



Calorie consumption and physical activity engagement: patterns and trends in Europe

Review of Scientific Evidence and Policies on Nutrition and Physical Activity-Objective B1: A comprehensive review of the scientific evidence about the source of calories consumed and types and frequency of physical activity among Europeans

Summary Report



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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 B1: A comprehensive review of the scientific evidence about the source of calories consumed and types and frequency of physical activity among Europeans

This review aims to capture current consumption and physical activity levels in Europe, comparing how these have changed over time. Whilst recognising that the link between the two is important in discussions about weight status and obesity, this review is intended to provide a high-level overview of current practices among Europeans and not to comment on overall energy balance (as examined in a separate review- Objective A1- published as part of this series).

1.1 Scope of this review

To ensure the most relevant sources were reviewed, we:

- Focused on studies and reports with the most recent data (published after 2004, unless stated) and excluded studies and reports with (older) data less relevant to the situation today;
- Did not exclusively focus our search on high fructose corn syrup or sugar sweetened beverages (SSBs) as related literature was the focus of Objective B3 and Objective B2 reports, respectively; however findings from the current review include SSBs or sugar when it was one of the food groups assessed; and
- Did not search for food expenditure, purchasing or availability data, unless there was a lack of information about consumption patterns.

1.2 Methodology

The review is based primarily on peer reviewed literature and information from datasets (which is prioritised), 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 20 peer review and 58 grey literature sources selected as relevant. These findings were presented at an expert workshop, following which a further 30 peer review and 20 grey literature sources were added.

1.3 Research questions

In this review, we focus on the most current literature (peer reviewed research and systematic reviews, as well as grey literature) on dietary and physical activity behaviours among Europeans with the goal of answering the research questions listed below. Research questions are grouped by those relating to dietary and consumption habits (RQ1 and RQ2) and by those relating to physical activity (RQ3 and RQ4):

- RQ1: What and how much do Europeans eat and drink, what kinds of food groups are more relevant and what trends are noticeable?
- RQ2: When and where do Europeans eat and drink?
- RQ3: How much physical activity do Europeans engage in?
- RQ4: What types of exercises are Europeans engaging in?

What and how much do Europeans eat and drink, what kinds of food groups are more relevant and what trends are noticeable?

This section focuses on the eating habits of Europeans by examining **how many calories** Europeans consume and **what types of products** according to food groups and trends in average consumption patterns over time (measured by energy intake and portion size). We do not make judgements about the health consequences of particular diets, energy intakes or portion sizes.

How much do Europeans eat and drink?

Although they vary between countries and by age, the average recommended daily intake (RDI) is around 2,500 and 2,000 kcal for men and women (respectively) engaged in moderate amounts of daily physical activity (Public Health Evaluation and Impact Assessment, 2013). Research in eight countries found that on average, energy intake was higher among boys than girls and increases with age (Hebestreit et al. 2016), whilst energy intake declines with age for older adults (de Groot et al., 2004).

In recent decades there have been relatively minor changes in the amount of food consumed in the EU, however, as most dietary data is self-reported, it is difficult to estimate and quantify portion sizes in order to assess consumption patterns among Europeans (Souverein et al, 2011). The ongoing EU Menu project will help to provide more harmonised food consumption data on portion sizes.

Dietary records indicate that fluid intake in Europe is in line with the recommended range of 1500-2000 mL/day. Water is the most commonly consumed beverage throughout Europe; tap water consumption is highest in Austria, whilst bottled water, fruit and vegetable juices and soft drinks were consumed most in Germany (Elmadfa and Meyer, 2015). Fluid intake varies by demographic and lifestyle factors.

What do Europeans eat and drink?

Research shows an overall increase in the total energy available per capita per day for each European region, with a specific increase in the percentage of energy from fats; and a decrease in the percentage of energy from carbohydrates (Balanza et al., 2007; Elmadfa et al., 2009). Higher availability is linked to more choices for Europeans in terms of what they eat and drink, creating demands for 'higher quality' produce e.g. retail sales in the EU organic market increased by 7.4% from 2013 to 2014 (Meredith and Willer, 2016).

One commonly studied aspect is adherence to a Mediterranean-like dietary pattern (a diet mainly based on vegetables, fruits, beans and pulses, wholegrains, fish and using olive oil instead of other fats). However, research has found that European countries (including Mediterranean countries), are increasingly moving away from the Mediterranean diet (for example: Vareiro et al., 2009, van Dooren and Kramer, 2012).

Consumption of core food groups

This section summarises the dietary habits of Europeans, and is structured on the core food groups specified in the eatwell.co.uk food pyramid (UK Food Standards Agency).

Vegetables, salad and fruit are often associated with a healthy diet (European Food Information Council (EUFIC), 2012). National dietary guidelines compiled by the Food and Agriculture Organisation of the United Nations (FAO) indicate that most MSs follow the WHO recommendation of a minimum intake of 400g or five different portions of fruit and vegetables a day, though there is some variation. Regardless, average intake of fruit and vegetables among EU populations is still poor; EHIS (2016) data shows only 14.1% eat the recommended five or more portions of fruit or vegetables a day.

Daily consumption of vegetables, salad and fruits does vary among different populations however. Findings from the EHIS Survey (2016) show over half of the

population in Romania and Bulgaria (65.1% and 58.6% respectively) report no consumption of fruit and vegetables on a daily basis, compared to Belgium which has the smallest proportion of people reporting zero consumption (16.1 %). Respondents in the United Kingdom also report high levels of daily fruit and vegetable consumption, with a third of all respondents consuming more than five fruits and vegetables a day. Freshfel's Activity Report (2016) estimates that the increase in consumption of vegetables between 2012 and 2013 was much lower than for fruit (0.5%).

Higher levels of fruit and vegetable intake are reported among females across all age groups, and older age groups compared to those aged 15-24 (particularly adolescents) (EHIS 2016, HBSC 2016). Socio-economic status is also a key influencing factor on fruit and vegetable consumption (Douglas et al., 2014; Gordon, Robinson and McCartney, 2011) due to knowledge or education, and availability and price.

Wholemeal cereals and breads, potatoes, pasta and rice are the main dietary source of starch (a glycaemic carbohydrate), and also contribute to dietary fibre intake (EFSA, 2010). Dietary guidelines for breads, cereals, potatoes, pasta and rice in Europe vary from recommending 2-4 to 8-10 servings a day (WHO, 2003) and in general, WHO and national authorities tend to encourage the consumption of starchy and fibre-rich foods for this category.

Elmadfa et al. (2009) summarise that bread and potatoes are important components of meals in Northern, Central and Eastern Europe. The consumption of wholemeal foods is not measured routinely in national dietary surveys, but some national data reported by EUFIC (2015) suggests that high proportions of the public do not eat wholegrain at all. Even in Nordic countries, where higher intakes of wholemeal products are observed, average intakes appear to still fall short of the current recommended level of 75 g/day, with only between 16% (of Danish men) and 35% (of Norwegian women) meeting national guidelines. This is likely a result of the increased availability of cheaper 'refined carbohydrates' (Fulponi, 2009).

Milk, yoghurt and cheese are an important source of animal protein and fat. There are large differences in consumption, reflecting the differing recommendations in guidelines among MSs in the Southern and Northern regions of Europe (Elmadfa et al., 2009); this is also reflected in the differences between guidelines. Westhoek et al. (2011 citing FAO 2006) note high levels of dairy consumption (>50%) in Finland and Sweden; high cheese consumption in France, Denmark, the Netherlands and Greece; and high milk consumption in Ireland and Finland. Sweden has equally high consumption levels for both milk and cheese.

Meat, poultry, fish, eggs, beans and nuts are useful sources of protein. Guidelines vary considerably across the region (WHO, 2003) though tend to emphasise eating lean cuts of meat; restricting red meat; and more fish, pulses and eggs. Overall, EU citizens consume roughly 68.3kg per capita of meat (excluding fish) per year – this is more than the world average (OECD 2016), with a reported 2% increase in consumption between 1995 and 2011 (most of this increase occurred before 2008, and there was a notable decrease in beef consumption attributable to the bovine spongiform encephalopathy crisis) (EEA, 2016). Over the same period, fish and seafood consumption has also increased (especially freshwater fish consumption).

- The consumption of meat and eggs remains highest in Central and Eastern Europe. Fish and seafood are the largest contributors of animal protein consumption in Spain, Greece and Norway (compared to processed meat in Germany and the Netherlands) (Elmadfa et al., 2009).
- Average red meat consumption (37kg per capita per year) is higher the recommended 16kg a year but fish and seafood remains below RDI in most countries (Westhoek et al. 2011).

- Non-animal food products in this food category, i.e. legumes, beans and nuts, seem to have grown in popularity in recent years, as 'natural' meat replacements for healthy or restricted/specialised diets (WWF, 2017).

Fats, spreads and oils are a valuable source of concentrated energy and contain essential fatty acids (Woodgate and van der Veen, 2014). Nevertheless, WHO (2003) guidelines recommend restricting total dietary fats to under 30% of daily energy intakes, and emphasise limiting 'bad' fats (e.g. saturated fat). Nonetheless, Europeans still eat too much saturated fat, with consumption levels on average 40% higher than the maximum recommended by WHO guidelines (Westhoek et al., 2011).

Worldwide, 134 million tonnes of natural animal and vegetable fats and oils are consumed every year (REA, 2013, cited in Woodgate and van der Veen, 2014). Elmadfa et al. (2009) found that the highest intake of fats was reported in the Central and Eastern region (at around 39g/capita/day), and the lowest intakes were reported in the Western region (28g/capita/day). Tennant and Gosling (2015) also found that vegetable oils make up a significant part of the energy intake in typical European diets, especially in the South.

Foods high in fat, sugar and salt are a common source of calories for individuals in the EU (due to their accessibility and taste), but guidelines for this food group are focused on limiting intake (e.g. no consume more than 5g of salt a day). In general, the average European will consume nearly 1kg of sugar a month. Sugar intake is highest amongst individuals living in Eastern European countries (Latvia and Lithuania) and 'newer' MSs, and tends to be lowest among the EU-15 countries. Salt intake is highest in Hungary (at 15g per day), Croatia, the Czech Republic and Bulgaria (all 14g per day). Nearly all countries exceed the 5g target in the EU (EUFIC, 2010). National estimates suggest that salt consumption does appear to be decreasing in some MSs e.g. Finland, France and Lithuania, though this still may exceed RDI.

Children tend to be prevalent consumers of foods and drinks high in fat, sugar and salt (Krølner et al., 2011) and commonly eat foods that are characterised as heavily processed, for example, high consumption of dessert foods/confectionaries in Germany (Fernandez-Alvira et al., 2014); and high consumption of sweets in French-Belgium and Scotland (HBSC 2016). Higher than recommended intakes of sugar-sweetened beverages among children across Europe are also noted.

When and where do Europeans eat and drink?

This section summarises patterns in when and where Europeans eat and drink, including out-of-home eating patterns. Future studies should aim to standardise and improve research in this area.

When do Europeans eat and drink?

The frequency and timing of eating and drinking occasions appears to vary considerably by MSs. Park et al (2017) found that mean eating frequency ranges between countries, from 4.3 times a day in France to 7.1 times a day in the Netherlands. Huseinovic et al (2016) also found a 'south-north gradient' in intake frequency e.g. mean intake frequency for women ranged from 5 times a day in Greece and Italy, to 7 times a day in the Netherlands, and for men from 4.9 times a day in Italy to 6.8 times in the United Kingdom.

A substantial amount of research on meals is focused on children and adolescents:

- Results of the Healthy Lifestyle in Europe by Nutrition in Adolescence (HELENA) study (Hallström et al., 2011) show only half of the adolescents interviewed were 'regular **breakfast** consumers', though daily breakfast consumption has increased over time (between 2002 and 2010) (Lazzeri et al 2016). Consumption was influenced by socio-demographic factors, peer influence, parent encouragement and food choices available. Older children are less likely to eat breakfast daily compared to younger children (HBSC 2016).

- **Lunchtime** food consumption in children and adolescents appears to vary as a result of when and where lunch is consumed. Across Europe, the majority of adolescents eat lunch at home (67%) followed by at school (26%), with absolute lunchtime energy intake ranging from 2425 kJ in school lunches to 2927 kJ elsewhere. High consumption of sweet foods were common when lunch was eaten at home or elsewhere compared to school (Müller et al., 2013).
- Research on **dinner** patterns among children was more limited. The HBSC survey (2016) found only one in five teens eat dinner with their parents, implying that the timing of eating occasions vary even in the same household.

Huseinovic et al. (2016) found that among adults aged 35-74, main meals were consumed regularly (above 85% and 76% consume breakfast and lunch daily, and between 90-99% eat dinner daily – though those in central and European countries appeared to eat lunch less regularly than those in Mediterranean countries). However, older adults ate less regularly than younger adults. de Groot et al (2004) found that dinner is consumed later in Portugal and Spain than in northern European countries, and participants in Netherlands and Switzerland consume foods on more occasions (e.g. five smaller meals rather than the three-meal structure) than those in more southern geographic regions (e.g. Portugal and Italy).

Research on snacking (Huseinovic et al., 2016) shows that snacking contributes to around 23-35% of daily energy intake among adults in Central and Northern European countries, compared to just 10-20% of adults in Mediterranean countries. De Craemer et al. (2015) also found that more than 50 grams per day of unhealthy snacks are consumed across countries (Greece: 53 g/day; Spain: 59 g/day; Germany: 61g/day; Bulgaria: 62 g/day; Poland: 68 g/day; and Belgium 73g/day).

Where do Europeans eat and drink?

Given an increase in eating out-of-home, this section focusses on food eaten and prepared outside of the home. Eating out information (meals, beverages and snacks) from 25,202 individuals (aged 35-64) in seven countries was sought as part of the HECTOR project. Findings suggest that ice cream, sweet and savoury products, non-alcoholic beverages (including soft drinks, hot drinks and juices), beer and spirits tend to be consumed more commonly outside than in the home in all eight countries. However, there was geographic patterning for consumption of other foods:

- Out-of-home consumption was more frequent for fruits in Northern and Central European countries; sugar/sweet products in Italy, Greece and Oporto-Portugal; and red meat in Germany.
- The contribution of out-of-home eating to total energy intake was higher in men than in women, and for Northern and Central European countries than Southern ones (with the exception of Poland, where it was just 15%).

Using a broader definition of 'eating-out' (anywhere lunch and dinner were consumed away from home), D'Addezio et al. (2014) confirmed there were differences in out-of-home lunch and dinner consumption, as well as a significant association between nationality and frequency of eating out. On average, a third of respondents ate lunch out-of-home once or more a week, with high rates observed: in Denmark and Italy; among younger than older respondents; among those who were single rather than married/cohabiting; and among respondents in the 'normal' weight than overweight or obese categories. The proportion of people eating out at lunchtime at least once a week increased with education levels.

An increase in disposable income is another key factor in explaining the general increase in out-of-home food consumption. D'Addezio et al. (2014) found that 6.2% of respondents would eat at cheaper fast-food outlets once or more a week, and takeaway food was most popular for respondents in UK, with 15% eating a takeaway 1-2 times a week (this was least popular for respondents in Belgium). In comparison

to the UK, Polish respondents were 41% less likely to eat pre-packaged meals; and Danish respondents were 50% less likely to eat takeaway food. In addition, females were 41% less likely to eat pre-packaged meals than males.

How much physical activity do Europeans engage in?

This section focuses on **how much** physical activity Europeans engage in (structured according to three broad age groups) by examining: **time** (indicated by duration and frequency), **intensity** (differentiating between moderate levels of effort and vigorous intensity as defined by WHO 2013) and **sedentary behaviour** (linked to but not mutually exclusive with physical inactivity).

Guidelines provide rough benchmarks to understand minimum recommendations for different groups in the population; this section refers to WHO global recommendations for levels of physical activity for three age groups: 5–17 years old, 18–64 years old and 65 years old and above. Most data reported is based on surveys or recall. Studies using objective methods such as accelerometers or pedometers can help to verify the self-reported data collected through surveys or diary logs.

Adults

Just over half (54.2%) of 18-64 year olds in the EU (excluding Ireland and Belgium) seem to be engaging in health-enhancing, non-work related aerobic physical activity each week (EHIS, 2016). Most adults (22%) tend to perform 1-150 minutes of physical activity a week, whilst 15.4% and 16.8% of adults engage in 150-299 minutes and over 300 minutes of physical activity respectively.

Adults in Denmark, Sweden and Finland have the highest levels of physical activity engagement (30.4% spend more than 300 minutes per week), less than a fifth of adults in Romania (16.6%) and Bulgaria (19.8%), and only 31.1% of adults in Greece, spend any amount of time on physical activity per week (EHIS 2016). Similar findings are reported in the 2014 Eurobarometer. Due to a lack of EU-level data over time, trends in physical activity can only be explored using national data.

Only 8% of adults aged 25 and over played sport or exercised at least five times a week (Eurobarometer, 2014). Older adults and female respondents report less physical activity engagement and time spent on physical activity, however the gender gap in engagement narrows with age. There is some evidence of a link between socio-economic status and educational, and participation in physical activity, but limited evidence about the association between ethnicity and cultural factors and physical activity (Eurobarometer 2010, 2014; EHIS 2016).

Older data compiled in the WHO Global Health Observatory Data Repository highlights over 30% of adults in 18 MSs were insufficiently physically active in 2008, though the prevalence of physical inactivity varies by MSs. Physical inactivity was highest in Malta (71% and 74% for men and women respectively), and lowest for men in Estonia (17%) and women in Greece (16%) (WHO 2013). More Europeans are likely to never exercise or play sport (42%) than to play sport or exercise with some regularity (33%) (Eurobarometer 2014).

According to Eurobarometer (2010) data, two-thirds of Europeans report sitting for 2.5–8.5 hours per day, with 18.5% sitting for more than 7.5 hours (Eurobarometer, 2010; Loyen et al. 2016). Respondents in northern Europe report more sitting time than those in the south of Europe (notable exceptions are Ireland, Croatia and the Czech Republic). Those in white collar or managerial occupations reported more sedentary time than those in manual work, as did those who were less physically active and those who use the internet every day (Loyen et al., 2016).

Older adults

On average, 37% of older adults (aged 65 and over) in the EU are engaging in health-enhancing, non-work related aerobic physical activity each week, with 13%

performing over 300 minutes of physical activity. Conversely, 63% of those aged 65 and over do not take part in any physical activity a week compared to 46% of younger adults) (EHIS, 2006). The finding that older people are less inclined to devote time to exercising for recreational purposes than younger age groups is confirmed by the Eurobarometer surveys (2003, 2010 and 2014). Further, accelerometer data collected in England, Portugal, Norway and Sweden also illustrates that older people spent more time choosing sedentary activities than younger groups (Loyen et al., 2017).

There are visible (though not always consistent) cross-national differences the extent of physical activity engagement among older adults:

- Myck (2010) found the highest proportions of older adults engaging in vigorous physical activity at least once a week are men in Switzerland (68%) and women in the Netherlands (66%). In contrast, men and women in Poland appear to have the lowest levels of at least weekly vigorous physical activity engagement (38% of men and 29% of women).
- EHIS (2016) data shows 95% of respondents report physical inactivity in Bulgaria and Romania, whilst Denmark reports the lowest percent of inactivity, with only 27% of older adults reporting no engagement in physical activity.
- Gomes et al. (2017) found that respondents in Sweden also have low levels of physical inactivity (4.9%) compared to those in Portugal (29%) in 2011/12.

Children and adolescents

Longitudinal data on physical activity engagement is available from HBSC surveys. This suggests that in general moderate-to-vigorous physical activity (MVPA) engagement appears to be increasing for boys and girls in all age groups. According to HBSC data, children in Italy, Denmark and France have the lowest levels of physical activity at all ages (11, 13 and 15 years), with Italy being the worst (only 5% of girls, and 12% of boys engage in sufficient physical activity at age 15). The highest activity levels are in Ireland, Austria (though not for 15 year olds), Czech Republic and Finland. At all ages, boys are significantly more likely than girls to achieve sufficient MVPA in most countries (HBSC 2016, Eurobarometer 2014). This finding is also confirmed by Acitgraph accelerometer data (Cooper, 2015).

All identified studies show that physical activity levels among children and adolescents do not meet current guidelines of 60 minutes of MVPA per day.

- Crude estimates based on Global Health Observatory (WHO) data show that over 70% of 11-17 year olds are insufficiently active in all MSs, with noticeably higher levels of physical inactivity in Ireland, Denmark and France.
- HBSC (2016) data shows that less than half of young people surveyed meet the current guideline of 60 minutes MVPA per day in all countries and regions, though Van Hecke et al. (2016) show that across all countries total daily minutes of MVPA varied between 23-200 minutes between countries.

Sedentary behaviour among children and adolescents relates to factors such as age, gender, and country differences in the prevalence of activities associated with sedentary behaviour (Pavelka et al., 2016). Verloigne et al. (2016) found that the average amount of screen time (a proxy for sedentary behaviour) ranges from 1.0-2.7 hours in children (aged 2-12) to 1.3-4.4 hours in adolescents (aged 13-18) (with highest amounts reported in Eastern Europe e.g. Bulgaria, Slovakia and Ukraine). Physical activity levels also fluctuate throughout the week.

What types of exercise are Europeans engaging in?

In order to fully assess 'how much' physical activity Europeans do, it is also essential to examine **what types of activities** Europeans are engaging in. Importantly, no specific surveys, with sufficiently consistent data collection, have been carried out

across Europe to enable a reliable comparison and assessment of the types of sports and exercises that Europeans tend to engage in (Hoekman et al., 2011).

Whilst the number of people exercising or playing sport at least once a week in the EU slightly increased between 2009 and 2013 (from 40% to 41%), so did the number stating they never exercise or play sports (from 39% to 42%) (Eurobarometer 2010).

Individual forms of sports and exercise (e.g. running, cycling and swimming) appear to be growing in popularity among Europeans, whilst club sport participation and membership appears to have stagnated (Scheerder et al., 2011, Eurobarometer 2014). National surveys provide greater detail about uptake of these activities, and the reason for their uptakes (Omyła-Rudzka, 2013; Muller, 2003).

Far more people also now appear to engage in physical exercise 'as part of daily life' (notable exceptions are Spain and Ireland); around 17% of those surveyed for the Special Eurobarometer 412 (2014) engaged in 'other physical activity' regularly (five times or more per week), compared to 8% who played sport. de Groot et al., 2004 explain that for older adults in particular, most physical activity is performed as part of daily life; in their SENCA study a high proportion of particularly elderly men still undertook work activity which required physical activity of some sort, (e.g. 2.4-3.3 hours of housework and between 1.6-2.4 hours of leisure-time activities per day).

Around a third of Europeans who are physically active take their exercise while travelling (Eurobarometer 2010, 2014). However, the types of physical activity performed varies by European city, with high rates of walking in Barcelona and Paris, and high rates of cycling in Copenhagen (Rojas-Rueda et al., 2016).

Key determinants affecting choice of physical activity

- **A shortage of time** was the main reason given by respondents to the Special Eurobarometer (2010, 2014) for not practising sport more regularly; nearly half of all respondents in both surveys (45% and 42% respectively) suggested that they lack time to practice sport more regularly.
- **Access to sport and exercise facilities** may influence where Europeans engage in physical activity. The Eurobarometer survey (2014) found that most Europeans engage in physical activity in parks or outdoors (40%), at home (36%) or as part of a daily commute (25%). However, there is regional variation e.g. outdoor locations remain popular in Nordic countries, Slovenia and Austria (and are least popular in Hungary and Romania).
- **Access is also linked to income**, as this can influence the extent to which certain types of sports and exercises are affordable. Those in the lower income bracket may have fewer options given the need to purchase equipment (Muller, 2003) or apply for sports membership (Kahn and Norman, 2012).
- **Sociodemographic factors** can influence choice of activity. For example, older age groups (50+) tend to concentrate on walking and home-related activities (Eurobarometer, 2010) compared to younger age groups; and men play more sport than women and are more likely than women to engage in other forms of physical activities for a longer period (Eurobarometer 2010, 2014).

Conclusion

The first half of this review focused on **calorie consumption (or energy intake)** from food and drink products. Almost all the data available on consumption is self-reported (based on methodologies such as food diaries or memory recall). For particular topics, the ability to identify patterns or trends was also limited by a lack of information or comprehensive data (for example, for certain food groups and the discussion around 'when' Europeans eat and drink).

Based on the data and research available for review, consumption habits appear to be changing across Europe as a result of a number of factors including individual preferences and choice, the increased availability of food products through global food manufacturers, and higher disposable income. A key driver of changing meal patterns appears to be a lack of time, which results in trends towards eating on the go and at irregular times. For example, Europeans now spend less time preparing food in the home and there is an increased trend towards food consumption outside of the home, although it is not clear whether or not this has led to increased caloric intakes.

Whilst consumption appears to be converging with the increased availability of and accessibility to foods across the European Union, there are still some variations in the types of food groups consumed by MSs, and the frequency and time of eating and drinking occasions. This may often be based on cultural or historical habits (for example, those in Southern Europe are more likely to eat meals resembling the Mediterranean dietary pattern and eat later). In addition, specialised diets are also becoming more popular with the increased availability and accessibility of alternative food products.

Food-based dietary guidelines aim to provide recommendations for dietary intakes. To some extent variations in some dietary intake patterns across countries are influenced by differences in guideline recommendations (e.g. for dairy products). On the whole, Europeans still do not meet international, European or national food-based dietary guidelines, and differences can be noted by age (children, adults and older adults). Fruit and vegetable consumption is still below recommended levels for both adults and children, whilst salt, sugar and fat consumption still exceeds recommended levels.

The second half of this review examined **European habits in relation to physical activity** undertaken in the home, at work or during leisure-time. Again, the studies identified tended to rely on self-reported data, though a few data sources used objective accelerometer or pedometer data.

Overall, relatively few European adults or children achieve recommended levels of physical activity. Sedentary behaviours are also common in all age groups. These are closely linked to factors which are not age-dependent such as screen-time; time spent in school or work, time spent on physical activity, including household chores.

There are noticeable differences in the amount of physical activity by country as well as by sociodemographic factors such as age and gender. For example, a greater percentage of adults and older adults do not meet physical activity recommendations compared to children and adolescents. Multiple factors also influence the type of physical activity undertaken, including: accessibility and income; sociodemographic factors such as age and gender; individual preference; and national policies/targets.

More individuals engage in physical activity as part of daily life than they do playing organised sport. Active transport (walking or cycling) is a particularly common contributor to physical activity, with a third of physically active adults taking their exercise while travelling. Public health authorities can consider ways to enhance the environment and/or create policies to support active transit.

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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) (http://www.who.int/topics/obesity/en/)
Adult overweight	An abnormal or excessive fat accumulation that presents a risk to health, with a BMI equal to or more than 25.	WHO (http://www.who.int/topics/obesity/en/)
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 (http://apps.who.int/bmi/index.jsp?introPage=intro_3.html)
Child/adolescent obesity	There are different systems available to measure child or adolescent obesity for different ages. Children under 5 obesity is weight-for-height greater than 3 standard deviations above WHO Child Growth Standards median; Children aged 5-19 overweight is BMI-for-age greater than 2 standard deviation above the WHO	WHO http://www.who.int/mediacentre/factsheets/fs311/en/ (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>http://www.who.int/mediacentre/factsheets/fs311/en/</p> <p>(Other definitions are available for different national and international systems).</p>
Exercise	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.	WHO (http://www.who.int/dietphysicalactivity/pa/en/)
Insufficient physical activity	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.	WHO http://www.who.int/mediacentre/factsheets/fs385/en/
Physical activity	Any bodily movement produced by skeletal muscles that requires energy expenditure.	WHO (http://www.who.int/topics/physical_activity/en/)
Physical inactivity	A lack of physical activity	WHO (http://www.who.int/dietphysicalactivity/pa/en/)
Sedentary behaviour	Any waking behaviour characterized by an	Tremblay, M. S., et al. (2017). Sedentary

Term	Definition	Source
	energy expenditure ≤ 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. http://doi.org/10.1186/s12966-017-0525-8
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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