw.	744710
2	(osteopor* or bone* or bmd or fractur*).tw.	162897
3	((systemat* adj2 review*) or metaanaly* or meta?analy* or (meta* adj2 analy*).tw.	79954
4	1 and 2 and 3	53
5	limit 4 to (yr=2009-2014 and (english or french))	40
6	remove duplicates from 5	27

Scopus

(TITLE-ABS-KEY(dairy OR milk* OR butter* OR margarine* OR cheese* OR curd* OR paneer OR quark OR fromage* OR cheddar* OR mozzarella* OR queso OR emmental OR gruyere OR gouda OR edam OR jarlsberg OR cantal OR cascaval OR colby OR "monterey jack" OR parmesan OR "pecorino romano" OR cream* OR creme OR smetana OR kefir OR whey OR casein OR yoghurt OR yogurt OR yoghourt OR zabadi OR kumislairag OR dahl OR rahmjoghurt OR dovga OR jameed OR zabadi OR raita OR labneh OR khoa OR ricotta OR ghee OR smen OR clabber OR gelato OR sherbet)) AND (TITLE-ABS-KEY(osteopor* OR bone* OR bmd OR fractur*)) AND (TITLE-ABS-KEY((systemat* W/2 review*) OR metaanaly* OR meta?analy* OR (meta* W/2 analy*))) AND PUBYEAR > 2008 AND (LIMIT-TO(LANGUAGE, "English") OR LIMIT-TO(LANGUAGE, "French"))

Whole grains and type 2 diabetes

Database(s): Embase 1974 to 2014 June 25
Search Strategy:

#	SEARCHES	RESULTS
1	exp poaceae/ or exp chenopodium quinoa/ or exp fagopyrum/ or exp amaranthus/ or exp cereal/ or exp dietary fiber/ or exp carbohydrate diet/	149013
2	((whole* or intact* or in?tact*) adj2 grain*).ti,ab.	2403
3	or/1-2	150127
4	exp diabetes mellitus/	597918
5	exp systematic review/ or meta analysis/ or ((systemat* adj2 review*) or metaanaly* or meta?analy* or (meta* adj2 analy*)).tw.	195688
6	3 and 4 and 5	139
7	limit 6 to (yr=2009-2014 and (english or french))	86

Database(s): Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily, Ovid MEDLINE(R) and Ovid OLDMEDLINE(R) 1946 to Present
Search Strategy:

#	SEARCHES	RESULTS
1	((whole* or intact* or in?tact*) adj2 grain*).ti,ab.	1939
2	exp dietary fiber/ or exp dietary carbohydrates/	36314
3	exp poaceae/ or exp chenopodium quinoa/ or exp fagopyrum/ or exp amaranthus/ or exp cereals/	89654
4	or/1-3	123261
5	exp diabetes mellitus/	315980
6	meta analysis.pt. or meta analysis/ or ((systemat* adj2 review*) or metaanaly* or meta?analy* or (meta* adj2 analy*)).tw.	135324
7	4 and 5 and 6	58
8	limit 7 to (yr=2009-2014 and (english or french))	41

Database(s): CAB Abstracts 1973 to 2014 Week 24, Econlit 1886 to May 2014, Food Science and Technology Abstracts 1969 to 2014 June Week 4, Global Health 1973 to 2014 Week 24, International Pharmaceutical Abstracts 1970 to June 2014, PsycINFO 1806 to June Week 4 2014
Search Strategy:

#	SEARCHES	RESULTS
1	(Malt* or cereal* or grain* or poaceae* or gramineae* or buckwheat* or quinoa* or chenopod* or amaranth* or fagopyr* or pseudo?cereal* or grass* or oat* or barley* or maize* or corn* or millet* or rice* or rye* or wheat* or sorghum* or tritic* or fonio* or spelt* or einkorn* or emmer* or durum* or Andropogoneae* or Panicoideae* or zea* or Hordeum* or vulgare* or sativa* or digitaria* or Polygonac* or gramin* or teff or farro or einhorn or kamut or durum or bran).ti.	722597
2	((whole* or intact* or in?tact*) adj2 grain*).ti,ab.	8524
3	or/1-2	725980
4	(diabet* or pre?diabet* or (pre adj2 diabet*)).tw.	179825
5	((systemat* adj2 review*) or metaanaly* or meta?analy* or (meta* adj2 analy*)).tw.	79954
6	3 and 4 and 5	72
7	limit 6 to (yr=2009-2014 and (english or french))	53

teff OR farro OR einhorn OR kamut OR durum OR bran

Scopus

((TITLE(malt* OR cereal* OR grain* OR poaceae* OR gramineae* OR buckwheat* OR quinoa* OR chenopod* OR amaranth* or fagopyr* OR pseudo?cereal* OR grass* OR oat* OR barley* OR maize* OR corn* OR millet* OR rice* OR rye* OR wheat* OR sorghum* OR tritic* OR fonio* OR spelt* OR einkorn* OR emmer* OR durum* OR andropogoneae* or panicoideae* OR zea* OR hordeum* OR vulgare* OR sativa* OR digitaria* OR polygonac* OR gramin* OR teff OR farro OR einhorn OR kamut OR durum OR bran)) OR (TITLE-ABS-KEY(((whole* OR intact* OR in?tact*) W/2 grain*)))) AND (TITLE-ABS-KEY(diabet* OR pre?diabet* OR (pre w/e diabet*))) AND (TITLE-ABS-KEY(((systemat* W/2 review*) OR metaanaly* OR meta?analy* OR (meta* W/2 analy*))) AND PUBYEAR > 2008 AND (LIMIT-TO(LANGUAGE, "English"))

Appendix I: Glossary of terms

Acceptable Macronutrient Distribution Range (AMDR):

A range of intakes for a particular energy source that is associated with reduced risk of chronic disease while providing adequate intakes of essential nutrients; expressed as a percentage of total energy intake.

Adequate Intake (AI): A recommended average daily nutrient intake level based on observed or experimentally determined approximations or estimates of nutrient intake by a group (or groups) of apparently healthy people who are assumed to be maintaining an adequate nutritional state.

Canadian Nutrient File (CNF): A computerized, bilingual food composition database containing average values for nutrients in foods available in Canada. The CNF reports up to 152 nutrients in over 5690 foods.

CNF/CFG classification: A classification system that assigns foods within the Canadian Nutrient File to categories based on how closely they align with Food Guide guidance. The following terms describe the sub-groups within the category “all other foods”:

- **Non-alcoholic beverages:** Includes beverages such as fruit drinks or cocktails, sports drinks, carbonated drinks, coffee, and tea.
- **Uncategorized foods:** Ingredients, seasonings and unprepared foods such as unprepared mixes, dehydrated and condensed soups, spices and herbs, condiments and other foods that are usually eaten in quantities not large enough to contribute to a Food Guide Serving.
- **High-fat and/or high-sugar foods:** Foods high in sugar and/or fat that could not be assigned into one of the four major food groups of CFG. Examples include candies, chocolate, syrups, and sauces as well as high fat/sugar foods that are usually eaten in quantities not large enough to contribute to a Food Guide Serving.
- **Foods and beverages that are not classified:** Some foods could not be categorized within the CNF/CFG classification due to missing nutrient information (e.g. missing sugar values or saturated fat values). Other foods in this group that were not classified are infant formulas and most baby foods. This category also includes mixed dishes within the CNF database. These mixed dishes do not have ingredient proportions and thus could not be classified.

Dietary Reference Intakes (DRI): The Dietary Reference Intakes (DRIs) are a set of scientifically based nutrient reference values for healthy populations.

Eating habits and behaviours: Refers to how Canadians eat (e.g. frequency of eating occasions) and ways they obtain and use foods (e.g. frequency of fast food consumption, food skills).

Estimated Average Requirement (EAR): The median usual intake value that is estimated to meet the requirement of half the healthy individuals in a life-stage and sex group.

Food and nutrient intakes: Types and amounts of foods and food groups, and the prevalence of nutrient inadequacy or excess in the population and subgroups of the population. This includes available information on the use of vitamin and mineral supplements.

Food supply: Foods available in the marketplace and the nutritional composition of foods.

Health status: Prevalence of nutrition-related chronic diseases and conditions of public health interest, as well as changes in the nutritional status of the population and subgroups of the population.

Nutrition information environment: Sources of information related to nutrition that Canadians are exposed to, and that can either complement or contradict Canadian dietary guidance (e.g. messages used to market products).

Policy: An official guideline or set of guidelines for the intentions, goals and actions of an organization in accomplishing specified objectives.

Tolerable Upper Intake Level (UL): The highest level of continuing daily nutrient intake that is likely to pose no risk of adverse health effects in almost all individuals in the life-stage group for which it has been designed.