



# **Nutrition and physical activity guidelines for different populations**

Review of Scientific Evidence and Policies on Nutrition and Physical Activity-Objective E: A comprehensive review of the scientific evidence about the existence, need and usefulness of nutrition and physical activity guidelines for specific population groups

## **Summary Report**



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Directorate-General for Health and Food Safety  
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## **Preface**

### **About this project**

Overweight, obesity and their related diseases represent a leading cause of morbidity and mortality, and pose a major challenge for the sustainability of healthcare systems of EU Member States. The growing prevalence of overweight and obesity among all age groups across Europe constitutes a serious concern for policy makers. Tackling this issue requires a comprehensive response that reflects the multifactorial and complex nature of obesity and overweight. One particularly important area of focus has been on the development of preventative strategies which include nutritional and physical activity interventions.

The European Commission Directorate General for Health and Food Safety (DG SANTE) recognises the significant challenges policy makers face in developing effective and efficient policy interventions relating to diet and physical activity. One such challenge includes the complexity and breadth of the evidence base. By providing independent, accurate summaries of recent and relevant information and statistics on determinants of diet and physical activity and their impact on health, this project aims to support policy makers to continue to develop policy instruments which enable people to make healthier lifestyle choices. In particular, this project aims to support the development of healthier behaviours in vulnerable and/or at-risk subpopulations (including children, pregnant and lactating women, and older adults) and low socio-economic status groups (including low income and education).

### **About this series**

This evidence review is one of eight reviews relating to different determinants of diet and physical activity.

Seven of the reviews are of the scientific evidence and policies in the following areas:

- Knowledge, attitudes and behaviours contributing to positive energy balance (objective area A1);
- Dietary and physical activity patterns in Europe (objective area B1);
- Consumption of fruit juices, artificially and sugar-sweetened beverages and its impact on weight status and health (objective area B2);
- Consumption of high-fructose syrup and its impact on weight status and health (objective area B3);
- Relationship between weight status and physical activity with school and work performance outcomes (objective area C);
- Early warning indicators of obesity and physical inactivity trends (objective area D);
- Nutrition and physical activity guidelines for specific population groups (objective area E).

Building on these seven reviews, the final review (objective area A2) examines specifically the evidence for effective and efficient policies and interventions in terms of promoting, supporting and improving nutritional and physical activity behaviours at both individual and population level.

All reviews, and their summaries, are available on the DG SANTE webpage [here](#).

### **Approach and purpose**

The reviews have been designed to provide policymakers with summaries of recent and relevant evidence in these key areas of interest. Given the broad scope of each of the reviews, it should be stressed that they are not intended to be rigorous systematic reviews of all literature published in this field. Rather, they are intended as pragmatic reviews combining a comprehensive search methodology with expert academic input, facilitated through workshops, to provide a practical and accurate summary of key issues and tackling broad lines of enquiry, with the greater aim of supporting the

development and improvement of policies in this area. Each of the project's eight methodologies and analyses was reviewed by DG SANTE and academic experts in these topics.

While the methods to conduct this comprehensive literature review are systematic, it is *not* a systematic review. This review does not systematically analyse literature to identify *all* relevant published data and/or appraise its quality. Methods to conduct the literature review consisted of five steps: (1) refining the research questions, (2) developing a search approach and databases, (3) conducting literature searches, (4) screening articles for inclusion; and (5) abstracting and synthesising relevant data.

To minimise bias, the literature search approach included identification of a priori search parameters (also considered first level inclusion and exclusion criteria), agreed with DG SANTE, to guide searches and inform screening and selection processes for data inclusion. Due to the immense number of literature search results at step 3, the application of quite limiting exclusion criteria at step 4 was deemed necessary. This may however have resulted in not screening all potentially relevant literature. All relevant articles that were found appropriate for inclusion were reviewed for relevance to each objective area, and the scope of the specific research questions. Furthermore, the inclusion of different types of scientific evidence (from systematic reviews and peer-reviewed original articles down to BSc theses) and the presentation of this scientific evidence next to grey literature information presented a challenge in terms of maintaining an understanding of the quality and weight of the evidence. The authors addressed this to some extent by structuring the document in such a way that peer-reviewed and grey literature are clearly identified. The full methodology and steps taken for each review is included in Annex of the full literature review documents.

DG SANTE and the Joint Research Centre (JRC) provided input on all stages of the project and comments on the literature reviews. Expert workshops were organised to discuss findings, highlight additional relevant sources to fill gaps and improve the series of reviews. Experts were carefully selected from academic and policy-making fields, based on expertise of the specific topics addressed.

The methodology used across all eight reviews remained consistent, and within each review a detailed summary of the approach is provided, along with a full bibliography for further reading.

## **Objective E: Existence, need and usefulness of nutrition and physical activity guidelines for specific population groups**

This review describes the scientific evidence on the need and usefulness of nutrition and physical activity guidelines for specific population groups at national and European level. The population groups discussed include children, older adults, pregnant and breastfeeding women, patients with specific diseases, people of certain Body-Mass Index (BMI) or the physically inactive.

### **1.1 Scope of the review**

To ensure the most relevant sources were reviewed, we focused primarily on literature published after 2005, unless otherwise stated. It was outside the scope of the review to map all existing current nutritional and physical activity guidelines but for guidelines identified in the sources included, the exact content of existing guidelines mentioned are included (in the full review, rather than this summary document). Effective policies relating to the provision of guidelines are described in another review in the series, Objective A2.

### **1.2 Methodology**

The review is based primarily on peer reviewed literature with grey literature used to supplement any gaps (but treated with caution and the strength of the evidence assessed). Given the types of questions addressed in this review, publicly available datasets which were commonly referenced in both literature searches were analysed further to identify additional trends and patterns. A full description of the methodology used for all literature reviews can be found in the original source documents. A detailed methodology is available in the full review report. The review draws on 25 peer review and 11 grey literature sources selected as relevant. These findings were presented at an expert workshop, following which a further 3 peer review and 4 grey literature sources were added.

### **1.3 Research questions for this review**

In this review, we focus on the most current literature (peer reviewed research and systematic reviews, as well as grey literature) with the goal of answering the research questions listed below.

- What would be the health impact of providing guidelines for improving the nutrition and physical activity of certain population groups?
- What are the consequences of overweight, obesity and physical (in) activity in terms of health outcomes and recovery times?

## **What would be the health impacts of providing guidelines for improving the nutrition and physical activity of certain population groups?**

Much of the evidence found was focused on describing guidelines and recommendations, and the general effects that nutrition and physical activity can have on health, rather than evaluating the impact of guidelines themselves. This section summarises the key findings based on a body of evidence found.

### **Nutritional guidelines**

Statistical modelling has demonstrated that adherence to dietary recommendations can have a positive health impact and reduce the number of deaths attributable to cancer and cardiovascular disease among adults. Scarborough et al. (2012) and Belanger et al. (2014), found that adhering to dietary guidelines for fruit, vegetable, saturated fat, and salt consumption, could lead to a reduction of 33,000 deaths per year (among people aged 75 years or younger) from stroke, cardiovascular disease, and cancer in the UK (Scarborough et al., 2012) and 30,540 deaths per year in Canada (Belanger et al, 2014). In the modelling for Canada, recommendations for fruit and vegetable intake demonstrated the most potential for mortality prevention.

Among children, following nutritional guidelines has been found to reduce the risk of cardiovascular disease in particular. A review by Gidding et al. (2005) found that children from the age of 2 years and older should follow the same dietary requirements as adults to reduce this risk- this includes decreasing the intake of sugar-sweetened beverages, increasing the consumption of fish, especially oily fish, and reducing salt intake, including salt from processed foods.

The WHO Regional Office for Europe (2016), highlight the importance of promoting nutritional guidelines to pregnant and breastfeeding women, to ensure the better health of both the mother and child. From cross-country surveys conducted, they found that not all countries in the region do offer specific guidelines for pregnant women and recent observational studies in Canada indicate that pregnant women's adherence to national dietary recommendations there is low (Jarman, Bell, Nerenberg, and Robson, 2017). This suggests a need for nutritional guidelines to be particularly promoted towards pregnant women, in order to have any impact at all.

There is uncertainty over whether specific nutritional guidelines for older individuals would have more positive health impacts than those for all adults in general. Due to a decreased energy use among adults over 70, the Modified Food Pyramid created by Lichtenstein et al. (2008), widely used in US state educational materials, recommends a reduced calorie intake, but a similar or increased vitamin and mineral intake to the level recommended for adults generally. However, a feasibility study on dietary recommendations for older adults in the European Union, while agreeing about the need for specific nutrient-related recommendations for older adults, found that the existing dietary recommendations for healthy adults are appropriate for this population (Mak 2014). More research is needed in this area to determine which guidelines have the most health impact for the older adult population and how the guidelines can be achieved.

### **Physical activity guidelines**

While there is limited evidence available evaluating the impact of physical activity guidelines for children and adolescent in particular, there is a general consensus in the literature that regular physical activity in all ages is associated with immediate and long-term physical and psychological wellbeing. International and national reviews of observational and experimental evidence (published as grey literature) have found that both moderate and vigorous intensity physical activity are positively associated with more favourable health outcomes, and improvements in health-related measures, in children, adolescents and adults, although moderate activity does not lead to the



same level of improved cardio-respiratory fitness (WHO, 2010; UK Department for Health, 2011, Nordic Council of Ministers, 2014).

However, people who are overweight or obese may first need to work at a lower intensity for longer than the 150 minutes recommended for all adults. Based on a review of evidence underpinning their recommendations, the UK Department for Health (2011) advise that this should also be accompanied by dietary changes to reduce calorie intake. They recommend further that people who are overweight or obese should aim to gradually build up to 150 minutes of moderate intensity activity per week before increasing intensity but this will provide substantial health benefits even in the absence of reductions in body weight (UK Department for Health, 2011).

Nevertheless, the grey literature suggests that physical activity guidelines should not differ between adult population groups, unless individuals have specific health conditions. Adults with disabilities are encouraged to follow recommendations made for general populations, although it is acknowledged that adjustments may need to be made for individuals' capacity for exercise and specific health risks or limitations (WHO, 2010; UK Department of Health, 2011). For older adults, Nelson et al. (2007), based on evidence from an expert panel, found that guidelines for regular physical activity in older adults (similar to those for all adults but with additions relating to age-related health limitations) can reduce the risk of or help manage NCDs, reduce the risk of depression and anxiety, and have a dose-responsive association with the prevention of weight gain .

For population sub-groups who do have specific health conditions, it is widely recognised in the literature that nutrition and physical activity guidelines should be adapted to the individual. For example, scientific reviews of evidence have found that regular physical activity (and insulin management measures) can help prevent or delay the onset of diabetes-specific complications such as numbness of the limbs (neuropathy), retina damage/vision impairment and kidney damage (Hayes and Kriska, 2008), but should be specific to the type of diabetes (Mann et al., 2004).

### **Factors influencing the effectiveness of guidelines**

The grey literature suggests that there are other factors that can affect the health impact of guidelines and that guidelines alone cannot change people's behaviour (UK Department of Health, 2011). For physical activity guidelines to have a large health impact, they must be accompanied by concerted actions that create environments and conditions that make it easier for people to be more physically active and less sedentary (UK Department of Health, 2011).

### **What are the consequences of overweight obesity, and physical (in)activity in health outcomes and recovery times?**

Research indicates that being overweight, obese or physically inactive can increase the adverse effects of NCDs such as cardiovascular disease, diabetes and cancer, and can cause difficulties after physical injury or during pregnancy. This highlights the importance of providing guidelines in order to encourage prevention of these health statuses. The evidence identified did not always link guideline-specific levels of dietary consumption or physical inactivity to their health consequences, but does enable an understanding of the general effect of nutrition (for example, the benefits of specific diets) and physical activity in these areas.

### **Cardiovascular Disease**

Regular physical activity can help manage cardiovascular disease in individuals through improving blood pressure and cholesterol levels. A meta-analysis of 48 randomised controlled trials (RCTs) (Thompson and Franklin, 2004) found that exercise-based rehabilitation after a heart attack can reduce mortality rates by 20% reduction in total mortality and 26% in cardiac mortality in patients enrolled in cardiac rehabilitation programs.

In fact, levels of aerobic fitness could have greater impact on health outcomes from cardiovascular disease than the presence of obesity. A systematic review of international studies by Fogelholm (2010) looking at cardio-respiratory fitness (or physical inactivity) found that the risk for all-cause and cardiovascular mortality was lower in individuals with high BMI and good aerobic fitness, compared with individuals with normal BMI and poor fitness. However, having high BMI even with high physical activity was a greater risk for the incidence of type 2 diabetes and the prevalence of cardiovascular and diabetes risk factors, compared with normal BMI with high physical activity.

Specific diets can contribute to primary and secondary prevention of, and health outcomes from, cardiovascular disease. A review of meta-analyses (Eilat-Adar et al., 2013) showed that following a Mediterranean diet<sup>1</sup> of high fat intake could reduce cardiovascular morbidity and mortality, while Ignarro et al. (2007), found that diets high in fibre can reduce the risk of cardiovascular disease, and diets high in omega-3 fatty acids can reduce inflammation and prevent vascular calcification.

### **Cancer**

International and national cancer research institutes have highlighted that the avoidance of weight gain can prevent the risk of some cancers. The World Cancer Research Fund, based on international peer-reviewed epidemiological studies, estimates that a third of the most common cancers in high income countries, and roughly a quarter of cancers in lower income countries, could be prevented through healthier dietary behaviour, being physically active, and keeping a constant healthy weight (World Cancer Research Fund International / American Institute for Cancer Research, n.d.).

For those who already suffer from cancer, physical activity may be associated with improved survival rates and lower risks of reoccurrence, but this has so far only been established by observational studies (Rock et al. 2012). This was identified by an expert panel, reviewing scientific evidence and best clinical practices on nutrition and physical activity recommendations for individuals diagnosed with cancer, that also found strong evidence that physical activity can positively impact physical functioning, fatigue and quality of life of cancer patients (Rock et al. , 2012). This improvement in physical functioning was further identified by a systematic review and meta-analysis, which found that exercise of a moderate intensity for cancer survivors can reduce fatigue and improve mobility (Dennett et al., 2016).

Among breast cancer patients in particular, physiotherapy as a form of physical activity can improve the recovery time after surgery. A systematic review of international research found that physiotherapy was found to be effective in improving outcomes such as range of motion and shoulder function, especially when initiated early after surgery (Chung, Hwang and Park, 2013). Interventions that had supervised exercise activities achieved higher adherence than self-directed ones, and thus provided more benefits.

### **Physical injury**

Obesity and overweight can increase the risk of sustaining injury in adults. An analysis of a large US dataset Finkelstein et al. (2007) found the odds of sustaining an injury to be 15% for people who are overweight increased to 48% for obese people with BMI values of 35-40. Their results suggested that the incidence of injuries related to falls will likely increase as obesity rates continue to rise, along with increases in sprains/strains, lower extremity fractures, and joint dislocations.

For young people, recovery times from more complex injuries can also be affected by weight. In a cross-sectional analysis, Warsh, Jansen, and Pickett (2010) found that

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<sup>1</sup> Mediterranean diet includes high fat intake (40-50% total daily calories) with saturated fat comprising ≤8% and mono-unsaturated fat comprising 15-25% of total calories.

students who experienced a combined injury (e.g. broken bone and ankle sprain) and who were obese took longer to recover than normal weight students. However, there was not a statistically significant difference in recovery time for either broken bones or sprains or strains as individual injuries.

### **Pregnancy**

For pregnant women, maternal obesity, before and after conception, can increase the risk of pregnancy related complications. A review of evidence on maternal nutrition (Poston et al. 2016) found that pre-pregnancy overweight and obesity are associated with impaired fertility, higher risk of preterm birth, difficulties during labour and delivery, risk of post-partum haemorrhage, co-morbidities, and mortality. Maternal nutrition is also associated with an increased risk of gestational hypertension and diabetes, which are strongly correlated with large-for-gestational-age infants and can alter the offspring's glucose and lipid metabolism and induce hypertension.

### **Conclusion**

There is limited evidence assessing the health impact of providing guidelines to specific populations. Beyond a small number of studies, for example, looking at the dose-response association established between the amount of moderate-to-vigorous physical activity and health benefits, the experimental evidence base mainly provides general rationale for nutritional and physical activity guidelines, for example, the impact of maternal nutrition during pregnancy on the health and future health of the unborn child. Apart from statistical modelling, it has not been well established how the act of providing guidelines specifically affects these health outcomes – further research is required in this area. The effectiveness of guidelines can vary depending on the context in which guidelines are implemented and the target population. Additional research is needed on the impact of the social, environmental, and political environment in which guidelines are implemented to understand how guidelines can be used in the most effective and efficient way.

Despite this, the rationale and need for providing nutritional and physical activity guidelines to different populations remains clear, given the different potential health outcomes associated with poor nutrition, overweight and obesity, and physical (in)activity. These include the increased risk of diseases, particularly type 2 diabetes and cardiovascular diseases, and BMI appears to have an association with an increased risk of injury and longer recovery times after injury. Diet and physical activity can also play an important role in both the prevention and management of NCDs, necessitating the need for guidelines for people with different conditions.

## Annex 1 Peer reviewed literature bibliography

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### Annex 3 Glossary

The following definitions are common definitions that are used across all eight objective areas. Where a study uses a different definition, this is highlighted on an individual basis in the review reports.

Table 1. Definitions of terms used across the reviews

| Term                                    | Definition  | Source  |
|---|---|---|
| Adult obesity                           | An abnormal or excessive fat accumulation that presents a risk to health, with a BMI of 30 or more.   | World Health Organisation (WHO) ( <a href="http://www.who.int/topics/obesity/en/">http://www.who.int/topics/obesity/en/</a> )   |
| Adult overweight                        | An abnormal or excessive fat accumulation that presents a risk to health, with a BMI equal to or more than 25.  | WHO ( <a href="http://www.who.int/topics/obesity/en/">http://www.who.int/topics/obesity/en/</a> )   |
| Alcopops                                | Pre-mixed beverages containing a spirit, wine or malt combined with a non-alcoholic drink.  | 1. Anderson, P., Suhrcke, M. and Brookes, C. (2012) An overview of the market for alcohol beverages of potentially particular appeal to minors. London: HAPI.   |
| Artificially sweetened beverages (ASBs) | Beverages sweetened with low-calorie or zero-calories sweeteners such as sucralose, aspartame, saccharin, stevia or sugar alcohols.   | ICF definition based on all literature identified in objective area B2 literature review  |
| Body Mass Index                         | A person's weight (in kilograms) divided by the square of his or her height (in metres).  | WHO ( <a href="http://apps.who.int/bmi/index.jsp?introPage=intro_3.html">http://apps.who.int/bmi/index.jsp?introPage=intro_3.html</a> )   |
| Child/adolescent obesity                | There are different systems available to measure child or adolescent obesity for different ages.<br><br>Children under 5 obesity is weight-for-height greater than 3 standard deviations above WHO Child Growth Standards median;<br><br>Children aged 5-19 overweight is BMI-for-age greater than 2 standard deviation above the WHO | WHO<br><a href="http://www.who.int/mediacentre/factsheets/fs311/en/">http://www.who.int/mediacentre/factsheets/fs311/en/</a><br><br>(Other definitions are available for different national and international systems). |

| Term                           | Definition  | Source   |
|--------------------------------|---|--|
|                                | Growth Reference median.  |  |
| Child/adolescent overweight    | <p>There are different systems available to measure child or adolescent overweight for different ages.</p> <p>Children under 5 overweight is weight-for-height greater than 2 standard deviations above WHO Child Growth Standards median;</p> <p>Children aged 5-19 overweight is BMI-for-age greater than 1 standard deviation above the WHO Growth Reference median.</p> | <p>WHO</p> <p><a href="http://www.who.int/mediacentre/factsheets/fs311/en/">http://www.who.int/mediacentre/factsheets/fs311/en/</a></p> <p>(Other definitions are available for different national and international systems).</p> |
| Exercise                       | <p>Exercise, is a subcategory of physical activity that is planned, structured, repetitive, and purposeful in the sense that the improvement or maintenance of one or more components of physical fitness is the objective.</p>   | <p>WHO</p> <p>(<a href="http://www.who.int/dietphysicalactivity/pa/en/">http://www.who.int/dietphysicalactivity/pa/en/</a>)</p>  |
| Insufficient physical activity | <p>Physical activity that does not meet WHO recommended levels of at least 60 minutes a day of moderate-vigorous activity for children and adolescents and at least 150 minutes of moderate-intensity aerobic physical activity throughout the week for adults.</p>   | <p>WHO</p> <p><a href="http://www.who.int/mediacentre/factsheets/fs385/en/">http://www.who.int/mediacentre/factsheets/fs385/en/</a></p>  |
| Physical activity              | <p>Any bodily movement produced by skeletal muscles that requires energy expenditure.</p>   | <p>WHO</p> <p>(<a href="http://www.who.int/topics/physical_activity/en/">http://www.who.int/topics/physical_activity/en/</a>)</p>  |
| Physical inactivity            | <p>A lack of physical activity</p>  | <p>WHO</p> <p>(<a href="http://www.who.int/dietphysicalactivity/pa/en/">http://www.who.int/dietphysicalactivity/pa/en/</a>)</p>  |
| Sedentary behaviour            | <p>Any waking behaviour characterized by an</p>   | <p>Tremblay, M. S., et al. (2017). Sedentary</p>   |



| Term                             | Definition  | Source   |
|----------------------------------|---|--|
|                                  | energy expenditure $\leq 1.5$ metabolic equivalents (METs) while in a sitting or reclining posture.   | Behavior Research Network (SBRN) – Terminology Consensus Project process and outcome. <i>The International Journal of Behavioral Nutrition and Physical Activity</i> , 14, 75. <a href="http://doi.org/10.1186/s12966-017-0525-8">http://doi.org/10.1186/s12966-017-0525-8</a> |
| Sugar sweetened beverages (SSBs) | Any beverage with added sugars. This includes soft drinks, soda, fruit drinks, punch, sports drinks, sweetened tea and coffee drinks, energy drinks and sweetened milk. These beverages may be sweetened with added sugars such as sucrose (table sugar) or high fructose corn syrup, which is what distinguishes them from 100% fruit juice and beverages with non-caloric sweeteners (e.g., aspartame, saccharin or sucralose). | US Department of Agriculture. 2010. <i>US Department of Health and Human Services. Dietary guidelines for Americans, 2010</i> . 7th edition, Washington (DC): US Government Printing Office  |

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