



National Institute for Public Health
and the Environment
Ministry of Health, Welfare and Sport

Food *consumption* in the Netherlands and its *determinants*

Background report to ‘What’s on our
plate? Safe, healthy and sustainable
diets in the Netherlands.’





National Institute for Public Health
and the Environment
Ministry of Health, Welfare and Sport

Food consumption in the Netherlands and its determinants

Background report to 'What's on our plate? Safe,
healthy and sustainable diets in the Netherlands.'

RIVM Report 2016-0195

Colophon

© RIVM 2017

Parts of this publication may be reproduced, provided acknowledgement is given to: National Institute for Public Health and the Environment, along with the title and year of publication.

M. Geurts (author), RIVM
A.M. van Bakel (author), RIVM
C.T.M. van Rossum (author), RIVM
E. de Boer (author), RIVM
M.C. Ocké (author), RIVM

Contact:
Marga Ocké
National Institute for Public Health and the Environment
Marga.Ocke@rivm.nl

This investigation has been performed by order and for the account of the Director General RIVM, within the framework of project S/015012 Knowledge Synthesis safe, healthy and sustainable diets.

This is a publication of:
**National Institute for Public Health
and the Environment**
P.O. Box 1 | 3720 BA Bilthoven
The Netherlands
www.rivm.nl/en

Synopsis

Food consumption in the Netherlands and its determinants

Background report to 'What's on our plate? Safe, healthy and sustainable diets in the Netherlands.'

Food consumption in the Netherlands and its determinants
Background report to 'What's on our plate? Safe, healthy and sustainable diets in the Netherlands.'

Dutch consumers eat on average 1 kilo of foods and drink 2 liters of beverages daily, divided into breakfast, lunch and dinner, and 4 in between moments. Per person, we consume an average of about 350 grams of milk, 100 grams of meat (products), 125 grams of vegetables and 125 grams of fruit and nuts per day. From the fifties meat consumption has increased up to the nineties. Then the meat consumption fell slightly, but is still higher than in the fifties. Now, more than a quarter of the foods and 10% of the beverages are of animal origin. RIVM mapped food consumption of the Dutch population, and factors affecting food consumption.

In recent decades, the variety of the food supply increased, foods come from around the world, we eat more processed foods and less basic foods. Increasingly, we buy food in supermarkets and spend less time on food preparation. There are small but growing groups of consumers who choose to eat healthy or sustainable.

Consumers make most food decisions based on routine and habit. Knowledge and motivation play a relatively minor role in food choice. When safety, health and sustainability play a role in food choices, it is the value as perceived by the consumer that is considered. This is not always in line with the scientific consensus. Besides habits, knowledge and motivation, the social and physical environment play a role. The ubiquitous and ever-present food supply in the immediate environment strongly influences the food choices.

This report is a background study for the 2017 report, "What is on our plate? Safe, healthy, and sustainable diets in the Netherlands" which was published on the 24th of January 2017. In this report, healthy, safety and sustainability aspects of food are integrated.

Keywords: food consumption, food choice, eating, Netherlands

Publiekssamenvatting

Voedselconsumptie in Nederland en de determinanten hiervan

Achtergrondrapport bij 'Wat ligt er op ons bord? Veilig, gezond en duurzaam eten in Nederland.'

Het Nederlandse voedingspatroon en de determinanten daarvan
Dagelijks eet een gemiddelde Nederlander 1 kilo en drinkt hij of zij 2 liter, verdeeld over ontbijt, lunch en diner, en 4 tussendoormomenten. Per persoon consumeren we gemiddeld zo'n 350 gram zuivel, 100 gram vlees(producten), 125 gram groente en 125 gram fruit en noten per dag. Vanaf de jaren 50 tot de jaren negentig is de vleesconsumptie toegenomen. Sinds de jaren negentig is de vleesconsumptie licht gedaald, maar nog steeds hoger dan in de jaren vijftig. Nu is ruim een kwart van het eten en 10% van het drinken van dierlijke oorsprong. Het RIVM heeft de voedselconsumptie, en factoren die de voedselconsumptie beïnvloeden in kaart gebracht.

In de laatste decennia, is het aantal verschillende voedingsmiddelen toegenomen, komen voedingsmiddelen uit de hele wereld, eten we meer bewerkt voedsel en minder basisvoedingsmiddelen. We kopen voedingsmiddelen vaker in supermarkten en besteden minder tijd aan voedselbereiding. Er zijn kleine maar groeiende groepen consumenten die bewust kiezen om gezond of duurzaam te eten.

Consumenten maken de meeste voedselkeuzes gebaseerd op routine en gewoonte. Kennis en motivatie spelen een relatief kleine rol bij voedselkeuze. Bij de motivatie om veilig, gezond en duurzaam te eten, gaat de consument bovendien uit van de eigen perceptie, die niet altijd overeen komt met de wetenschappelijke consensus. Naast gewoonten, kennis en motivatie, spelen de sociale en fysieke omgeving een rol. Het alom en altijd aanwezige voedselaanbod in de directe omgeving is sterk bepalend voor de voedselkeuze.

Dit rapport is een achtergrondstudie voor de rapportage 'Wat ligt op ons bord? Gezond, veilig en duurzaam eten in Nederland' van het RIVM die op 24 januari 2017 is verschenen. Hierin worden de aspecten van gezond, veilig en ecologisch duurzaam voedsel geïntegreerd weergegeven.

Kernwoorden: voedselconsumptie, voedselkeuze, eten, Nederland

Contents

Summary — 9

1 Introduction — 11

2 What determines our food choices? — 13

- 2.1 Introduction — 13
- 2.2 Individual factors — 14
 - 2.2.1 Biological factors — 14
 - 2.2.2 Demographic factors — 15
 - 2.2.3 Psychological factors — 15
 - 2.2.4 Consumer perception of healthy, safe, and sustainable diets and foods — 16
 - 2.2.5 Situational factors — 17
- 2.3 Social environment — 17
 - 2.3.1 Social modelling — 18
 - 2.3.2 Social norms — 18
 - 2.3.3 Social support — 19
- 2.4 Physical and information environment — 19
 - 2.4.1 Home — 20
 - 2.4.2 School — 20
 - 2.4.3 Worksites — 21
 - 2.4.4 Retail — 21
 - 2.4.5 Restaurants and fast food outlets — 22
 - 2.4.6 Information environment — 22
- 2.5 Key findings — 23

3 What do we eat? — 25

- 3.1 What do we eat on a daily basis — 25
- 3.2 What do we eat on a weekly basis? — 28
- 3.3 What are common dietary patterns? — 28
- 3.4 Dutch food consumption compared with Europe — 29
- 3.5 Key findings — 30

4 What do different subgroups eat? — 33

- 4.1 Children and adults — 33
- 4.2 Men and women — 33
- 4.3 Pregnant and lactating women — 33
- 4.4 High consumers — 35
- 4.5 Differences between groups with different migration backgrounds — 35
- 4.6 Persons in urban and rural areas — 36
- 4.7 Persons with high and low social-economic status (SES) — 37
- 4.8 People with different social environments — 38
- 4.9 Vegetarians and vegans — 39
- 4.10 Key findings — 39

5 When, where and with whom do we eat? — 41

- 5.1 When do we eat — 41
- 5.2 Where do we eat — 42
- 5.3 With whom do we eat — 43
- 5.4 Key findings — 43

6	How has our diet changed over time? — 45
6.1	The influence of increasing prosperity — 46
6.2	The influence of globalisation — 48
6.3	The influence of power concentration — 52
6.4	The influence of increasing food portion sizes — 56
6.5	Decreasing preparation time and increasing convenience — 56
6.6	Public response to food industrialisation and globalisation — 57
6.7	Key findings — 59

Acknowledgement — 61

References — 63

Summary

The background report 'Food consumption in the Netherlands and its determinants' provides basic information on food consumption and food supply for the Dutch population. It serves as a background report to the RIVM-report 'What's on our plate? Safe, healthy and sustainable diets in the Netherlands' and in other background reports that answer the questions 'How, safe, healthy, and ecologically sustainable is the Dutch diet?' respectively.

Determinants of food choice and food consumption act within four broad levels, i.e. the individual, the social environment, the physical environment, and the macro-level environment. Between these determinants various interactions take place. Habit is an important determinant at the individual level, whereas rational conscious choice only explains a small part of dietary behaviour. Rational choices are determined by factors like self-efficacy or perceived behaviour control. Social modelling and parenting styles seem to modify children's eating behaviour. In the physical environment, the availability of foods strongly influences food consumption. All these determinants act within the context of the macro-environment, where food policies and pricing play an important role.

When people are motivated to choose foods based on characteristics such as safety, healthiness or environmental sustainability, the perception of these values determines their actual food choice. In general, the ideas about what constitutes a healthy diet are in line with scientific rationale, whereas for food safety, the discrepancy between lay view and scientific evidence is larger. Regarding sustainability, consumers have different interpretations; some think about organic foods others about animal welfare, or fair trade. Meat is generally seen as healthy, and the impact on the environment is underestimated.

An average adult daily food intake of the Dutch population weighs a little over 3 kilos. About 2 kilos of the daily food intake originates from beverages, i.e. water, tea and coffee, juice, soda, milk(products) and alcoholic beverages. Other food groups with a high contribution to the daily food intake (grams) are bread (like products), fruit, vegetables and potatoes.

Breakfast provides 14% of the total daily energy-intake, lunch 21%, dinner 36%, and in-betweens 30%. Vegetables, potatoes, meat(products) and (shell)fish are most often consumed during dinner. During lunch, bread is the most consumed product. Fruit and snacks are most often consumed between meals.

Food consumption differs for various subgroups in the population:

- Men consume more food than women. This translates to most food groups except for fruit and tea-coffee-water, where consumption is higher in women.
- Food consumption increases with age, until middle age, and then it declines. However, compared to adults, children consume more

milk products, sweet and savoury snacks, sweet bread spreads, and beverages other than water, coffee, tea and alcoholic beverages.

- Intake of fruit, vegetables and tea-water-coffee is highest amongst the higher educated, while the low educated consume more meat, potatoes-rice-pasta, sauces and sugar sweetened beverages.
- The prevalence of vegetarians and vegans in the Netherlands ranges from 2.2% to 4.5%. About 1 in 3 persons is a flexitarian; someone who does not eat meat daily.
- Different dietary patterns based on migration background can be identified within the Netherlands. For example, Dutch people of Surinamese-origin adhere to traditional Surinamese dietary patterns, which includes noodle and rice dishes, traditional vegetables, and white meat. The use of traditional foods, like specific breads, was also identified for Dutch people of Moroccan and Turkish descent. Compared to native Dutch people, groups with migration background more frequently consume a hot meal twice a day.

Within Europe, the Dutch food consumption pattern is characterised by high consumption of (alcoholic and non-alcoholic) beverages, dairy products, snacks & desserts, sugar & confectionary, and fats (plant and animal-based). The consumption of eggs, legumes, fish and fruit are amongst the lowest in Europe.

In the past decades, various time trends in food consumption and related food supply were observed. These include an increased volume of the food supply, larger product diversity, a globalised food supply, and a shift from basic foods to processed foods. These trends are linked to underlying driving forces of larger productivity as a result of agricultural and technical innovations, and globalisation. Secondly, consumed foods are more often bought in supermarkets and consumers spend less time on food preparation. These changes relate to social-cultural driving force regarding convenience, but also to the shift in power concentration to retail. Thirdly, there are still small but growing groups of consumers that specifically choose diets from a health image or from a sustainability point of view, for example, foods with a sustainability logo, and diets with less or no meat. These trends seem to be responses to globalisation and the bio-industry.

1 Introduction

In 2004, the report "Our Food, Our Health. Healthy diet and safe foods in the Netherlands" was published. At that time, the report responded to the urgent need for integrated information about what constitutes a healthy diet and safe food. This type of integrated information was needed to assist in formulating priorities for policies in the fields of health protection and health promotion (1). In the following decennium, new knowledge about healthy diets (2) and safety of foods has become available (see, for example, the large number of opinions produced by the European Food Safety Authority (<http://www.efsa.europa.eu/en/publications>)). Moreover, food became an important topic in the public debate. In this debate, the sustainability of food production has become one of the main new issues.

In 2014, the Dutch Scientific Council for Government Policy (WRR) published a report that explored the consequences of the large global challenges regarding ecological sustainability, public health and the robustness of the food supply for the Netherlands. The Council identified the specific vulnerabilities, opportunities and responsibilities of those challenges for the Dutch government and society. They concluded that it was time for an explicit food policy which takes into account the diversity of values in relation to food, the relationship between production and consumption, and the changing power relations in the food system (3).

The integrative report "What's on our plate? Safe, healthy and sustainable food in the Netherlands" (4) complements the WRR report by specifically focusing on the Dutch food consumption pattern. It aims to give coherent answers to questions regarding Dutch food consumption. How safe, healthy and ecologically sustainable is our current food consumption pattern? With what measures and to what extent can our food consumption pattern become safer, healthier and more sustainable? And on what aspects do these three goals conflict or coincide? This knowledge synthesis is one of the cross-cutting themes of the RIVM strategic programme 2015-2018. The programme focuses on issues that can impact our future health and environment and which deserve extra attention. In this way, the RIVM is preparing for tomorrow's issues.

To underpin the key messages in the final integrative report "What's on our plate? Safe, healthy and sustainable food in the Netherlands" (4) a number of background reports have been prepared. The present background report "Food consumption in the Netherlands and its determinants" provides basic information on food consumption needed for the interpretation of the safety (5), the healthiness (6) and the ecological sustainability (7) of the Dutch food consumption pattern. In the report the following questions are answered: 'What determines our food choice?' (Chapter 2), 'How do we eat?' (Chapter 3), 'What do different subgroups in the Dutch population eat?' (Chapter 4), 'When, where, and with whom do we eat?' (Chapter 5), and finally, 'How has our diet changed over time' (Chapter 6).

2 What determines our food choices?

2.1 Introduction

Before describing the food consumption characteristics of the Dutch population, we describe the various determinants of food choices. People engage in multiple eating and drinking episodes per day. Each eating episode requires many types of decisions. These include whether, what, where, when, with whom, how long, how, and how much to eat and or drink.

Figure 2.1 illustrates the many determinants underlying food choice and eating behaviour. In an ecological approach, these determinants can be placed at four different levels, i.e. the individual level, the social environment, the physical environment, and the macro-level environment.

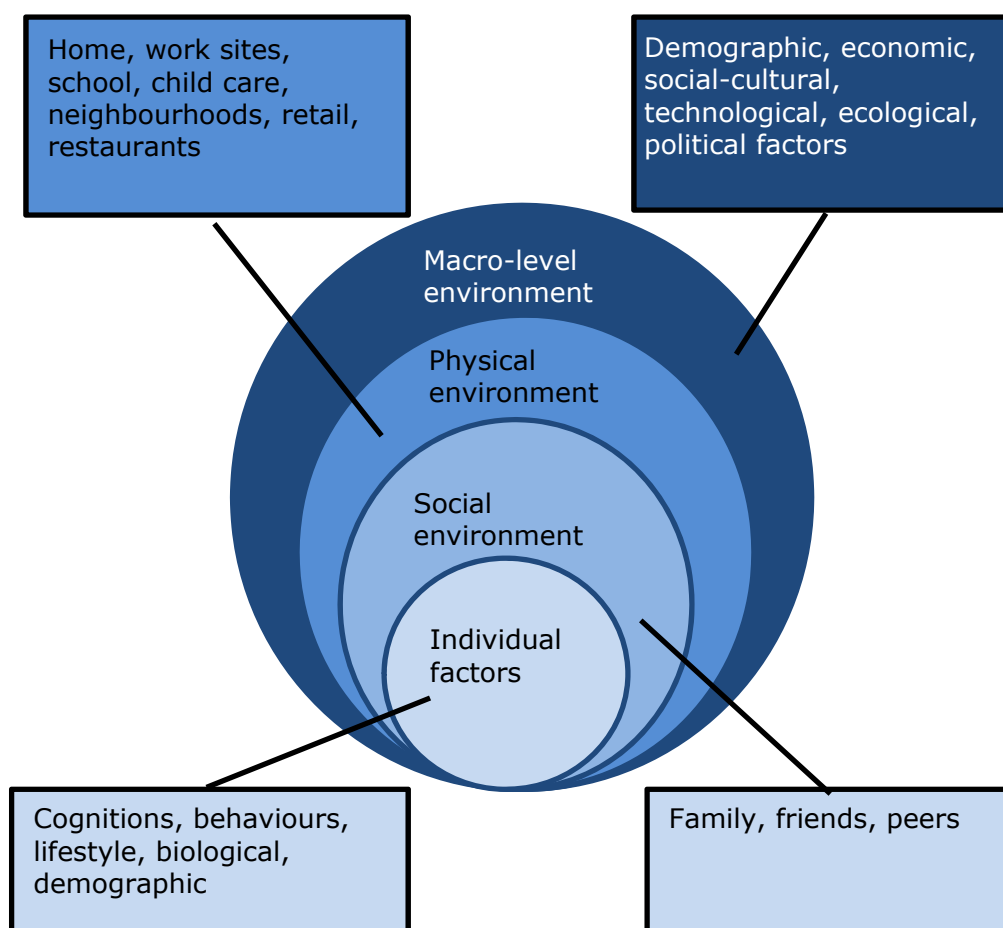


Figure 2.1 Determinants of food choice at four levels (adapted from Story et al. (8))

Moreover, determinants within and across levels interact, both directly and indirectly, to impact food choices. In general, individual behaviour change is difficult to achieve without addressing the context in which people make decisions (8).

Individual-level determinants related to food choices and eating behaviours include cognitions, behaviours, and biological and demographic factors. These are discussed in section 2.2. The social environment refers to interactions with family, friends, peers, and others in the community (section 2.3). The physical environment relates to the settings where people eat or procure food. Examples are work sites, schools, restaurants, and supermarkets; these are presented in section 2.4. Macro-level factors operate within the larger society. These include population demographics, economic, social-cultural, technological, ecological and political factors. Macro-level factors are described in the background report 'Driving forces of food consumption and supply' (9). They are not covered in the present report.

Scientific publications on determinants of food choice mostly focus on specific healthy or unhealthy food choices, like fruit, vegetable and snack consumption. There are few publications on determinants underlying food choice. Moreover, many studies are cross-sectional in design. Other studies are experimental studies in specific settings for which extrapolation to real life situations is questionable. Overall, the evidence regarding true determinants of food choice in scientific literature is suggestive at best (10). Nevertheless, the food and retail industries accumulated lots of insight into methods that influence consumers' food choice. Examples of such 'nudges' are product placement and the routing within a supermarkets. Due to economic competition this information is generally not publicized (3).

2.2 Individual factors

Individual-level factors related to food choices and eating behaviours include biological, demographic, psychological and situational factors (8).

2.2.1 Biological factors

Various biological factors play a role in food choices. The DONE framework on determinants of nutrition and eating distinguishes biological factors related to brain function, oral function, food-related physiology, anthropometrics, sensory perception, physical health and sleep characteristics (11). Of these, dental deficiency and food preferences were rated as the most modifiable factors, with a relatively high impact at the population level (See www.uni-konstanz.de/DONE/view-interactive-data/). Although taste and preferences are known to be crucial drivers of dietary behaviour, there is not much evidence on how they actually influence food consumption (10).

The earliest stages of life such as during pregnancy and infancy seem critical periods to acquiring taste preferences (12). This is important since dietary behaviours have been found to track from childhood into adulthood (13). Children's food intake seems to be influenced by nature and nurture. There is still much unknown about the molecular genetic associations of children's capacity to self-regulate food intake. However,

twin studies and supporting evidence suggest sizable heritable influences on four behaviour indexes of food intake self-regulation: eating in the absence of hunger; eating rate; caloric compensation and satiety responsiveness; and food responsiveness (14).

2.2.2 *Demographic factors*

Various socio-demographic characteristics are associated with food choices. Differences in food consumption by age, gender, socio-economic status, and migration background are described in chapter 4.

Much research has shown that groups with lower incomes and lower levels of educational attainment (i.e., socio-economic status) have poorer diets as well as higher levels of obesity and diet-related diseases. Chapter 4 provides more information on differences in food consumption by educational level in the Netherlands. The diet inequalities may partly be explained by factors in the social and physical environment such as neighbourhood differences in the availability of healthy foods, economic barriers to purchasing food, and having limited time or resources for food preparation (15). Research findings suggest that food costs are an obstacle to increasing consumption of nutrient-dense foods such as whole grains, fruits, and vegetables. When food budgets are limited, individuals tend to select lower-cost, energy-dense foods to meet their energy needs and prevent hunger. Although some nutrient-dense foods may be purchased inexpensively, these food products tend to be less palatable and often require much time for preparation (15). A systematic review and meta-analysis show that, on average, healthier diets cost more than unhealthy diets (16).

2.2.3 *Psychological factors*

Many types of psychological factors have been studied in relation to food choices. These include factors related to personality, mood and emotions, self-regulation, health cognitions, food beliefs, food habits, eating regulation, and weight control cognitions and behaviours (11). The most important factors appear to be habits, behavioural intention, and self-regulation skills.

A significant part of daily eating behaviours consists of habits. Habit strength was found to be important for healthy dietary intake such as consumption of vegetables and fruit, as well as for snacking behaviour in adults (10). When behaviour is habitual, people require little information to make decisions, intentions are poor predictors of behaviour, and behaviour is triggered by situational cues. This is fundamentally different for non-habitual behaviour (17).

Behavioural intention is the major predictor of (health) behaviour in social-cognitive models like the Theory of Planned Behaviour (18). Social-cognitive correlations have been studied, however the evidence on their importance in the context of eating behaviour is often moderate, at best (10). Results show that rational conscious choices only explain a small part of dietary behaviour. The conscious dietary intentions are regulated by attitudes, subjective norms and behaviour control in both adults (10) and youth (19). For a person to have the intention to adhere to a healthy diet, he or she should know what constitutes a healthy diet; feel motivated to adhere to a healthy diet;

and feel capable of adhering to a healthy diet. Intending to eat healthily is generally a necessary precondition in the early stages of behaviour change. That is, self-regulation strategies aimed at changing eating patterns, such as implementation intentions, are effective only when people are intending to change their eating behaviour. Moreover, implementation intentions seem more effective in promoting healthier eating than in diminishing unhealthy eating (20).

In the international literature, commonly expressed food choice values relate to taste and enjoyment, cost, managing relationships, and convenience (21). In a Dutch consumer study on food values and purchase behaviour from 2008/2009, healthiness, palatability and affordability were mentioned as the most important considerations when shopping for food. Health is highlighted as one of the main food quality values. People who feel health is important buy more fruit, vegetables and fish. The production values, animal welfare, the environmental foot print, fair trade and traditional production methods, play a very minor role for consumers. Maximally 4% of the respondents rated these values in the top three of their important values. Those who claim food production values as a purchasing motive also act according to their claim. Food safety is considered reasonably important. Respondents who feel food safety is important claim to buy more EKO labelled products and fewer snacks, though this is poorly related with actual behaviours (22). The small percentage of consumers for which food production values (ecological, fair trade, animal welfare) influence food choices is growing (3). In principle, everyone has a positive attitude towards sustainability, but while shopping, consumers' food choice is determined by price or convenience. This is because people make choices at a concrete level whereas the wish for a sustainable future works at the higher construal level where ideal images are considered (23).

2.2.4

Consumer perception of healthy, safe, and sustainable diets and foods

When food values play a role in food purchases and food choices, it is the value as perceived by the consumer that is considered. Research has shown that discrepancies exist between the perceived value by the consumer and by the professional (24). The current report focuses on the safety, healthiness, and ecological sustainability of the Dutch diet. Therefore, the text below briefly describes what consumers perceive as a safe diet, a healthy diet and a sustainable diet, and how this differs from the scientific knowledge.

In general consumers do not distinguish between different aspects of food, such as safety, healthiness and sustainability. These different aspects of food are used interchangeably. For example, the healthiness and safety of foods are perceived as being the same thing, and sustainable or organic foods are often regarded as healthy. Overall, foods are generally classified as good or not good.

When asked what a healthy diet looks like, most people mention that this is a diet rich in vegetables and fruit, and limited in fat, sugar and salt content. Also naturalness, balance, variety and moderation are often mentioned, though consumers differ in interpretation of these concepts. So this is generally in line with the insights from science. Regarding meat, some consumers perceive more meat as a healthy

food, while others think that a healthy diet should include meat in moderation (25).

Consumers expect that the food supply is safe. If they do worry about food safety, unfamiliar, uncertain, uncontrollable, and severe consequences are factors associated with risk perception. Novel food processing techniques score high on several of these parameters and are consequently regarded with suspicion and perceived as risky by consumers. Examples of perceived unsafe techniques in relation to foods are genetic modification, and nanotechnology (24). In contrast to scientists, consumers express greater concerns about chemical than to microbial contaminants. Risks of synthetic chemicals (particularly food additives) are perceived as being less safe compared to risk associated with naturally occurring chemicals. Consumers associated chemical contaminants more strongly with the potential for severe consequences, long-term effects, and lack of personal control, as opposed to microbiological risks (26).

Consumers differ in their interpretation of sustainability of the diet. Some persons think of animal welfare or organic foods and other about the distance from farm to fork or the environmental impact of the diet. People are informed about the environmental impacts of certain consumption behaviours. However, factual knowledge about product-specific environmental footprints is partially lacking among consumers. In general, consumers underestimate the ecological impact of meat production (27, 28), whereas the importance of waste reduction is generally acknowledged (28).

2.2.5 *Situational factors*

The DONE framework on determinants of nutrition and eating distinguishes hunger, related health behaviours, and situational and time constraints as separate situational factors (11).

Regarding related health behaviours, the amount of screen time and sedentary behaviour are strongly related with dietary behaviour. Screen time is positively associated with snack and sugar-sweetened beverage consumption and inversely associated with fruit and vegetable consumption. Important mechanisms in this relation are exposure to marketing of unhealthy foods and beverages (foods high in fat, salt and sugar) through screens and mindless eating of larger than intended amounts (10, 19). Also sedentary activities and unhealthy dietary behaviour have repeatedly been found to cluster. This might be due to the sharing of similar environmental cues. For example, sedentary behaviour offers a context for the consumption of energy-dense food and drinks (10).

Eating behaviours influence the amount that is eaten. For example, eating rate affects energy intake. Faster eating is associated with higher energy intake and higher body mass index (29).

2.3 **Social environment**

Foods and food intake form an important part of our social lives. Most eating takes places in the presence of other people and is often perceived as an enjoyable part of our cultural experience (30). The social environment includes interactions with family, friends, peers, and others

in the community, and may impact food choices through mechanisms such as role modelling, social support, and social norms (8). The culture in which we live is an important determinant of our social environment. For example, migration plays a role in dietary patterns by bringing about cultural changes affecting attitudes, orientations or behaviours, a process defined as acculturation. A study among participants with Dutch and Surinamese origin showed that those with Surinamese origin living in the Netherlands adhered more to a dietary pattern that is characterized by traditional Surinamese foods than to the other more Western dietary patterns (31). Section 4.5 provides more information on different dietary patterns by migration background. Within this section, a subdivision has been made by working mechanisms (modelling, norms, and support), rather than by types of people in the social environment such as presented in Figure 2.1.

2.3.1 *Social modelling*

From a review based on 69 experimental studies, it was evident that how much people eat is determined by social modelling, i.e. to conform to the amount eaten by others. Much less is known about modelling of food choices, for example, when both low and high-energy-dense foods are offered. Most experimental social modelling studies focussed on harmful social modelling, using energy-dense snacks. There is some evidence that people are less likely to model their eating partner for healthy or unpalatable foods. It has, however, been demonstrated that children model the healthy eating habits of their peers and/or parents, leading to an increased vegetable intake and reduced fat intake, and that students who reside in colleges with healthy eating norms are more likely to eat healthily. Individual factors such as sex, age, weight, and personality do not appear to be critical in explaining social modelling effects. Modelling has been shown to occur both because individuals seek information about appropriate behaviour and because individuals seek to affiliate with others. The most dominant interpretation is that modelling of food intake is an example of a broader phenomenon of social influence. Whether these conclusions hold outside laboratory settings needs further investigation (30).

A review on eating behaviours of children in the context of their family environment concluded that children's eating is modified by parental behaviours, amongst others by modelling and child feeding behaviours next to the home environment (see section 2.4) (12). Other factors that have been associated with healthful dietary behaviours of children are the frequency of family meals, and parental intake and parenting practices for children's diets (8).

2.3.2 *Social norms*

Social norms are implicit codes of conduct that provide a guide to appropriate action. The social group might be defined at the level of nationality, peer group, family or friendship grouping. Social norms may be communicated directly via cultural practices and rules, actual behaviour in a given situation, or indirectly via environmental cues such as served portion sizes. A systematic review of experimental studies showed that social norms about eating have a moderate effect on both food choice and amounts consumed. It is however unknown if these effects are long lasting (32). The effect of social norms is modified by

individual factors that influence food choice. Norm following is more likely when there is uncertainty about what constitutes correct behaviour and when there is greater shared identity with the norm referent group. Palatability considerations may override normative considerations, particularly for persons with sufficient self-control (33).

2.3.3 *Social support*

In a review on psychosocial factors that influence the consumption of vegetables and fruit by adults, social support was found to be a strong predictor. Other factors of influence were more at the individual level (see section 2.2) (34). For youth, a review concludes that social support and modelling appear to be important for different nutrition behaviours. Parents have a crucial role in the nutrition behaviours of their children. The familial influence is a significant correlate of fruit and vegetable intake and snack consumption in youth in more than 75% of the available studies. Parents should not only provide a good example by eating right themselves, but also by using parenting practices and styles that encourage and support healthy eating habits in their offspring (19).

2.4 **Physical and information environment**

The physical environment includes the multiple settings where people eat or procure food such as the home, work sites, schools, restaurants, and supermarkets. The physical settings within the community influence which foods are available and impact barriers and opportunities that facilitate or hinder (healthy) eating (8); *see also 5.2: Where do we eat?* The large variety and the types of food available in the various settings, like convenience foods, strongly influence consumers' food choice.

In this section various settings are discussed: home, school, worksite, retail, restaurants and fast food outlets. In many of these settings, food needs to be purchased. The cost of food is the second most important factor affecting food decisions, after taste. The current structure of food prices is that high-sugar and high-fat foods provide calories at the lowest cost. Thus individuals and families with limited resources may select energy-dense foods high in refined grains, added sugars, and fats as a way to save money. Fresh fruit and vegetables are more expensive on a per calorie basis than are fats and sugars, *see also section 3.1*. In diverse settings, e.g. schools, worksites, and restaurants, subsidizing healthy foods like fruit and vegetables has resulted in increased purchases of those foods. These findings suggest that reductions to the costs of certain foods can increase point-of-purchase sales of those items (35). More studies are needed on economic factors influencing eating behaviour and the relationship between diet quality and food costs (8).

Relevant environmental influences may be country specific. Interpretation of the results is difficult because many studies in this chapter originated from other countries, for example the United States. Moreover, there is a lack of knowledge on appropriate confounders in the relationship between the environment and intake (10). Little to no research has been conducted on the settings for childcare, neighbourhoods and communities that seem relevant for the Dutch situation. Several international studies have found evidence that low-income communities are more often impacted than affluent communities

by poor access to supermarkets, chain grocery stores, and the healthful foods available in these stores. Similar disparities have also been found in school environments (15). Regulation of food intake is influenced by both the internal appetite control system and external environmental cues. Especially in obesogenic environments where food is always in abundance available, external cues seem to override and/or undermine internal signals, which put severe challenges on the accurate regulation of food intake (36).

2.4.1 Home

The Dutch consume about 80% of their food intake at home (see section 6.2: Where we eat). At home, two of the most powerful factors that influence (healthy) dietary choices among children and adolescents are availability (foods present in the home) and accessibility (whether available foods are in a form or location that facilitates their consumption, such as fruit on the counter).

Availability and accessibility are positively associated with fruit and vegetable intake among children and adolescents (8, 19). The same is true for the availability and consumption of soft drinks in the home (8). Home availability and taste preferences are the major factors that influence fruit and vegetable intake among adolescents. Even when taste preferences for fruit and vegetables are low, if fruit and vegetables were available in the home, intake among adolescents increased (8). See also section 2.2: Individual factors.

2.4.2 School

In the Netherlands, food at schools is offered in canteens, vending machines and selling points in the direct school environment. International studies have related the availability of snacks and drinks sold in schools (vending machine, school store, canteen or snack bar) to higher intakes of total calories, soft drinks, total fat, and saturated fat and lower intakes of fruit and vegetables, milk, and key nutrients. (8, 19). In the Netherlands, 80% of secondary schools have a canteen and vending machines. Basic foods like vegetables, fruit, bread and dairy products are usually available in the canteen. Vending machines usually include confectionary, crisps, candy bars, and sugar-sweetened beverages (37) (see table 2.1).

Table 2.1. Facilities related to food supply at Dutch secondary schools.

Facilities at school (n=361) % (n)		Type of vending machines (n=304) % (n)	
Canteen and vending machines	79 (284)	Sodas	83 (299)
Only canteen	15 (54)	Snacks and confectionary	70 (251)
Only vending machines	6 (20)	Fresh foods	16 (57)
Neither of both	1 (3)		

There is little evidence for an association between retail food environment surrounding schools and food consumption of sugar-sweetened beverages, fast food, fruit and vegetables (19).

2.4.3 *Worksites*

Food choices and eating behaviours are influenced by the physical availability of food in the workplace and surrounding neighbourhood, workplace policies, organisational support for health programmes, and social norms among co-workers (15). Sources of food in the workplace environment include company cafeterias, vending machines, company-sponsored meetings and events, office fundraisers, and shared refrigerated or cupboard space. In addition, the neighbourhood surroundings of a workplace may offer access to grocery stores, convenience stores, snack carts, and restaurants. Evaluation studies have demonstrated that making changes in the workplace food environment can lead to significant dietary improvements among employees. Modest but significant changes in intake of fruit, vegetables and fat can be influenced by reducing the price of healthful food in cafeteria and vending machines, point-of-purchase labelling, promotional materials, expanded availability of healthful foods and targeted food placement (8).

About half of the cohort studies show higher frequency of meal intake and/or poor nutrition quality in shift workers. Several studies show that shift work affects nutritional intake negatively (higher snack and sweets consumption, low breakfast) in shift workers, though this is not a consistent finding (38). In Europe and the US, 13-20% of workers are involved in a shift work schedule, including work at night (39).

2.4.4 *Retail*

About 66% of the household food budget is spent at supermarkets. Access to various types of retail food stores and the physical availability of food products in local stores seems to impact food choices (15). There is moderate evidence in support of the causal hypothesis that neighbourhood food environments influence dietary health (10). In the USA, the presence of food stores in the neighbourhood and the availability of healthful products in those stores seem to be important contributors to healthy eating patterns. The relationship is complex and more research is needed (8). Most studies originate from the USA, where the situation/neighbourhoods/retail is different.

The food industry is aware that individual food choice of consumers is influenced by many factors. Supermarkets try to influence choices by commercials, product placements and store layout (3).

Food portion sizes are strong environmental factors that influence energy intake. For a variety of foods, it has been shown that people's energy intake increases when they are offered larger portions. There seems to be no meal-to-meal compensation. Only limited information is available on the development of portion sizes in the Netherlands. Similar to studies in other countries, it was shown that portion sizes of energy-dense products increased, see section 6.4 for more information. The extension of the variety in portion sizes seems to enhance the freedom of choice of consumers. However, larger portions are often made

attractive by charging a lower price per unit. In this way, consumers are steered towards larger portions (40).

2.4.5 *Restaurants and fast food outlets*

In 2014, out-of-home-consumption accounted for 31.7% of the total food expenditure. Out-of-home-consumption can be divided into food service industry (15.8% of the expenses), catering and cafeterias (5.9% of the expenses), and fast-food (including foods sold at petrol stations and similar, 10% of the expenses) (41); see also section 5.2 Where we eat). Research amongst adults, adolescents, and children has examined whether the accessibility of restaurants may impact food choices. No relationship was found between dietary intake measures and neighbourhood proximity of fast-food restaurants. The price of fast food may be a more important determinant of dietary intake than the physical availability of restaurants. Provision of nutrition information has been shown to greatly improve the selections of those consumers who consider nutrition when ordering (15).

2.4.6 *Information environment*

Consumers are exposed to an overload of food-related information from various sources, including food marketing. The flow of information is confusing and often contradictory. It tells consumers what products are (not) healthy, honest, friendly and / or sustainable. Using social and traditional media, food gurus jump into a consumer need for rapid and clear recommendations for a healthy and sustainable lifestyle. Also, the information from the Nutrition Centre and science, is according to some, no more than an opinion. However, research also shows that the confidence in institutions such as the Dutch Nutrition Centre and the scientific community remains high amongst most people (42, 43).

Food and beverage marketing has an enormous potential to influence eating behaviour. Promotional campaigns employ a large spectrum of techniques that are designed to reach diverse consumer groups. Examples of commonly employed techniques include advertising on sponsored media channels (e.g. television, radio, internet), premium offers, in-store displays, event and athletic sponsorships, celebrity endorsements, product packaging and placements, and character licensing. Promotions for energy-dense, nutrient-poor products represent the greatest share of marketing expenditures. Most research which has examined the influence of marketing on attitudes and behaviour has focused on television advertising and youth younger than the age of 12 years. Although limited in scope, this body of research provides moderate to strong evidence that television advertising influences the attitudes (e.g., food preferences) and behaviours (e.g. purchase requests, food choices) of children aged 2 - 11 years. In light of this research, several countries have introduced strong regulatory measures to reduce the amount of food advertising viewed by children. Belgium, Sweden, and Norway have completely banned television advertising directed at children aged under 12, and Australia prohibits advertisements during television programming targeted to preschool children (15). See also the Background report titled 'Health aspects of the Dutch diet?' (6).

2.5 Key findings

- Determinants of food choice and food consumption can be categorized at the level of the individual, social environment, physical environment, and macro-level environment.
- Habits are important determinants at the individual level. Rational conscious choices only explain a small part of dietary behaviour. When making conscious choices, factors like self-efficacy or perceived behaviour control play a role. Taste, convenience and price are also important individual determinants of food choice.
- The consumers perception of a healthy diet is generally in line with scientific rationale. However, when it comes to food safety, consumers; perception of what is safe or not, is not supported by scientific evidence. Regarding sustainability, consumers have different views; especially consumers' views about meat are too optimistic. Meat is generally seen as healthy, and the impact on the environment is underestimated.
- The social environment includes social modelling. Social modelling and parenting styles are especially important determinants of children's' food choice.
- In the physical environment, the availability of foods strongly influences food consumption. In many physical environments, energy-rich and nutrient-poor foods are abundantly available. Various interactions take place between the individual determinants and determinants in the social, physical and macro-level environment. There is a lack of integrative studies on

3 What do we eat?

3.1 What do we eat on a daily basis

A population's food consumption can be quantified in several ways, each providing a different insight. In this section, the average food consumption in the Netherlands is first described in terms of grams per day, and thereafter as the contribution to daily energy intake. Most of the estimates in this chapter are taken from the Dutch National Food Consumption Survey (DNFCS) 2007-2010. The study population of DNFCS 2007-2010 included men and women aged between 7 and 69 and was representative with regard to age, gender, educational level and urbanization, but not for the native country of origin (44). Data were collected using a validated data collection method (45) and provide detailed information on what, when and where Dutch children and adults eat (44). A limitation of self-reported data on food consumption, which is observed in most studies, is the underreporting of energy intake (46). In the DNFCS 2007-2010, energy intake was underreported on average by 16% (44). Where possible, the data from 2007-2010 have been updated with data from the first two years of DNFCS 2012-2016 (ongoing). This survey uses the same dietary assessment methods as the DNFCS 2007-2010, but reports on a broader age range (47).

Between 2012-2014, the Dutch population ate and drank, on average, 21 different types of food per day. This adds up to an average daily intake of a little over 3 kilos. Beverages (alcoholic and non-alcoholic beverages and milk(products)) contributed to about 68% or over 2 kilos of the total daily food intake. Other food groups that contribute greatly to the daily food intake in grams are dairy products (e.g. cheese, yoghurt), bread, vegetables and fruit. The average weight of each of these food groups is between 355 grams and 122 grams per day (47). On average, 28% of our food and 10% of our beverages are from animal-based products. This adds up to 16% of our total food consumption and provides 60% of our daily intake of protein. The average daily consumption of meat between 2012 and 2014 is 101 grams (47).

A different perspective is obtained when the contribution of food groups to the total energy intake is investigated. From this perspective, bread contributes most to total energy intake. Potatoes provide about 5% of the average daily energy intake, fruit and vegetables about 7%, and meat(products) 11% (44). Nutrient information is not yet available for the DNFCS 2012-2016, thus these estimates are based on data from 2007-2010.

Above, we describe the current diet based on the weight of food groups and the amount of energy that food groups provide. Statistics Netherlands collects information on the proportion of our household budget spent on food, via household budget surveys. On average, households spent about 11% of their total income on food; this proportion does not vary between households with different income levels (48). Compared to other food groups, most money is spent on

alcoholic beverages, fruit, vegetables and animal products (fish, pork, beef and poultry). Bread and cereals (including rice and pasta), sugars and fats contribute least to total household spending (49).

The three perspectives described above are also presented in Figure 3.1. Taking these perspectives into account, we conclude that relatively little money is spent on non-alcoholic drinks and coffee & tea, but these products are consumed in large quantities. Similarly, relatively little money is spent on bread, cereals (including rice and pasta), potatoes and fats, but these foods are important sources of energy. A relatively large amount of money is spent on fruit and vegetables, while these food groups do not provide a lot of energy. Also, a relatively large amount of money is spent on meat, fish, confectionary and cheese. These foods are consumed in small quantities.

Food provides energy, but it is also a source of macronutrients, micronutrients (vitamins and minerals), and other (bioactive) compounds like artificial sweeteners. The amount of macro and micronutrients that our diet provides and the extent to which this is sufficient to fulfil our needs is described in the Background report 'Health aspects of the Dutch diet?' (6). No information on the average intake of artificial sweeteners is available. However, we do know that 59% of the Dutch population aged between 7 and 69 consume artificially sweetened products. The consumption is highest in the youngest age group (7 to 13 years) and declines with age. Non-alcoholic beverages, dairy products (mainly yoghurt), and confectionary contributed most to the consumption of artificially sweetened foods (44).

A second, more concentrated, source of nutrients and bioactive compounds are food supplements (50). Examples are supplements with vitamins, minerals or fish oil. In 2012-2014, 42% of Dutch children and adults aged 1 to 79 used dietary supplements in the previous year (51). Supplement use is highest in younger children and women and also higher in the winter compared to the rest of the year (51). The most commonly used dietary supplements are multivitamin/mineral supplements, vitamin C, vitamin D, and omega-3 fatty acid supplements. Vitamin D is commonly used by the youngest children and older women. Furthermore, research on characteristics of supplement users suggests that supplement users are more often highly educated, have a higher income, and a healthier lifestyle (more active, non-smoking and healthier dietary habits) (52). More information on the intake of supplements and the relevance of supplement use for meeting the nutritional guidelines is described in the Background report 'Health aspects of the Dutch diet' (6).

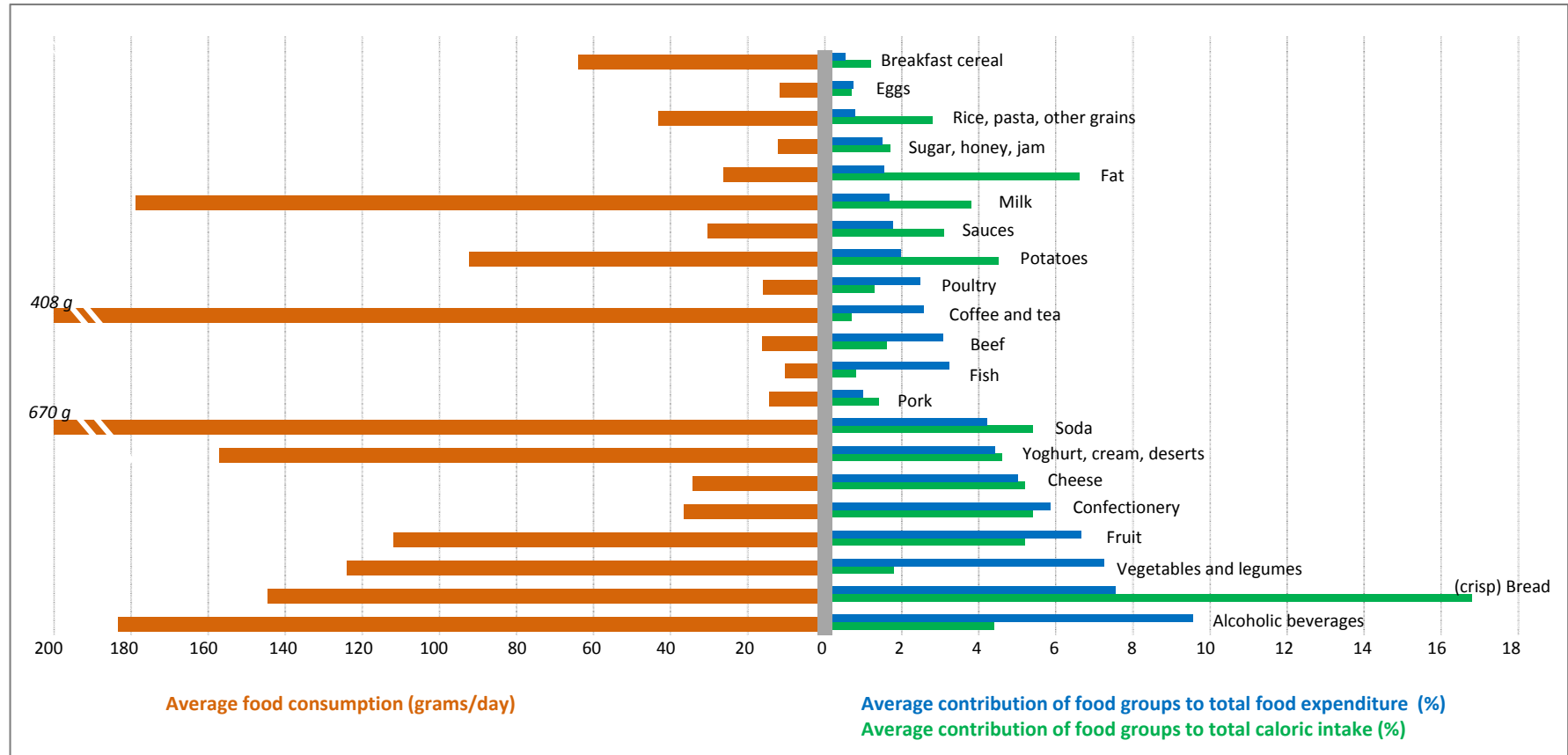


Figure 3.1 An overview of the average consumption in grams per day (orange); the average contribution to total caloric intake in percent (green); and the average contribution to total food expenditure in percent (blue). Estimates are ordered according to food expenditure and are based on the Dutch adults' consumption between 2007 and 2010¹ and on household budget estimates collected between 2007 and 2010 by Statistics Netherlands.

¹Note that not all foods groups are included in the figure, thus the total of all food groups does not equal the total daily food consumption, expenditure of food or caloric intake

3.2 What do we eat on a weekly basis?

The estimates provided above are all quantified as an average intake per day. However, what about the average week-menu? Figure 3.2 gives some insights into the Dutch week-menu by presenting the average number of days that a food group is consumed (consumption days) and the average number of portions that are consumed on a consumption day. Only a few food groups are consumed on average six to seven days a week; bread and bread spread (butter, margarine), water and vegetables, while many food groups are consumed only once or twice a week, for example fish and soup (44). Alcohol use is common in the Dutch population; 82% of the Dutch population aged 19 or above sometimes drink alcohol (53). According to Figure 3.2, the average week menu contains three glasses of wine and four glasses of beer.

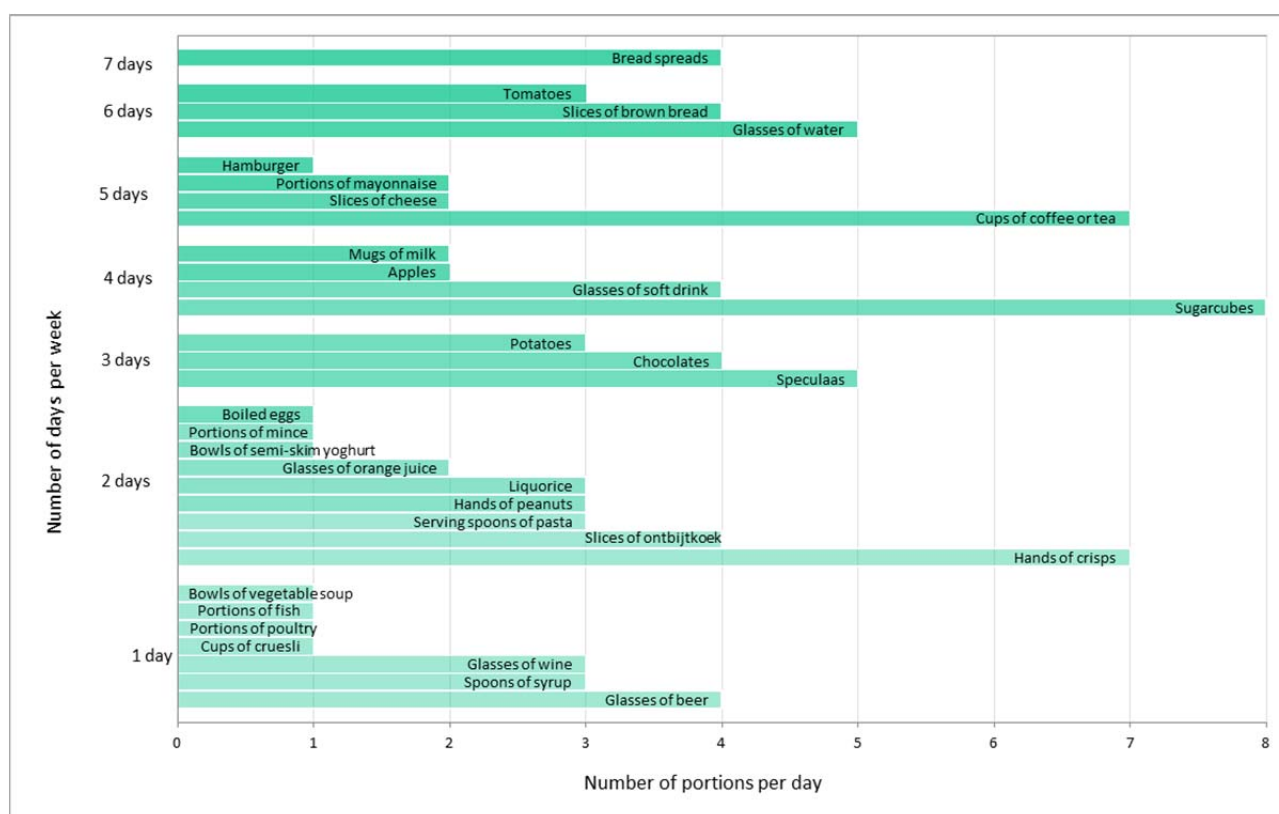


Figure 3.2 Overview of an average week-menu of Dutch people aged between 7 and 69 (DNFCS 2007-2010). The Y-axis displays the average number of days that a food group is consumed (consumption days) and the X-axis displays the average number of portions eaten on a consumption day.

3.3 What are common dietary patterns?

Three studies used statistical approaches to derive subgroups in the adult population with different dietary patterns based on their consumption of foods. Two of these made a distinction between two subgroups (54, 55) and the third study between three subgroups which were homogenous in dietary patterns (56). All three studies identified one subgroup with a prudent pattern. Although there were differences in the exact dietary patterns, all three were characterized by a high consumption of fruit, vegetables, brown bread, and low-fat dairy products. The other dietary

patterns differed between the studies. In addition, all three were characterized by high consumption of less healthy foods such as French fries and snacks, sugary products, white bread, and or red meat.

Two of the three studies investigated the stability of the dietary patterns over time. These studies observed stable dietary patterns, but membership for a specific pattern was unstable. For example, only 42% of the participants were classified as having the same dietary pattern five to ten years later (54).

3.4 Dutch food consumption compared with Europe

Even though different food consumption patterns can be distinguished within the Dutch population, country-specific elements become apparent through international comparison. Compared to adults (18 to 64 years) in twelve other European countries (Austria, Czech Republic, Denmark, Finland, France, Germany, Ireland, Italy, Romania, Spain, Sweden, United Kingdom), Dutch adults are in the top 3 of highest consumption of alcoholic and non-alcoholic beverages, dairy products, snacks & desserts, sugar & confectionary, and fats (both plant and animal based) (see Figure 3.3). The consumption of eggs, legumes, fish and fruit are amongst the lowest in Europe (4th rank from the bottom or lower, see Figure 3.3) (57).

A similar picture is shown in Figure 3.4, with data from women in the 1990s European Prospective Investigation into Cancer (EPIC) study.

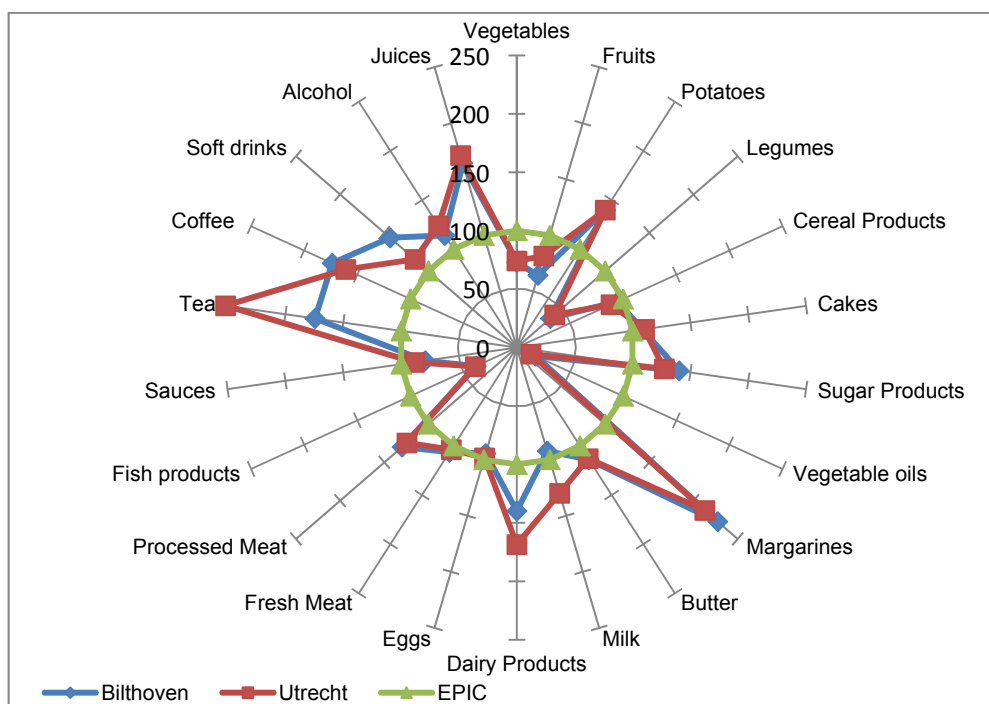


Figure 3.4 Consumption of food groups by Dutch women compared to other women included in the EPIC study (58).

Compared to other European centres, the consumption of tea, juices, potatoes, cakes, sugar products, margarines, butter, milk and dairy products is 50% or more above the average (circle indicated at 100),

whereas consumption of legumes, vegetable oils, and fish(products) is less than half of the EPIC-average (58).

3.5 Key findings

- We eat and drink about 3 kilos of food per day. Some foods are consumed daily (e.g. bread, bread-spreads), others weekly (e.g. fish and soup). About 25% of our food and 10% of our beverages is animal-based.
- Multiple dimensions are available to quantify food consumption; and they sometimes provide different insights. For example, coffee and tea, soda and milk(products) and bread are consumed most. Most of our energy intake comes from bread, fat, and confectionary and most money is spent on alcoholic beverages, bread, vegetables and fruits.
- Forty-two percent of the Dutch population used dietary supplements at some time in the past year, in addition to their food.
- Compared to other Europeans, Dutch adults consume more alcoholic and non-alcoholic beverages, dairy products, snacks & desserts, sugar & confectionary and fats. In contrast, consumption of eggs, legumes, fish and fruit are amongst the lowest in Europe.

		Eggs	Legumes & nuts	Fruit	Fish	Vegetables	Drinking water	Grains	
Consumption Higher ↓		Austria	Denmark	Ireland	Denmark	Sweden	Italy	Finland	
		Denmark	Finland	UK	France	Ireland	Romania	Denmark	
		France	Sweden	Sweden	Romania	France	Sweden	Spain	
		Netherlands	Netherlands	Netherlands	UK	Austria	Spain	Sweden	
		Germany	Ireland	France	Netherlands	Netherlands	UK	Romania	
		Ireland	Romania	Romania	Ireland	UK	France	UK	
		Sweden	Austria	Italy	Austria	Finland	Netherlands	Netherlands	
		Spain	Italy	Austria	Germany	Germany	Ireland	Italy	
		Finland	Germany	Denmark	Finland	Denmark	Austria	France	
		Italy	France	Spain	Sweden	Spain	Finland	Germany	
	Romania	Spain	Finland	Italy	Italy	Denmark	Ireland		
	UK	UK	Germany	Spain	Romania	Germany	Austria		
Consumption Higher ↓		Meat (products)	Alcoholic beverages	Fats & oils	Confectionary	Non-alcoholic beverages	Dairy products	Roots & tubers	Snacks & desserts
		Denmark	Spain	Austria	Italy	Italy	Romania	France	Denmark
		Italy	Italy	UK	Romania	Spain	Italy	Austria	Sweden
		UK	France	Sweden	Spain	Romania	Austria	Italy	UK
		France	Romania	Italy	Ireland	Sweden	UK	Spain	Ireland
		Sweden	Sweden	France	UK	France	France	UK	Finland
		Spain	Austria	Ireland	Austria	Finland	Germany	Germany	Romania
		Germany	Denmark	Spain	Sweden	Ireland	Ireland	Finland	Italy
		Austria	Finland	Denmark	Denmark	UK	Spain	Romania	France
		Netherlands	Germany	Germany	Germany	Austria	Sweden	Denmark	Spain
	Romania	Netherlands	Netherlands	Netherlands	Denmark	Denmark	Ireland	Austria	
	Ireland	UK	Romania	Finland	Netherlands	Netherlands	Netherlands	Germany	
	Finland	Ireland	Finland	France	Germany	Finland	Sweden	Netherlands	

Figure 3.3 Twelve European countries ranked (from lowest to highest) according to the population's intake of several food groups¹

¹Due to differences in dietary assessment method qualitative comparisons were carried out

4 What do different subgroups eat?

4.1 Children and adults

The energy requirement of adults is generally higher compared to that of children. The differences in energy requirement are reflected in the total food consumption of these age groups; i.e. on average, adults consume more food compared to children. However, deviations from this observation were observed when zooming in on particular food groups (see Figure 4.1). Milk products, sweet and savoury snacks, bread-spreads (excluding cheese and meats) and beverages (other than water-coffee-tea and alcoholic beverages) are consumed more by children than by adults (see Table 4.2) (59). Differences in the food consumption of the elderly in different age categories (70-74, 75-79 and 80+) were also observed. The 'younger' elderly consume more vegetables and drink more non-alcoholic beverages compared to the other age groups (60).

4.2 Men and women

Gender also influences food consumption, see Table 4.2. When we compare the quantity of food consumption (grams/day) between men and women aged 7 to 69, men generally eat more compared to women. This can again be related to differences in energy requirements (23). The proportion of men who occasionally drink alcoholic beverages is also higher compared to women (53). Only fruit and tea-coffee-water are consumed in higher quantities by women than by men (59).

4.3 Pregnant and lactating women

Pregnancy and lactation may also influence food consumption. Pregnant and lactating women are recommended to eat more or less of some foods and nutrients, because of different nutritional needs or because some foods are associated with increased microbiological hazards (e.g. raw milk and *listeria monocytogenes*). Also, the interest in the short term and long term impact of nutrition during the first 1000 days of life on child health is increasing (61). In the Netherlands, the most recent information on food consumption of pregnant women dates back to the 1997-1998 food consumption survey (62). In this survey, data from 50 pregnant women were collected. When comparing¹ the average food consumption of the pregnant women with women of childbearing age (19 to 50 years), their consumption appears similar (62). As expected, the consumption of alcoholic beverages was lower in pregnant women compared to other women of childbearing age. Average consumption of alcoholic beverages was 36 grams per day for women aged 19 to 22 years, 94 grams per day for women aged 22 to 50 years, and 3 grams per day for pregnant women.

¹ Qualitative comparison of the average daily consumption of food groups.

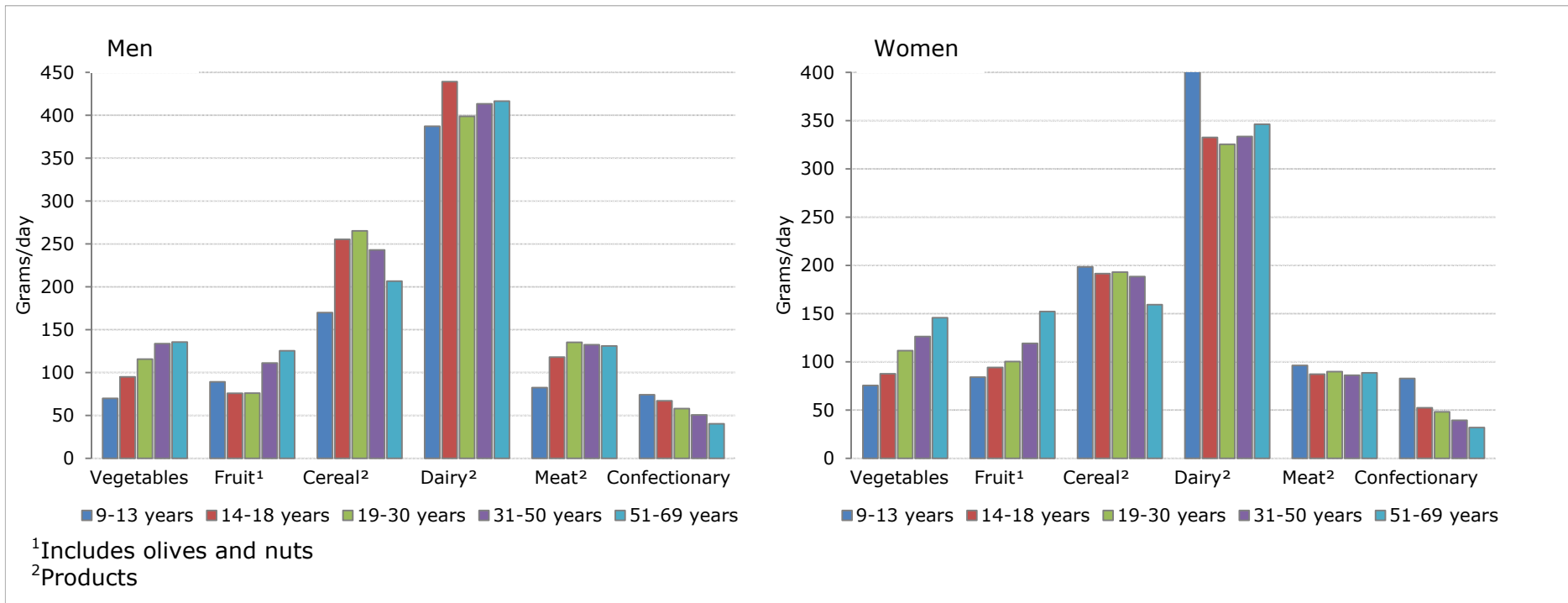


Figure 4.1 Average food consumption (grams/day) of vegetables, fruit, cereal, dairy, meat and confectionary within different age groups, separately for men and women (DNFCS 2007-2010; n=3,819).

Furthermore, the consumption of dairy products was higher in pregnant women (pregnant women: 446 grams per day, women aged 19 to 22: 342 grams per day, women aged 22 to 50: 332 grams per day) (62). Information on the nutrient intake of pregnant women is included in section 3.5.4 of the background report 'Health aspects of the Dutch diet' (6).

We did not find any information on the food intake of Dutch lactating women, but information on the proportion of breastfed and formula-fed infants is available. In 2015, 80% of infants were breastfed at birth, and 20% formula fed. The percentage of complete breastfed infants declined to 39% after the first six months of life (63) (see also section 3.5.1. of the background report 'Health aspects of the Dutch diet' (6).

4.4 High consumers

All estimates presented in this chapter are quantified as a population average. However, this average is based on the distribution of food consumption within the population. Table 4.1 shows the consumption of adult men and women at the 95th percentile of the habitual intake distribution. Only 5% of the population eats even more of these foods.

Table 4.1 Food consumption of men and women aged between 19 and 69 at the 95th percentile of the habitual intake distribution (grams/day) and the percent increase compared to the habitual median intake (DNFCS 2007-2010 (64)).

	Women grams/day (%) n=1051	Men grams/day (%) n=1055
Vegetables	200 (64)	204 (66)
Fruit	248 (123)	211 (171)
Cereal products	245 (46)	345 (58)
Dairy products (including milk and cheese)	661 (127)	813 (130)
Cheese	62 (94)	74 (105)
Milk	376 (445)	514 (359)
Meat	139 (62)	210 (62)
Red meat	106 (63)	169 (66)
Fish	31 (343)	47 (571)
Non-alcoholic beverages (including juice)	636 (233)	857 (232)
Alcoholic beverages	399 (667)	1100 (368)

4.5 Differences between groups with different migration backgrounds

The Dutch population is very multicultural. In 2016, the Dutch population totalled 16.98 million people, of which 22% (3.8 million) had a migration background. Western immigrants accounted for 44% of the total immigrant population, and non-western immigrants for 56% (49). Since culture and nationality influence food consumption, different ethnic dietary patterns can be identified within the Netherlands. For example, Dutch people with a Surinamese-background adhere to traditional

Surinamese dietary pattern, which includes noodle and rice dishes, traditional vegetables and fish. Commonly consumed dishes by those from a Turkish background are Ayran and Börek (see textbox). The characteristics of the Turkish dietary pattern are a high consumption of legumes, cereals (typically Turkish bread), meat, fruit and vegetables and soups, see Figure 4.2. The consumption pattern of inhabitants with a Moroccan background shows a high consumption of shellfish, cereals (traditionally Moroccan bread) and meat. Inhabitants of Amsterdam with a Surinamese and Moroccan background consumed fewer vegetables compared to inhabitants with a Turkish and Dutch background. Furthermore, the average use of alcoholic drinks is low in people of Surinamese, Turkish and Moroccan background due to religious beliefs, which are taken into account in the overall diet (65).

Examples of commonly consumed foods by three groups with migration background

Surinamese: roti (flat bread), fried rice, chow mein, dried salted codfish, fried banana, pomtajer and cassava (vegetables).

Turkish: börek and poğaca (savoury pastries), Turkish bread, ayran (yoghurt drink), sarma and dolma (filled grape leaves), bulgur.

Moroccan: rghaif and lemsemmen (pancakes), Moroccan bread, couscous, tajine (stew), lamp or mutton.

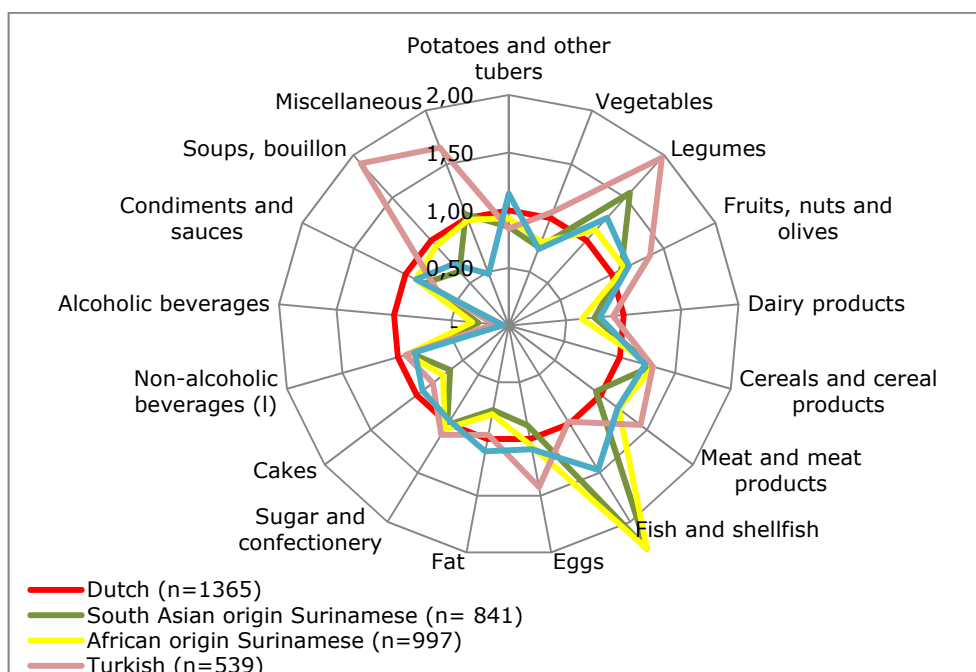


Figure 4.2. Differences in food intake in residents of Amsterdam with a Surinamese, Turkish and Moroccan background compared to native Dutch (65).

4.6 Persons in urban and rural areas

Differences in food consumption by population density of the place of residence within the Netherlands have been studied for consumption of vegetables, fruit, and fish. Adults and children in urban areas consume

more vegetables than those in rural areas. Adult fruit consumption is higher in rural areas compared to urban areas. For fish consumption, a difference by population density can be seen in children only: a higher proportion of children in urban areas than in rural areas consume fish once a week (66).

4.7 Persons with high and low social-economic status (SES)

Socio-economic status (SES) influences food consumption behaviour. Important indicators of socio-economic status are educational level, work status, and income level. Studies associated lower educational or income level with the use of fewer healthy products such as fruit and vegetables, and higher spending on less healthy foods and beverages (67-69). Similar conclusions can be drawn based on Dutch data on people aged between 7 and 69; intake of fruit, vegetables and tea-water-coffee is highest amongst the higher educated, while the low educated consumed more potatoes-rice-pasta, sauces, sugar sweetened beverages and meat, see Table 4.2 (59, 70). Both the level and type of meat consumption differ between high and low SES groups. High SES groups consume more beef (not significant) and less 'half-and-half' minced meat, pork meat and processed meat (significant), compared to low SES groups (71).

Table 4.2 shows that consumption of alcoholic beverages is not associated with the level of education. However, in this table, grams of wine, beer and spirits are simply added together. In terms of the number of glasses of alcoholic beverages, higher educated people on average drink more than lower educated persons (49). Social-economic family status also affects children's food consumption. Children aged 4-13 from low SES families consumed lower amounts of fruit and vegetable compared to children from high SES families (72, 73). Differences in the intake of energy-dense snacks and drinks was also observed; consumption was higher amongst children aged 7-12 from low SES families (72, 73). Based on neighbourhood postal code, childcare centres were categorized as being low, medium or high SES day-care. It appeared that overall consumption in grams was similar between day-cares, but children attending high SES day-care centres consumed less fruit and savoury snacks but more vegetables than those in medium and low SES day-care centres (74).

What determines these different eating habits of people with high and low social-economic status? One study investigated potential mediators to explain differences in fruit and vegetable consumption between women with a high and low social-economic status. The results indicate that health considerations play a less important role, and nutrition knowledge is poorer amongst low SES (75). Other studies also suggest that the chance of higher fruit and vegetable intake increases in a high SES neighbourhood; possibly because there is a greater availability of fruit and vegetables (76).

In addition to education level, differences in household income can affect food consumption habits. In the Netherlands, people qualify for food assistance from the Dutch Food Bank when an individual's monthly disposable income is lower than 180 euro (with an additional income

allowance of €60 per adult and €50/child for families). The food bank provides food parcels that supplement the normal diet for 2 to 3 days. In 2013, the food bank supported approximately 85,000 individuals in the Netherlands. A study amongst food bank recipients showed that food insecurity was higher amongst women, people with a lower education level, and households with children. Furthermore, being food insecure was associated with low satisfaction of overall food intake and low self-efficacy of healthy eating (77).

Table 4.2 Statistically significant consumption differences between population subgroups (DNFCS 2007-2010; n=3,819).

	Age	Sex	Education level
Breakfast & lunch			
Bread(products)	Adults	Men	
Bread-spreads	Children	Men	
Cheese	Adults	Men	
Fats and oils	Adults	Men	Low and average
Milk(products)	Children	Men	
Dinner			
Vegetables	Adults		High
Potatoes, pasta, rice	Adults	Men	Low
Legumes	Adults		
Unprocessed meat	Adults	Men	Low
Processed meat and meat substitutes		Men	Low and average
Fish	Adults		
Soups	Adults	Men	
Sauces	Adults	Men	Low
In between			
Fruit	Adults	Women	High
Savoury snacks	Children	Men	
Sweet snacks	Children		
Beverages			
Water, coffee and tea	Adults	Women	High
Fruit juice			High
Sugar sweetened beverages	Children	Men	Low
Alcoholic beverages	Adults	Men	

4.8 People with different social environments

A person's social environment, values and lifestyle, can affect food choice. In the Netherlands, little information on this topic is available.

The Dutch Nutrition Centre commissioned a market research organization to conduct a quick scan that categorizes people according to the eight different social environments of the Mentality-model (see Figure 4.3). The information was collected via an online survey amongst 1.249 people aged between 18 and 75. Results are representative for age, gender, education level, region and mentality-environment (78).

Eating habits differ between these social environments. Cosmopolitans and Post-materialists reported a higher consumption of fruit and vegetables and a lower consumption of meat. While the diet of New conservatives is similar to the average Dutch diet, only their alcohol intake is higher than average. The diet of Traditionals contains, on average, more potatoes, dairy, fruit and less crisps. The consumption pattern of Post-modern hedonists, Convenience-oriented and Social climbers is characterized by high consumption of snacks, soda, fast-food and larger servings (78).

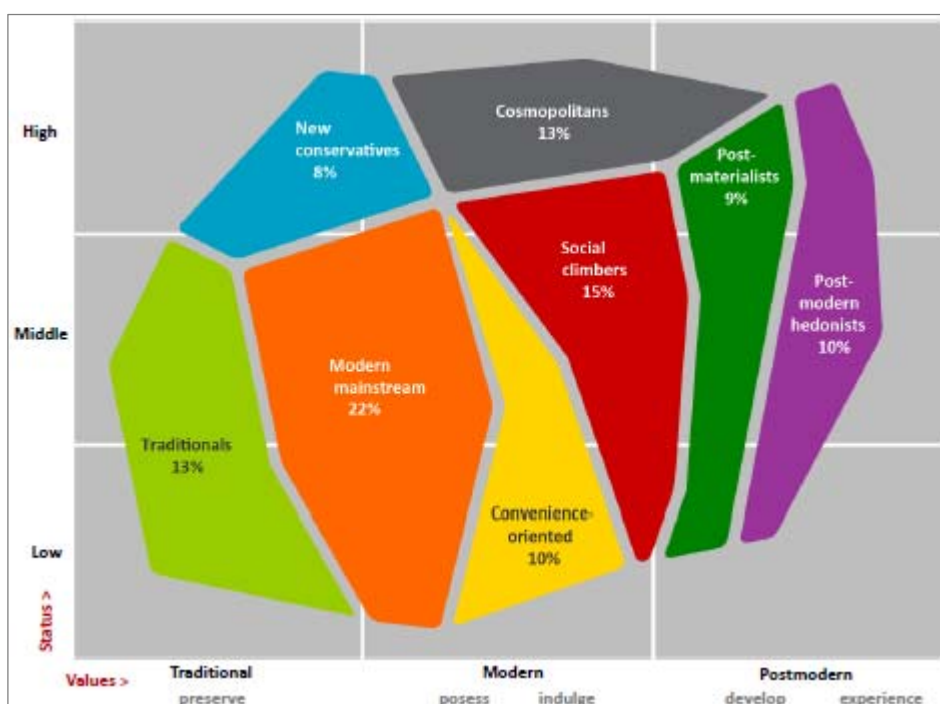


Figure 4.3 Division of the Dutch population according to the Mentality Model (78).

4.9 Vegetarians and vegans

People with a vegetarian or vegan diet can also be considered a population subgroup, as this characteristic influences their food consumption pattern. The available estimates that describe the prevalence of vegetarians and vegans in the Netherlands range from 2.2% between 2007-2010 and 4.5% in 2012 (79, 80).

4.10 Key findings

- Men and young adults have a higher energy requirement compared to other population groups. This results in higher food consumption of most food groups. Two exceptions are worth mentioning:
 - women consume more fruit than men
 - children consume more sweet and savoury snacks and non-alcoholic beverages than adults
- Recent information on food intake of pregnant and lactating women is not available; in 1998, food intake of pregnant and lactating women was similar in women of childbearing age.

- People with a high education level drink more water-coffee-tea and juice and eat more fruit and vegetables. People with a low education level drink more sugar sweetened beverages and eat more potatoes-rice-pasta, meat, fats and sauces.
- The Netherlands is increasingly becoming a melting pot of people from different cultural backgrounds. Characteristics of the original food patterns remain present in the diet of people with a migration background.
- Food pattern analysis reveals that, at the group level, identifiable population food patterns remain present over time, but people tend to switch between food patterns.

5 When, where and with whom do we eat?

Insights into consumption behaviour are obtained by asking ourselves the question 'when, where and with whom do Dutch people eat?'

5.1 When do we eat

At home or away, foods are consumed throughout the day (51). Over 75% of the Dutch adults aged between 19 and 69 consume food on more than 7 eating occasions per day (44). Young children who attend day-care centres consume food on at least six eating occasions per day. Evening snacks are less consumed by children aged 1 to 8 compared to the rest of the population (61). Breakfast skipping is the lowest among young children with 97% of young children eats breakfast daily. This percentage decreases during adolescence. At the age of 19 to 50, almost one in three men and one in five women do not eat breakfast every day. In people aged over 50, breakfast regains popularity, with 82% of males and 87% of females having a daily breakfast (51).

Figure 5.1 presents the time at which food and beverages are consumed throughout the day. Both in 2006 and in 2011, most people consumed their lunch between 12.00 and 13.00, and dinner between 18.00 and 19.00 (81). This is also visible in the latest food consumption survey in 2012 to 2014 (51). However, depending on the parents' education level, dinner time is later (high education) or earlier (low education) compared to the average. Also, families living in high urbanized areas appear to consume dinner later in the evening (82).

The energy consumed per eating occasion is more or less equally distributed among adults and children. Breakfast provides 14% of the total daily energy intake, lunch 21%, dinner 36%, and in-betweens 30% (44). The type of foods consumed per eating occasion differs. The most important energy source for a Dutch lunch is bread (83). Bread is also abundant in the lunchbox of primary and secondary school children. Of the primary school children, 69% used savoury bread-spreads and 45% used sweet bread-spreads. Secondary school children used savoury bread-spreads more often, and sweet bread-spreads less often; 79% and 39% respectively. Furthermore, 10% of the primary school children and 15% of the secondary school children brought candy or biscuits to school. Fruit was included in 77% of the lunchboxes of primary school children and in 35% of the lunchboxes of secondary school children. This study was conducted amongst 872 parents with at least one home-living child aged between 7 and 18 years (82).

Fruit is also often consumed as a snack in between meals (51, 74, 83). Other frequently consumed snacks by toddlers and children (7-12 years) are energy-dense foods and drinks (73, 74). Amongst children, the most popular moment to consume such snacks appears to be the afternoon; they consumed 30% of the energy-dense drinks and 45% of the energy-dense snacks at this time of day. The morning accounted for about 20% of the energy-dense snack and drink consumption. No differences in snack consumption between week and weekend days were observed (73).

The information presented above shows that different foods are consumed depending on the time of day. Other dimensions of time, like weekday or season also influence our food consumption. For example, the time at which people consume their breakfast and lunch overlap at the weekend, but not on weekdays (see Figure 5.1). Dinnertime appears to be around 18.00, no matter the day of the week.

Food consumption differs between week and weekend days. Compared to weekend days, potato, vegetable, fruit, dairy and legume consumption is about 10-20 percent higher during the week. However, the consumption of alcohol, fish, cakes, eggs and soup is higher in the weekend (in press).

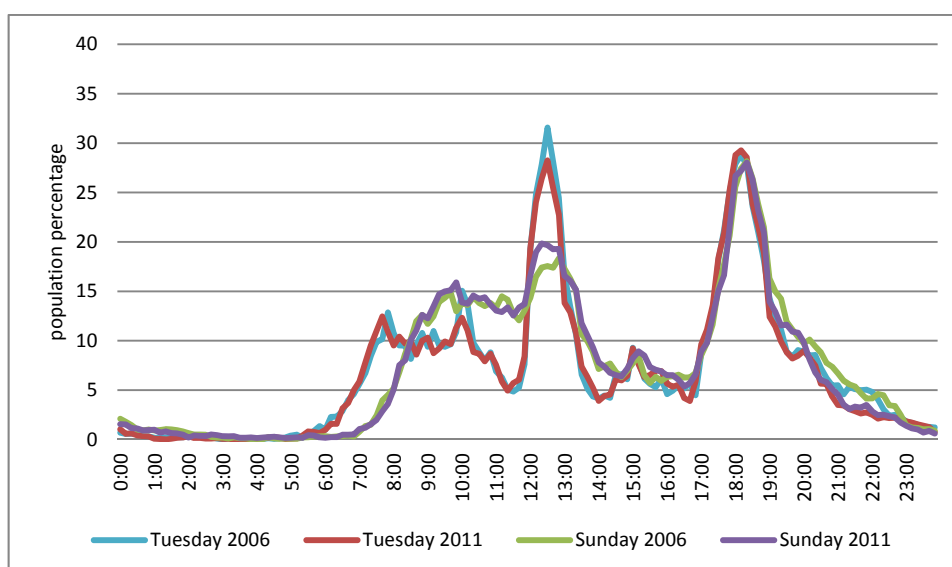


Figure 5.1 The time of food consumption during the day in 2006 and 2011, separate for weekdays and weekend days. The population included Dutch people aged 12 years or older (81).

5.2 Where do we eat

Most of our food is consumed at home. Food consumption at home accounts for about 80% of the total energy intake of people aged 1 to 79 (47). Children attending day-care centres consume about equal amounts of energy intake at home and at the day-care on a day that they attend the centre (74). Vegetables and potatoes were mainly consumed at home (44, 74). The majority (50 – 60%) of the energy-dense snacks and drinks consumed by children aged 7-12 also took place at home. Other places, accounting for about 15%, were school or a friend's house (73). Factors associated with at-home consumption of energy-dense snacks and drinks are unemployment of the mother, low urban density, and a larger household size (73).

Compared to children and adults, at-home consumption is higher amongst community-dwelling older adults (aged 70+) (60). Over 85% of their food consumption takes place at home, except for alcoholic beverages and cakes (69% and 79% at-home consumption respectively). About half of the women and 20% of the men in this sample of community-dwelling elderly prepared their own dinner every day. Daily home-delivery of a hot meal was not common within this population.

When away from home, (shell)fish, cakes, soups, beverages (alcoholic and non-alcoholic) and fruit are mostly consumed. Whether these foods are always bought outside of home is unknown as the estimates also include foods brought from home and consumed elsewhere (44). In 2014, out-of-home-consumption accounted for 31.7% of the total food expenditure. Out-of-home-consumption can be categorized as follows: food service industry (15.8% of the expenses), catering and cafeterias (5.9% of the expenses), and fast-food (including foods sold at petrol stations and similar, 10% of the expenses) (41).

5.3 With whom do we eat

Not only place and time, but also social context – with whom we eat – is thought to play a role in food consumption, see also section 2.3. Three basic propositions have been identified: 1) people appear to eat more when they eat in groups than when they eat alone, 2) eating with friends and family leads to greater intake than eating with strangers, and 3) the more people in the group the greater the per capita intake (84, 85). One of these effects, the so-called family-style eating, has proven to successfully support higher energy intake amongst Dutch nursing home residents (86). Eating with friends and family not only increases a person's food intake, but parents and children living together also appear to resemble each other in their short term intake of fats and fatty acids (87).

Information regarding the proportion of Dutch people eating alone or together is scarce. The information presented below is based on a survey amongst 872 parents with at least one home-living child aged between 7 and 18. The population sample was representative for age, gender, education level, region and social orientation (82). On weekdays, 39% of the families always eat their breakfast individually and 29% always eat their breakfast together. During the weekend relatively more families consume breakfast together (57%) (82). Compared to breakfast, families more often consume dinner together. The data show that 69% of the families with home-living children aged between 7 and 18 eat dinner together with the whole family (82). A minority (5%) of the families most often report having dinner somewhere other than at the dinner table (82).

5.4 Key findings

- Food consumption takes place throughout the day; six or seven eating occasions is common amongst children and adults. This includes two or three snacks in between meals; either fruit or energy dense snacks.
- Differences in food consumption between week and weekend days are apparent; potatoes, vegetables, fruit, dairy and legumes are consumed more during the week, and alcoholic beverages, fish, cakes, eggs and soup more during the weekend.
- More than two-thirds of our energy is consumed at home, compared to one-third out of home.
- Limited information is available regarding the social context of eating in the Netherlands; but 70% of the families with children usually have dinner together.

6 How has our diet changed over time?

Food consumption is subject to change. Between 2007 and 2010, adults consumed less potatoes, fruit and vegetables compared to 1987-1988, whereas consumption of non-alcoholic beverages (water, fruit, diet and soft drinks) was higher. Processed meat and poultry replaced unprocessed meat and products lower in fat (e.g. semi-skimmed milk) replaced products with a high fat content (e.g. full-fat milk) (88). Other changes are shown in Figure 6.1.

More recently, changes were observed between the food consumption as measured between 2007-2010 and 2012-2014. Figure 6.2 illustrates this for the general population aged 6 to 69 (51).

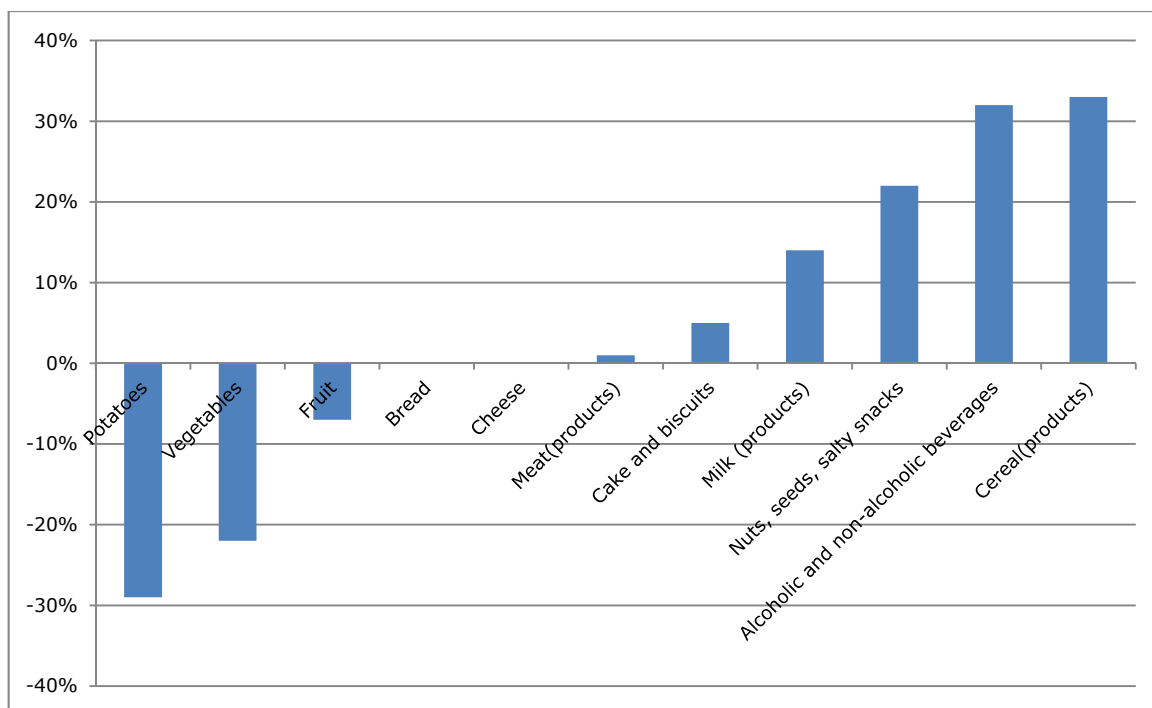


Figure 6.1 Changes in mean food consumption (main food groups) of the Dutch population aged 31 to 50 (decrease or increase of food consumption in DNFCs 2007-2010 in % compared to that in DNFCs 1997/1998) (88). Other age groups show similar findings.

*The food groups 'sugar and confectionary' and 'fats' have been excluded due to methodological concerns. In addition, food groups with a consumption of less than 20 grams were also excluded (e.g. legumes or fish)

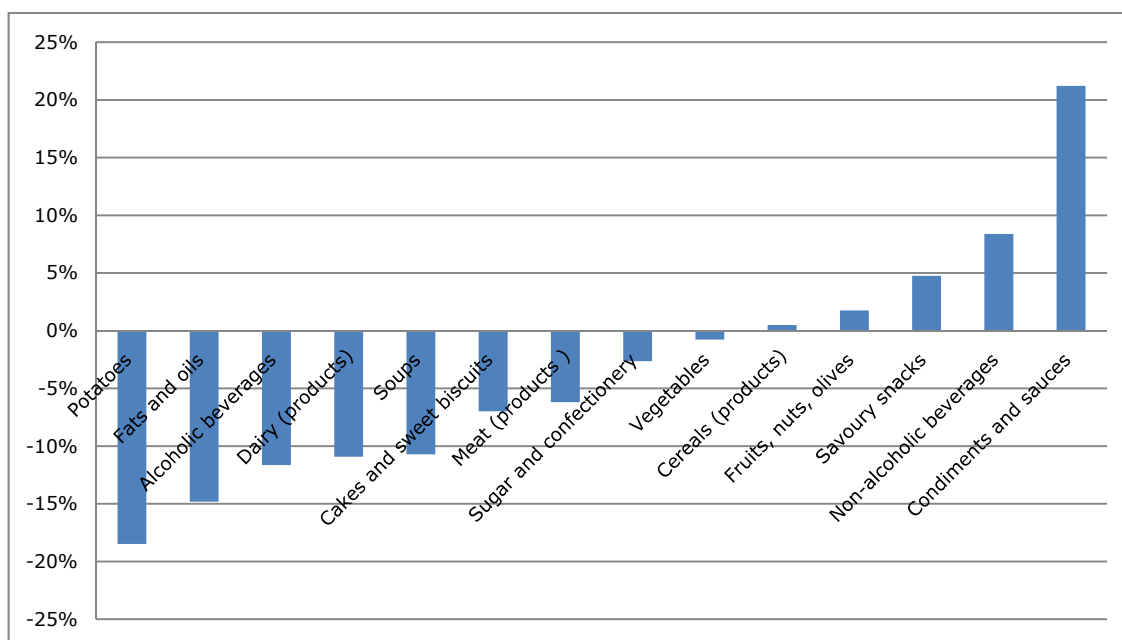


Figure 6.2 Changes in mean food consumption (main food groups) of the Dutch population aged 6 to 69 (decrease or increase of food consumption in DNFC 2012-2014 in % compared to that in DNFC 2007-2010), weighted for socio-demographic characteristics, season and day of the week (51).

Overall, the consumption of animal products declined over the past five years thanks to a reduced intake of meat and dairy products. Because of the different classification of food groups, not all changes can be compared accurately. Furthermore, the mean intake of legumes and fish is low in most age groups, so trend data are unreliable. Noteworthy is the increased consumption of fruit by children. The trend of an increased use of non-alcoholic beverages seen between 1978 and 2007 continued in 2012-2014. Another food group with an increase in consumption is that of condiments and sauces. In other food groups trends differ by age and sex. Apart from dairy and meat, over the last five years, a decline in consumption has been observed for alcoholic beverages (especially in young girls), fats and oils and cakes and sweet biscuits. The consumption of vegetables and bread and cereals has stabilized.

These dietary changes can be driven by changes in demographic, economic, social, technological, ecological, and political factors (see background report 'Driving forces of food consumption and supply'). Some of the driving forces directly affect the food choice of consumers, while others affect food consumption indirectly through changes in food production, food supply and food availability. The following sections highlight important changes in the food supply and dietary patterns. These changes are, where possible, linked to the driving forces.

6.1 The influence of increasing prosperity

Since 1970, the average global food availability per capita increased by 500 kilocalories per day, as well as the consumption of animal products and vegetable oils. Other foods, such as staples like roots and tubers, are consumed less (89).

In the Netherlands, influenced by increased prosperity, food consumption has shifted from a plant-based towards a more animal-based diet since the 1950s and 1960s. Figure 6.3 shows an increase in meat consumption (especially pork) up to the mid-90s. Meat consumption has declined slightly since then, but remains higher than in 1950. In the same period, potato and vegetable consumption decreased. The use of vegetables decreased from 181 grams/capita/day in 1950 to 164 grams/capita/day at the start of the 21st century. Potato use decreased from 356 grams/capita/day to 233 grams/capita/day (90). These estimates are based on food balance sheets, which can only be used as an indicator for the true food consumption of a population.

Figure 6.4 shows that increasing consumption of animal products went hand-in-hand with an increasing production of animal products, such as beef and pork (49). Across the same period, the proportion of our income spent on food declined. In 1969, about 25% of total household budget was spent on food, while this has declined to about 10% in 2013 (49).

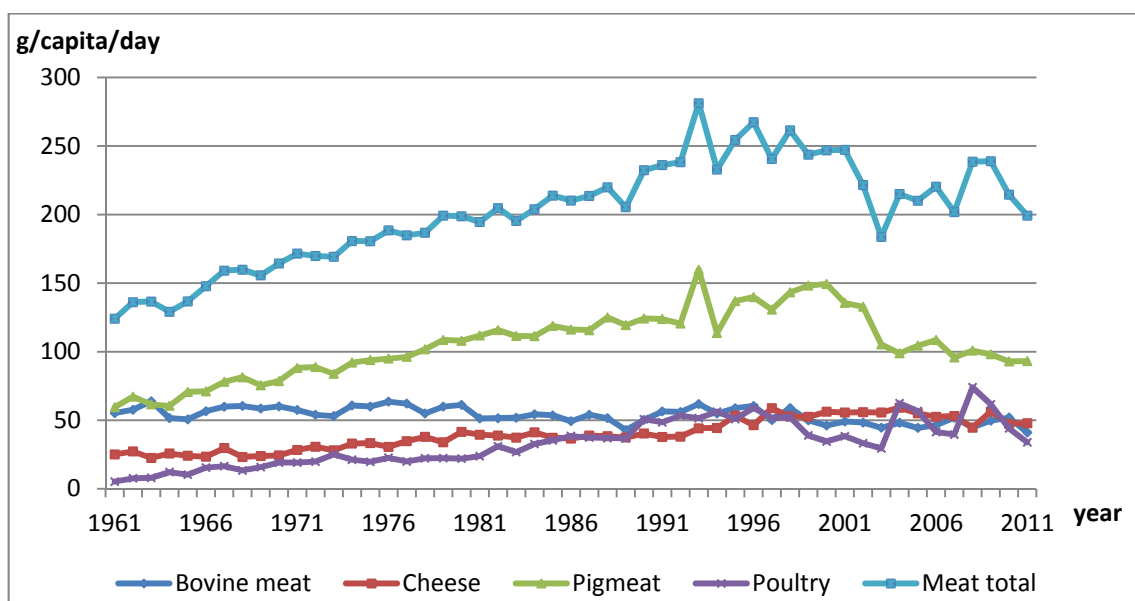


Figure 6.3 Per capita supply of animal based products in the Netherlands (in g per capita per day and in percent of total energy intake per capita per day). Data from food balance sheets 1961-2011 (91). Note that these data can be used to identify trends, but overestimate true food consumption.

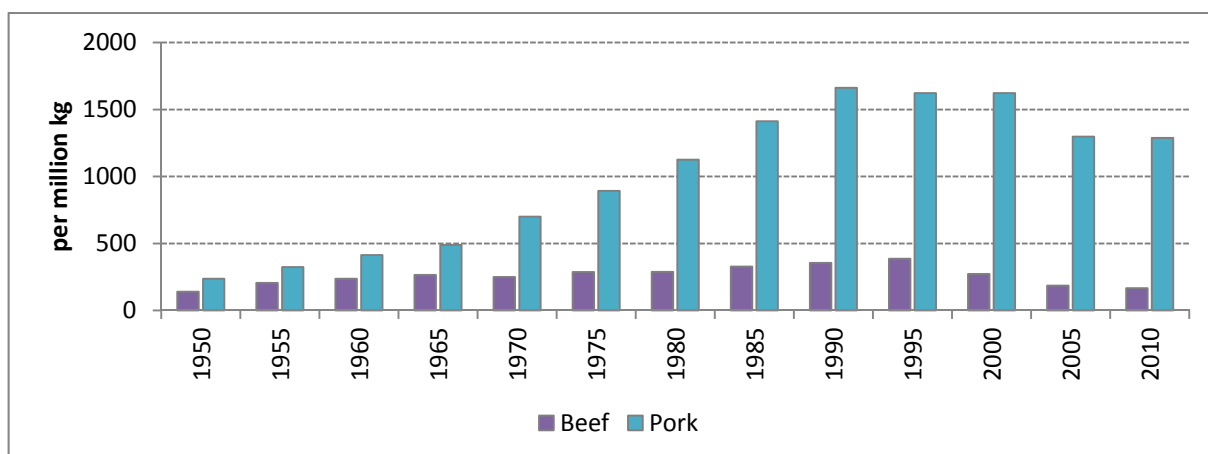


Figure 6.4 Dutch agricultural production of beef and pork between 1940 and 2010 (92).

The observed increase in food availability was made possible thanks to increased work-productivity and produce of the agricultural sector (93). Industrialisation of the agricultural sector made the observed increase in productivity possible (3). Important developments were mechanisation of the production process, specialisation, and the introduction of fertilizers, pesticides and antibiotics. Furthermore, the availability of cooling techniques and easier and quicker transportation possibilities made distribution of agricultural products easier. The agricultural sector also benefitted from the political climate which supported increasing productivity after the Second World War, for example via subsidies (3). How technological developments might support further sustainable intensification of the agricultural sector is described in section 6.2 of the background report 'Driving forces of food consumption and supply' (9).

6.2 The influence of globalisation

Influenced by increased globalization, non-native foods were introduced into the traditional Dutch eating pattern (94). For example, pasta or rice dishes partially replaced the traditional Dutch hot meal consisting of vegetables, potatoes and meat. Between 2012 and 2014, potatoes were only consumed every other day (47). Furthermore, seasonal products have become available all year, as have exotic products like melon, kiwi and pineapple. Figure 6.5 illustrates this.

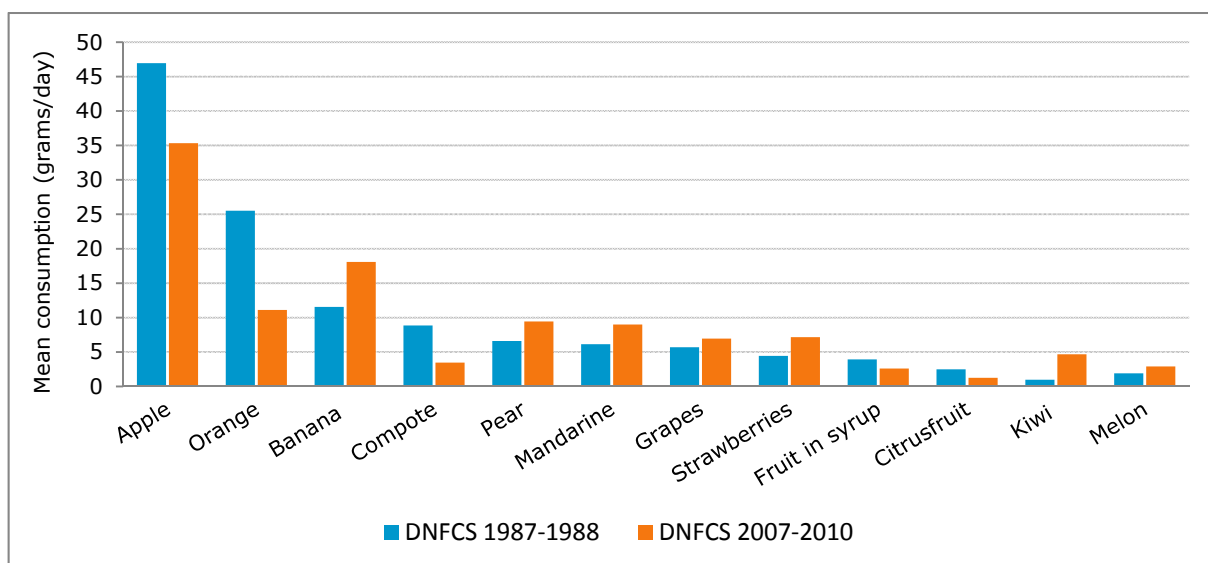


Figure 6.5 Popular fruit consumption (grams/day) by women aged 7-69 in the Dutch National Food Consumption Survey of 1987-1988 and 2007-2010 (44).

Most of the exotic fruit is imported from foreign countries (see Figure 6.6). In the Netherlands, more fruit is imported into the Netherlands than exported to other countries. This is also true for cereal products and plant oils and fats. Import exceeds export for these commodities. The production process for cereal products is included in Figure 6.7. This example illustrates the degree of dependency of the Netherlands on other EU or non-EU countries for cereal products. About 85% of the cereal used in the Dutch agro-food chain was imported from other countries; of which 83% from countries inside the EU and 17% from countries outside the EU. Most of the foods imported into the Netherlands are produced within the EU, except for fruit. Nearly 70% of the fruit imported into the Netherlands derived from countries outside the EU (95).

Even though import exceeds export for some food groups, overall the Netherlands is clearly an export country. Our largest export products are meat(products), dairy and eggs, vegetables and processed foods (see Figure 6.6). Particularly, the export of processed foods increased between 2009 and 2015.

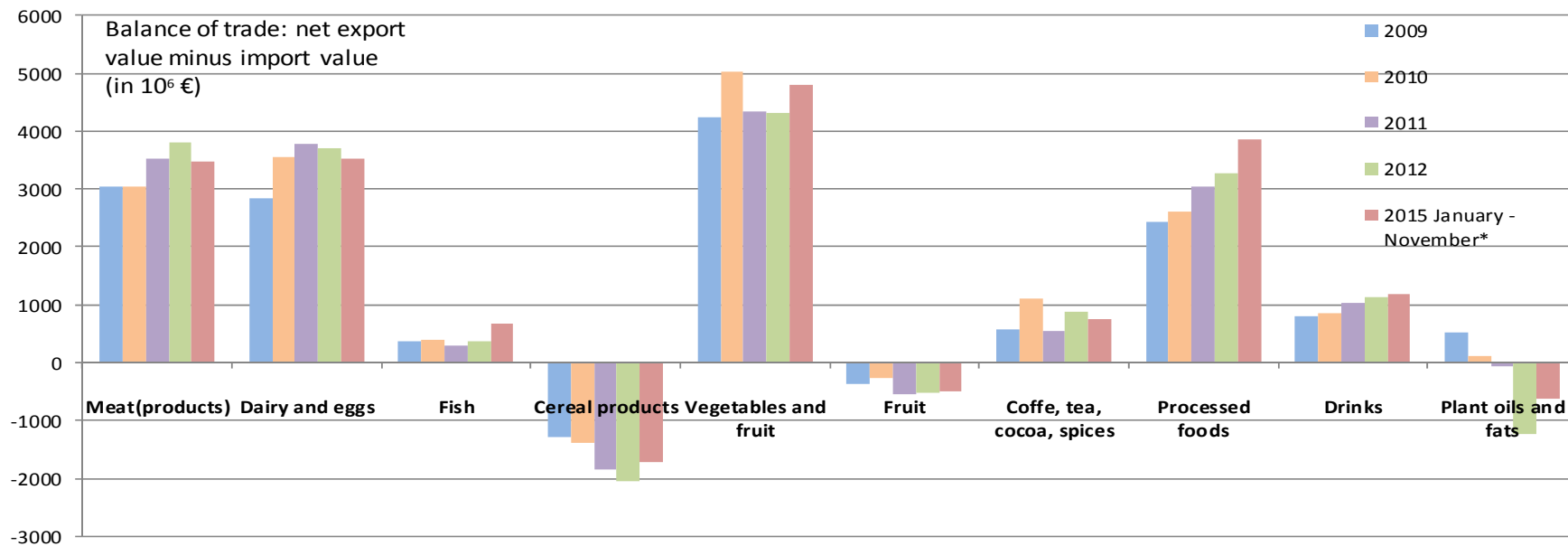


Figure 6.6. Balance of trade in the Netherlands according to SITC-class. 2009 - November 2015, Statline, CBS, accessed 16 February 2016.

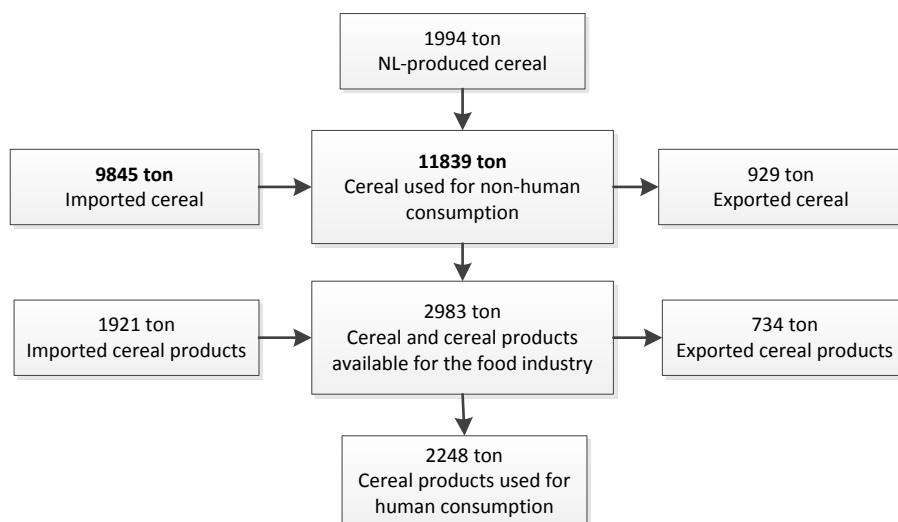


Figure 6.7 Import, consumption and export of cereal products in 2008-2009. Bron LEI.

The ratio between the production and consumption of foods in a country indicates the degree in which a country is self-sufficient. A country produces more than its citizens consume when the self-sufficiency-ratio exceeds 100%. The opposite is true when the self-sufficiency-ratio is lower than 100%. In the Netherlands, the level of self-sufficiency varies per food group (see Figure 6.8). The quantity of dairy, meat and vegetable products produced in the Netherlands is sufficient to cover our country's needs. However, for foods like fruit, fish and wheat, the Netherlands depends on other countries. Note that the dependency on other countries is probably higher than estimated in Figure 6.8, since the resources needed to produce these products are not taken into account. With an increasingly globalized agro-food chain, self-sufficiency may decline for some foods and dependency on other countries may increase (section 8.3, background report 'Driving forces of food consumption and supply' (9)).

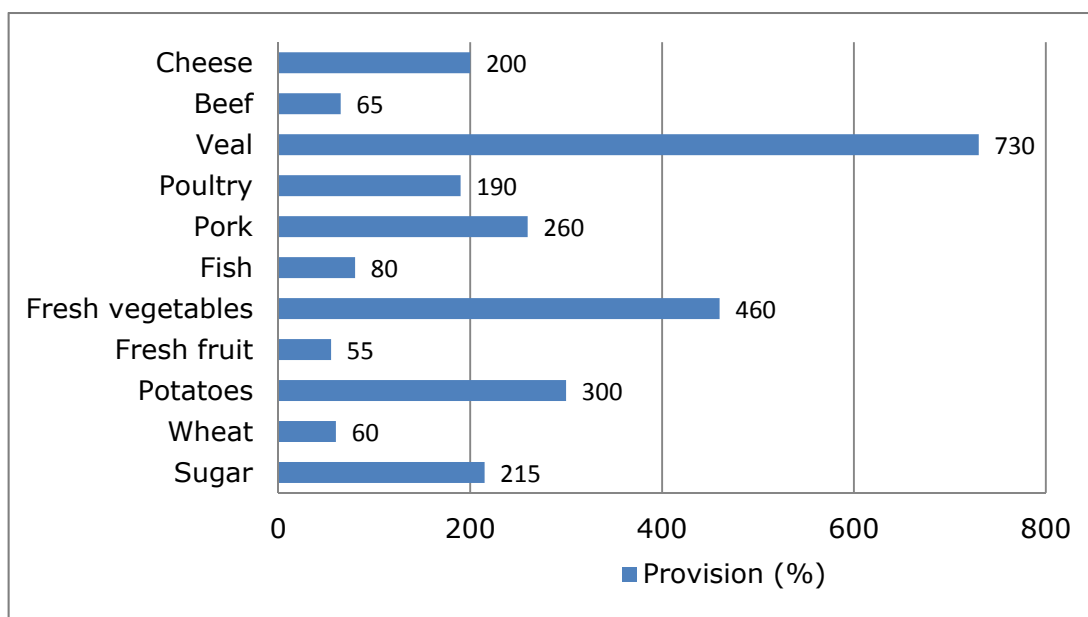


Figure 6.8 Provision of the Dutch agricultural sector to support Dutch food consumption of eleven food groups in 2009 (95).

These estimates do not directly provide information about the origin of the food consumed in the Netherlands, but they illustrate the complexity of the agro-food chain. This is especially true if all stakeholders involved in the production process of foods 'from farm to fork' are taken into account. Consequently, it is difficult to trace back a product's origin, especially if the food contains many ingredients. Examples of such products are a ready-to-eat chicken-curry meal, sate sauce, and jam-filled cakes; these may contain more than 20 ingredients. See also section 8.6 of the background report 'Driving forces of food consumption and supply' (9).

All the information above supports the finding that the food chain has become increasingly complex. However, the variation of commodities used for food production has declined. Thus, the ingredients of the food we eat are increasingly similar (96).

6.3 The influence of power concentration

Traditionally, foods consumed and prepared at home were bought at butchers, bakeries, greengrocers, markets etc. In the 1990s, about 60% of the household food-budget was spent in specialised shops. But the agro-food chain (including the retail market) has changed; nowadays about 66% of the household food-budget is spent in supermarkets (3, 97). Furthermore, online delivery of groceries is growing. Figure 6.9 shows how expenditure at four distribution channels changed between 2002 and 2010 for three food groups; meat, potatoes-fruit-vegetables, and cheese and eggs. For each group the proportion purchased in supermarkets increased.

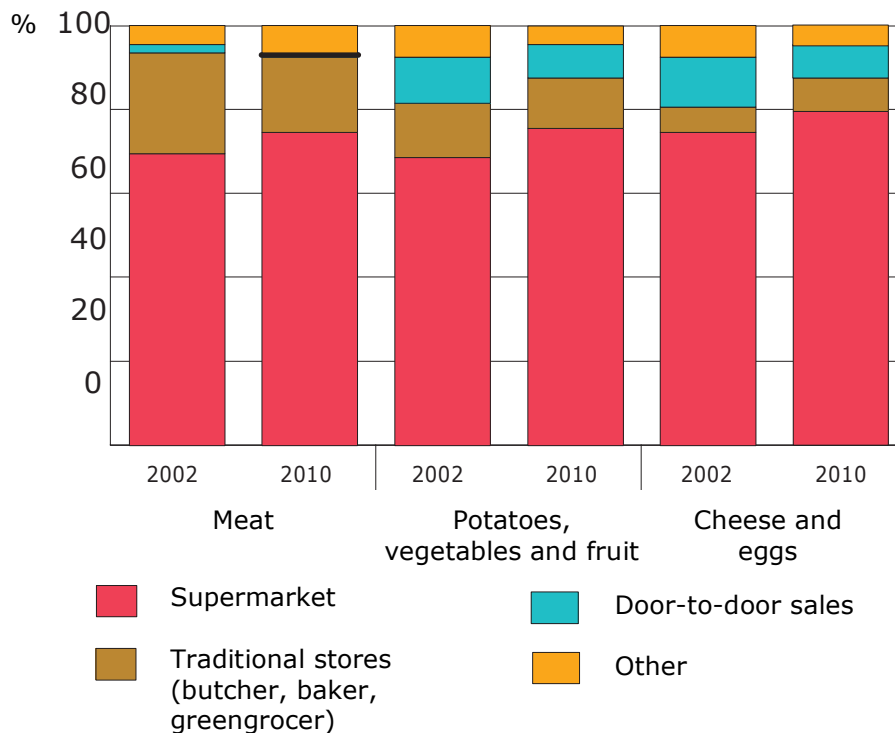


Figure 6.9 Consumer expenditure on meat, potatoes-vegetables-fruit, cheese and eggs in 2002 and 2010, separately for four distribution channels (90).

Centralisation of power in the food chain is high (see Figure 6.10). An underlying driving force for centralisation is the increasing scale of operation. When the market is saturated, economic growth often goes hand in hand with the takeover of (smaller) companies (3). The level of centralisation differs; amongst seed retailers, food distributors and supermarket formulas the power is extremely centralised (see Figure 6.10). Centralisation of power, like globalisation, may be considered as another form of dependency. It is argued that retailers – who are currently the dominant link within the food chain – can influence food manufacturers. And retailers can also influence consumers by determining which products are available and how they are offered (97). Retailers, including supermarkets and all other sellers of food have not always been the most dominant link within the food chain (see Table 6.1). At the moment, the competition between retailers, especially supermarkets, is increasing (98).

Table 6.1 Overview of dominant links within the food chain and how this changed over time (3).

Period	Farmers	Industry	Retail	Food service
<1900	Dominant	Limited	Minimal	Dominant (domestic)
1900-1950	Diminishing (except WOII)	Dominant	Limited	Diminishing (except WOII)
1960-1970	Regained importance (subsidized)	Dominant	Upcoming	Limited
1980-2000	Diminishing	Diminishing	Dominant	Upcoming
2000-2010	Regained importance?	Unsure	Dominant	Unsure

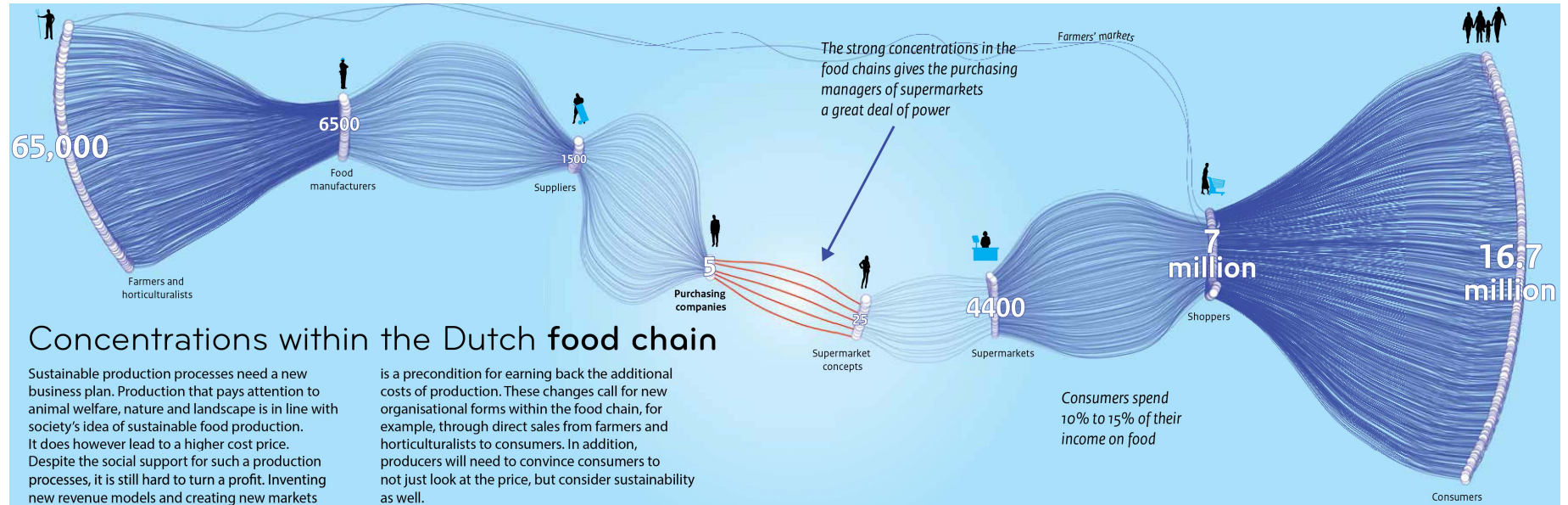


Figure 6.10. Overview of links within the Dutch food chain (97).

6.4 The influence of increasing food portion sizes

Thus, the food consumption of Dutch consumers has changed over the past 25 years. In one study, time trends in food portion size were studied for 8 types of products, some in different brands. These included confectionary bars, cola, potato crisps, burgers, croquette, cheese, and two types of large biscuits. Observed trends were the introduction of multi-packs and an increase in the range of available portion sizes. For example, the Hamburger was first introduced in the Netherlands in 1971. Two types were available at the time; one contained 255 kilocalories and the other 495 kilocalories. Larger options became available in 1987 and again in 2003. The latter contained 885 kilocalories, an increase of 400 to 600 kilocalories compared to the initial Hamburger introduced in the seventies. Similar increases in portion size were observed for soft drinks; the initial family bottle introduced in 1957 was 0.75 litre. The 1 litre, 1.5 litre and 2 litre bottles were introduced in 1968, 1978 and 1993 respectively. These findings are in accordance with studies into the development of portion sizes in other countries, which also found a general increase in portion sizes (40). On the other hand, driven by the increasingly busy lifestyle of Dutch consumers, the demand for single portion packs and re-sealable packaging has increased (98).

6.5 Decreasing preparation time and increasing convenience

The time we spend eating and preparing our food has changed over time; between 1975 and 2005 it decreased by 52 minutes and 86 minutes a week respectively (99). This trend has been influenced by, amongst others, the increasing availability of easy to prepare, ready-to-eat products and/or processed foods.

In the past decade, the availability of pre-cut and pre-packed vegetables increased. In 2014, the strongest growth in meal solutions was registered for canned and preserved food, soup and sauces, dressing and condiments (98). In addition, recent estimates show that the consumption of ready-to-eat meals is still increasing; a sales increase of 4.1% was observed between 2014 and 2015. The so-called 'ultra-fresh products' are especially popular; these products can be persevered up to seven days and focus on original ingredients e.g. whole tomatoes. Sales of these products increased by 20% (100). The increasing demand for convenience is not limited to the evening meal, an increase in on-the-go breakfast products has also been observed. Examples are breakfast bars and yoghurt in a pouch (98). Another trend which responds to the preference for quick and easy but healthy meals, are meal boxes that provide the ingredients for a number of meals per week. Even though three-quarters of the Dutch population is familiar with this concept, only 2% are registered members (101).

The increased availability of processed foods has also made it possible to cut back on preparation time. Time trends from 1998 to 2012 showed that ultra-processed products dominate the food supplies of 32 high-income countries including the Netherlands, and that their consumption is now rapidly increasing in middle-income countries. Ultra-processed products are made from processed substances extracted or refined from whole foods – e.g. hydrogenated oils and fats, flours and starches, variants of sugar, and cheap parts or remnants of animal foods – with

little or no whole foods. Many ultra-processed foods are cheap, palatable and ready-to-consume. They are generally energy-dense with high glycaemic load, high levels of fat, sugar and or salt, and low contents of dietary fibre and micronutrients (102). Table 6.2 provides information on the average habitual consumption of refined and unrefined cereal products and processed and unprocessed meat, amongst men and women in the Netherlands.

Table 6.2 Average habitual intake (grams/day) of food groups amongst men and women aged 19-69 in the Netherlands (64).

	Men	Women
Refined grains	108	81
Unrefined grains	116	89
Processed meat	55	37
Unprocessed meat	79	51

For high-income countries, average sales of frozen products like frozen bakery goods, meat and fish, potato products, desserts and ready-to-eat meals increased from about 24 kg per capita per year in 1998 to 26 kg in 2012. Soft drinks seem to be over their peak levels in high-income countries; there was a rapid increase of 13 litres per capita between 1998 and 2006, followed by a decline of 4 litres in 2012. Average sales of savoury snacks and confectionary remained more or less stable between 1998 and 2012 (103). Data from the European Prospective Investigation into Cancer and Nutrition (EPIC study) give some indication about consumption of highly processed foods in the period 1995-2000, though it uses a broader definition of highly processed foods compared to the ultra-processed foods mentioned above. In the Dutch EPIC-cohorts, about 50% of energy intake was provided by highly processed foods like cakes, biscuits, breakfast cereals, crisp bread, confectionery, processed meat and fish, milk beverages, yoghurt, cheese, cream desserts, margarines and other hardened fats and alcoholic beverages (104).

This search for convenient and quick foods can be linked to various driving forces, for example, the increased urbanisation and a higher number of two-income families. People want more free time and therefore cut back on the time spent on preparing meals. Technological developments have made this trend possible by developing food processing techniques. More recent technological developments, like the internet, have made it possible for supermarkets to invest in online activities which might further support the trends towards convenience (98). Furthermore, globalisation has made it possible to obtain ingredients of these complex foods from all over the world at a low price. Basic ingredients for the production of processed foods can be purchased wherever the stock price is lowest (102). Also socio-cultural influences have increased the demand for convenience foods. More information on the increasing demand for convenience as a driving force for food consumption is included in sections 3 and 5 of the background report 'Driving forces of food consumption and supply'.

6.6 Public response to food industrialisation and globalisation

The literature suggests that the perception of an increasingly industrialised food production process provokes counter-reactions, e.g. a

call for more organic and sustainable food (3). These changes are influenced, in part, by socio-cultural values. A detailed description of these driving forces is included in sections 5.2 to 5.6 of the background report 'Driving forces of food consumption and supply'. Indeed, many sustainable initiatives are based on the search towards 'pure and real' food (105).

Consumer spending on sustainable foods (including organic foods) increased in recent years. Sustainable foods contributed to 7% of total food spending between 2013 and 2014 (106), and for 8.2% in 2015 (107). Food groups that contributed most to consumer spending on sustainable foods in 2015 were fish (39%), eggs (35%) and coffee, tea, chocolate (25%) (107). Compared to estimates from 2014, a major increase in the contribution of fish was observed (2014: 21% (106), 2015: 39% (107)), this may be due to methodological differences between studies in combination with an actual increased contribution. Several quality labels are available that inform consumers about the sustainability of a product. Some of these labels focus on the environmental impact of a product, and others on animal welfare or whether the product is organically produced. In 2015, product sales of foods that claim to be organically produced increased by 15%. A 6.3% increase was observed for foods with an animal welfare label and a 3.9% growth for foods with a Marine Stewardship Council (MSC) label (107). Furthermore, the popularity of so-called 'flexitarians' is increasing. Flexitarians are people who reduce their meat intake by not eating meat daily. Between 2009 and 2011, the number of people who do not eat meat on one or two days a week increased from 30.3% to 34.6%. The number of every-day-meat-eaters declined from 30.5% in 2009 to 23% in 2011 (79). More recent estimates from 2015 show that 55% of the Dutch population can be considered as a flexitarian (no meat for dinner for at least 3 days per week) (78).

Besides more sustainable food consumption, many people are increasingly conscious of the healthiness of their diet. Familiarity with diets is widespread in the Dutch population. For example, over 50% of the population is familiar with the Dutch 'Wheel of Five', slimming diets like 'Sonja Bakker', and gluten free diets. About 36% of the population is familiar with superfoods, and 33% with the bread free diet. Less familiar diets are the Paleo diet, Detox diet and the Dr. Frank diet (less than 20% of the population is familiar with these diets) (108, 109). These diets (periodically) influence food consumption, for example, recent attention has focused on the supposedly negative consequences of excess bread consumption, resulting in a shift towards spelt bread and artisanal bread. Producers of breakfast cereal like oats, porridge and muesli have also benefited from this trend (98). Just like bread, the use of dairy products has received negative attention. Non-dairy alternatives increased in popularity; an increase of 11% in 2014 was observed mainly due to a rising demand for soy milk (98). Furthermore, 'healthy' is increasingly associated with foods that contain fewer artificial additives, which provides opportunities for fresh, less processed food and products with natural ingredients, so-called 'whole foods' (98). Opposing the trend for more whole foods, is an increasing market share of fortified foods since the Dutch Government introduced the 'Warenwetregeling toevoeging microvoedingsstoffen aan

levensmiddelen' (50). This law regulates the addition of micronutrients to products (see also section 5.5 of the background report 'Health aspects of the Dutch diet' (6)). For example, the number of products fortified with micronutrients or other bio-active compounds, and registered in the Dutch nutrient database, increased from zero in 1986 to 174 in 2011 (88).

6.7 Key findings

- Dairy, meat and vegetable products consumed by the Dutch are predominantly produced in the Netherlands. For these products, dependency on other countries is low. For other types of foods, like fruit, fish and wheat, the Netherlands is more dependent on other countries. Except for fruit, most of the imported food originates from European countries. Noteworthy is that these estimates do not include dependency on other countries for the production of animal feed.
- Food consumption has changed over the past decades, influenced by, amongst others, increased prosperity, increased food supply, and globalisation. For example, the variety of the food supply increased, exotic foods were introduced and household budget spending on food declined. Also, a shift towards a more animal based instead of plant based diet was observed after the Second World War. This increase stabilized in the 1990s and appears to have decreased slightly in recent years.
- A decline has been noted in the preparation time of food, supported by the increasing availability of ready-to-eat meals and processed foods. Moreover, a decline is observed in time spend on food purchase. Retail has become the dominant place of food purchase.
- There are still small but growing groups of consumers that oppose these trends, which also affects their food consumption. For example, the number of people consuming meat on a daily basis is decreasing, increasing sales estimates of soy milk have been observed, as well as an increasing market share of sustainable (including organic) foods.

7 Acknowledgement

The authors would like to thank the Geerte van Kesteren and Liesbeth Claassen (EMGO Institute for Health and Care Research) for their contributions to this report and Eveline Adriaans and José Drijvers for their support in finalizing this report. Furthermore, we would like to thank all members of the internal and external advisory committee for their constructive remarks.

8 References

1. van Kreijl C, Knaap A, Busch M, Havelaar A, Kramers P, Kromhout D, et al. *Ons eten gemeten. Gezonde voeding en veilig voedsel in Nederland*. Bilthoven: RIVM; 2004.
2. Gezondheidsraad. *Richtlijnen goede voeding 2015*. . Den Haag: Gezondheidsraad; 2015.
3. Wetenschappelijke Raad voor het Regeringsbeleid. *Naar een voedselbeleid*. Den Haag/Amsterdam: WRR/Amsterdam University Press; 2014.
4. Ocké MC, Toxopeus I, Geurts M, Mengelers M, Temme EHM, Hoeymans N. *Wat ligt er op ons bord? Veilig, gezond en duurzaam eten in Nederland*. Bilthoven: RIVM; 2017.
5. Mengelers M, de Wit L, Boon P, Franz E, Bouwknegt M, de Jonge R, et al. *How safe is our food? Background report to 'What is on our plate? Safe, healthy and sustainable food in the Netherlands'*. Bilthoven: RIVM; 2017. Report No.: 2016-0196.
6. Boer JM, Buurma EM, Hendriksen MAH, van Kranen H, Milder I, Ocké MC, et al. *Health aspects of the Dutch diet. Background report to 'What is on our plate? Safe, healthy and sustainable food in the Netherlands'*. Bilthoven: RIVM; 2017.
7. Hollander A, Temme EHM, Zijp M. *The environmental sustainability of the Dutch diet. Background report to 'What is on our plate? Safe, healthy and sustainable food in the Netherlands'*. Bilthoven: RIVM; 2017.
8. Story M, Kaphingst KM, Robinson-O'Brien R, Glanz K. *Creating healthy food and eating environments: policy and environmental approaches*. *Annual review of public health*. 2008;29:253-72.
9. Zantinge E, van Bakel M, van Loon J, Ocké MC. *Drijvende krachten van de voedselconsumptie en het voedselaanbod. Achtergrondrapport bij 'Wat ligt er op ons bord? Veilig, gezond en duurzaam eten in Nederland'*. Bilthoven: RIVM; 2017.
10. Sleddens EF, Kroeze W, Kohl LF, Bolten LM, Velema E, Kaspers P, et al. *Correlates of dietary behavior in adults: an umbrella review*. *Nutrition reviews*. 2015;73(8):477-99.
11. Symmank C, Mai R, Hoffmann S, Stok FM, Renner B, Lien N, et al. *Predictors of food decision making: A systematic interdisciplinary mapping (SIM) review*. *Appetite*. 2016;110(March): 25-35.
12. Kral TV, Rauh EM. *Eating behaviors of children in the context of their family environment*. *Physiol Behav*. 2010;100(5):567-73.
13. Craigie AM, Lake AA, Kelly SA, Adamson AJ, Mathers JC. *Tracking of obesity-related behaviours from childhood to adulthood: A systematic review*. *Maturitas*. 2011;70(3):266-84.
14. Faith MS, Carnell S, Kral TV. *Genetics of food intake self-regulation in childhood: literature review and research opportunities*. *Hum Hered*. 2013;75(2-4):80-9.
15. Larson N, Story M. *A review of environmental influences on food choices*. *Annals of behavioral medicine : a publication of the Society of Behavioral Medicine*. 2009;38 Suppl 1:S56-73.
16. Rao M, Afshin A, Singh G, Mozaffarian D. *Do healthier foods and diet patterns cost more than less healthy options? A systematic review and meta-analysis*. *BMJ Open*. 2013;3(12):e004277.

17. van't Riet J, Sijtsema SJ, Dagevos H, De Bruijn GJ. The importance of habits in eating behaviour. An overview and recommendations for future research. *Appetite*. 2011;57(3):585-96.
18. McDermott MS, Oliver M, Simnadis T, Beck EJ, Coltman T, Iverson D, et al. The Theory of Planned Behaviour and dietary patterns: A systematic review and meta-analysis. *Prev Med*. 2015;81:150-6.
19. Sleddens EF, Kroeze W, Kohl LF, Bolten LM, Velema E, Kaspers PJ, et al. Determinants of dietary behavior among youth: an umbrella review. *Int J Behav Nutr Phys Act*. 2015;12:7.
20. Adriaanse MA, Vinkers CD, De Ridder DT, Hox JJ, De Wit JB. Do implementation intentions help to eat a healthy diet? A systematic review and meta-analysis of the empirical evidence. *Appetite*. 2011;56(1):183-93.
21. Bisogni CA, Jastran M, Seligson M, Thompson A. How people interpret healthy eating: contributions of qualitative research. *Journal of nutrition education and behavior*. 2012;44(4):282-301.
22. Bartels J, Onwezen M, Ronteltap A, Fischer A, APW K, van Veggel R, et al. Eten van Waarde. Peiling Consument en Voedsel. Den Haag: LEI Wageningen UR; 2009.
23. Van Dam YK, De Jonge J. The Positive Side of Negative Labelling. *Journal of Consumer Policy*. 2015;38(1):19-38.
24. Ueland O, Gunnlaugsdottir H, Holm F, Kalogeras N, Leino O, Luteijn JM, et al. State of the art in benefit-risk analysis: consumer perception. *Food Chem Toxicol*. 2012;50(1):67-76.
25. Paquette MC. Perceptions of healthy eating: state of knowledge and research gaps. *Canadian journal of public health = Revue canadienne de sante publique*. 2005;96 Suppl 3:S15-9, s6-21.
26. Kher SV, De Jonge J, Wentholt MTA, Deliza R, de Andrade JC, Cnossen HJ, et al. Consumer perceptions of risks of chemical and microbiological contaminants associated with food chains: a cross-national study. *International Journal of Consumer Studies*. 2013;37(1):73-83.
27. Siegrist M, Visschers VHM, Hartmann C. Factors influencing changes in sustainability perception of various food behaviors: Results of a longitudinal study. *Food Quality and Preference*. 2015;46:33-9.
28. Vanhonacker F, Van Loo EJ, Gellynck X, Verbeke W. Flemish consumer attitudes towards more sustainable food choices. *Appetite*. 2013;62:7-16.
29. Robinson E, Almiron-Roig E, Rutters F, de Graaf C, Forde CG, Tudur Smith C, et al. A systematic review and meta-analysis examining the effect of eating rate on energy intake and hunger. *Am J Clin Nutr*. 2014;100(1):123-51.
30. Cruwys T, Bevelander KE, Hermans RC. Social modeling of eating: a review of when and why social influence affects food intake and choice. *Appetite*. 2015;86:3-18.
31. Sturkenboom SM, Dekker LH, Lamkaddem M, Schaap LA, de Vries JH, Stronks K, et al. Acculturation and dietary patterns among residents of Surinamese origin in the Netherlands: the HELIUS dietary pattern study. *Public Health Nutr*. 2016;19(4):682-92.
32. Robinson E, Thomas J, Aveyard P, Higgs S. What everyone else is eating: a systematic review and meta-analysis of the effect of informational eating norms on eating behavior. *Journal of the Academy of Nutrition and Dietetics*. 2014;114(3):414-29.

33. Higgs S. Social norms and their influence on eating behaviours. *Appetite*. 2015;86:38-44.
34. Shaikh AR, Yaroch AL, Nebeling L, Yeh MC, Resnicow K. Psychosocial predictors of fruit and vegetable consumption in adults a review of the literature. *Am J Prev Med*. 2008;34(6):535-43.
35. Faith MS, Fontaine KR, Baskin ML, Allison DB. Toward the reduction of population obesity: macrolevel environmental approaches to the problems of food, eating, and obesity. *Psychological bulletin*. 2007;133(2):205-26.
36. Bilman E, van Kleef E, van Trijp H. External Cues Challenging the Internal Appetite Control System-overview and Practical Implications. *Critical reviews in food science and nutrition*. 2015.
37. Geurts M, Brants H, Milder I. De voedingsomgeving op scholen. De stand van zaken in het voortgezet onderwijs en middelbaar beroepsonderwijs anno 2015. Bilthoven: RIVM; 2016.
38. Amani R, Gill T. Shiftworking, nutrition and obesity: implications for workforce health- a systematic review. *Asia Pacific journal of clinical nutrition*. 2013;22(4):505-15.
39. Atkinson G, Fullick S, Grindey C, Maclaren D. Exercise, energy balance and the shift worker. *Sports medicine (Auckland, NZ)*. 2008;38(8):671-85.
40. Steenhuis IH, Leeuwis FH, Vermeer WM. Small, medium, large or supersize: trends in food portion sizes in The Netherlands. *Public health nutrition*. 2010;13(6):852-7.
41. De bosatlas. De bosatlas van het voedsel. Groningen: Noofdhoff Uitgevers; 2014.
42. De Jonge J. Vertrouwen in de wetenschap 2015. Den Haag: Rathenau Instituut; 2015.
43. Voedingscentrum. Jaarlijks onderzoek door Motivaction. Den Haag: Voedingscentrum; 2015.
44. Van Rossum CTM, Franssen HP, Verkaik-Kloosterman J, Buurma EM, Ocké MC. Dutch National Food Consumption Survey 2007-2010: Diet of children and adults aged 7 to 69 years. Bilthoven: RIVM; 2011.
45. de Boer EJ, Slimani N, van 't Veer P, Boeing H, Feinberg M, Leclercq C, et al. The European Food Consumption Validation Project: conclusions and recommendations. *European journal of clinical nutrition*. 2011;65 Suppl 1:S102-7.
46. Ferrari P, Slimani N, Ciampi A, Trichopoulou A, Naska A, Lauria C, et al. Evaluation of under- and overreporting of energy intake in the 24-hour diet recalls in the European Prospective Investigation into Cancer and Nutrition (EPIC). *Public health nutrition*. 2002;5(6b):1329-45.
47. Van Rossum CTM, Beukers M, De Boer EJ, Brants HAM, Buurma-Rethans EJM, Ocké MC, et al. The diet of the Dutch; Results of the first 2 year of the Dutch National Food Consumption Survey 2012-2014. Bilthoven: RIVM; 2016.
48. CBS. Woonlasten vormen bijna 40 procent uitgaven laagste inkomens 2015. Available from: <https://www.cbs.nl/nl-nl/nieuws/2015/28/woonlasten-vormen-bijna-40-procent-uitgaven-laagste-inkomens>.
49. CBS. CBS Statline. 2016. Available from: <http://statline.cbs.nl/Statweb/>.

50. Warenwetbesluit Toevoeging micro-voedingsstoffen aan levensmiddelen, DGVgz/VVP/L 952051 (1996).
51. Van Rossum CTM, Beukers M, De Boer EJ, Brants HAM, Buurma-Rethans EJM, Ocké MC, et al. The diet of the Dutch; Results of the first 2 year of the Dutch National Food Consumption Survey 2012-2014. Bilthoven: RIVM; 2016.
52. Dickinson A, MacKay D. Health habits and other characteristics of dietary supplement users: a review. *Nutrition journal*. 2014;13:14.
53. GGD'en C, RIVM. Gezondheidsmonitor Volwassenen, GGD'en, CBS en RIVM [Internet]. 2012.
54. Dekker LH, Boer JM, Stricker MD, Busschers WB, Snijder MB, Nicolaou M, et al. Dietary patterns within a population are more reproducible than those of individuals. *J Nutr*. 2013;143(11):1728-35.
55. Fransen HP, May AM, Stricker MD, Boer JM, Hennig C, Rosseel Y, et al. A Posteriori Dietary Patterns: How Many Patterns to Retain? *J Nutr*. 2014.
56. Walthouwer MJ, Oenema A, Soetens K, Lechner L, de Vries H. Are clusters of dietary patterns and cluster membership stable over time? Results of a longitudinal cluster analysis study. *Appetite*. 2014;82:154-9.
57. EFSA Comprehensive European Food Consumption Database in Exposure Assessment [Internet]. EFSA. 2011.
58. Slimani N, Fahey M, Welch AA, Wirfalt E, Stripp C, Bergstrom E, et al. Diversity of dietary patterns observed in the European Prospective Investigation into Cancer and Nutrition (EPIC) project. *Public Health Nutr*. 2002;5(6B):1311-28.
59. Geurts M, van Rossum CTM. De Nederlandse voedselconsumptie vergeleken met de Richtlijnen voedselkeuze. Resultaten op basis van de Nederlandse Voedselconsumptiepeiling 2007-2010. Bilthoven: RIVM; 2014. Contract No.: 2014-0135.
60. Ocke MC, Buurma-Rethans EJM, De Boer EJ, Wilson-van den Hooven C, Etemad-Ghameshlou Z, Drijvers JJMM, et al. Diet of community-dwelling older adults. Dutch national food consumption survey Older Adults 2010-2012. Bilthoven: RIVM; 2013.
61. Gahagan S, Uauy R, Roseboom TJ. Developmental origins of pediatric obesity. *International journal of pediatrics*. 2012;2012:309863.
62. Hulshof KFAM, Kistemaker CB, M. De consumptie van groepen voedingsmiddelen door Nederlandse bevolkingsgroepen. Voedselconsumptiepeiling 1997/1998. Zeist: TNO-Voeding; 1998.
63. Peeters D, Lanting CI, van Wouwe JPK. Peiling melkvoeding van zuigelingen 2015. Leiden: TNO; 2015.
64. Geurts M, Buurma EM, van der A D, van Rossum CTM. Aanvullende gegevens ter ondersteuning van de Richtlijnen Goede Voeding 2015. Bilthoven: RIVM; 2015.
65. De Boer EJ, Brants HAM, Beukers M, Ocké MC, Dekker L, Nicolaou M, et al. Voeding van Marokkaanse, Turkse, Surinaamse en autochtone Nederlanders in Amsterdam. Bilthoven: RIVM; 2015.
66. Geurts M, Beukers M, Van Rossum C. MEMO Consumptie groenten, fruit, vis en een aantal nutriënten opgedeeld naar opleidingsniveau en verstedelijking. Bilthoven: RIVM; 2013.

67. Giskes K, Avendano M, Brug J, Kunst AE. A systematic review of studies on socioeconomic inequalities in dietary intakes associated with weight gain and overweight/obesity conducted among European adults. *Obesity reviews : an official journal of the International Association for the Study of Obesity*. 2010;11(6):413-29.
68. Giskes K, Turrell G, van Lenthe FJ, Brug J, Mackenbach JP. A multilevel study of socio-economic inequalities in food choice behaviour and dietary intake among the Dutch population: the GLOBE study. *Public health nutrition*. 2006;9(1):75-83.
69. Pechey R, Jebb SA, Kelly MP, Almiron-Roig E, Conde S, Nakamura R, et al. Socioeconomic differences in purchases of more vs. less healthy foods and beverages: analysis of over 25,000 British households in 2010. *Social science & medicine (1982)*. 2013;92:22-6.
70. van Lenthe FJ, Jansen T, Kamphuis CB. Understanding socio-economic inequalities in food choice behaviour: can Maslow's pyramid help? *The British journal of nutrition*. 2015;113(7):1139-47.
71. van Bussel M, van Rossum CTM, Temme EHM, Boon PE, Ocké MC. Socioeconomic differences in aspects of healthy, sustainable and safe food consumption among adults in the Netherlands. Submitted.
72. de Jong E, Visscher TL, HiraSing RA, Seidell JC, Renders CM. Home environmental determinants of children's fruit and vegetable consumption across different SES backgrounds. *Pediatric obesity*. 2015;10(2):134-40.
73. Gevers DW, Kremers SP, de Vries NK, van Assema P. Intake of energy-dense snack foods and drinks among Dutch children aged 7-12 years: how many, how much, when, where and which? *Public health nutrition*. 2015:1-10.
74. Gubbels JS, Raaijmakers LG, Gerards SM, Kremers SP. Dietary intake by Dutch 1- to 3-year-old children at childcare and at home. *Nutrients*. 2014;6(1):304-18.
75. Ball K, Crawford D, Mishra G. Socio-economic inequalities in women's fruit and vegetable intakes: a multilevel study of individual, social and environmental mediators. *Public health nutrition*. 2006;9(5):623-30.
76. Ball K, Lamb KE, Costa C, Cutumisu N, Ellaway A, Kamphuis CB, et al. Neighbourhood socioeconomic disadvantage and fruit and vegetable consumption: a seven countries comparison. *The international journal of behavioral nutrition and physical activity*. 2015;12:68.
77. Neter JE, Dijkstra SC, Visser M, Brouwer IA. Food insecurity among Dutch food bank recipients: a cross-sectional study. *BMJ open*. 2014;4(5):e004657.
78. Keuchenius C, van der Lelij B. Quicksan 2015: eetpatronen van verschillende sociale milieus, duurzaamheid en voedselverspilling. Amsterdam: Motivaction i.o.v. Voedingscentrum; 2015.
79. Dagevos H, Voordouw J, van Hoeven L, van der Weele C, de Bakker E. Vlees vooral(snog) vanzelfsprekend. Den Haag: LEI Wageningen UR; 2012.

80. Beukers M, van Rossum CTM. Memo: Percentage dieetvolgers en volgers van een leefregel. Resultaten van VCP 2007-2010. Bilthoven: RIVM; 2012.
81. Cloin M, van den Broek A, van den Dool R, de Haan J, de Hart J, van Houwelingen P, et al. Met het oog op de tijd. Een blik op de tijdsbesteding van Nederlanders. Den Haag: SCP; 2013.
82. Keuchenius C, Schaafsma S. Rituelen en gebruiken in het gezien. Een kwantitatief publieksonderzoek onder gezinnen in Nederland. Amsterdam: Motivaction i.o.v. AD; 2015.
83. Brants H, Drijvers JJMM, Niekerk M, Ocké MC, van Rossum CTM. Wat, waar en wanneer eten we? Voeding Nu. 2011;15(11):16-8.
84. Herman CP. The social facilitation of eating. A review. Appetite. 2015;86:61-73.
85. Feunekes GI, de Graaf C, van Staveren WA. Social facilitation of food intake is mediated by meal duration. Physiology & behavior. 1995;58(3):551-8.
86. Nijs KA, de Graaf C, Siebelink E, Blauw YH, Vanneste V, Kok FJ, et al. Effect of family-style meals on energy intake and risk of malnutrition in dutch nursing home residents: a randomized controlled trial. The journals of gerontology Series A, Biological sciences and medical sciences. 2006;61(9):935-42.
87. Feunekes GI, Stafleu A, de Graaf C, van Staveren WA. Family resemblance in fat intake in The Netherlands. European journal of clinical nutrition. 1997;51(12):793-9.
88. Geurts M, van Rossum CTM, Brants H, Verkaik-Kloosterman J, Hendriksen MAH. Veranderingen in het aanbod van voedingsmiddelen en de voedselconsumptie: Resultaten gebaseerd op bijna 25 jaar voedselconsumptieonderzoek. Bilthoven: RIVM; 2014.
89. Alexandratos N, Bruinsma J. World agriculture towards 2030-2050: the 2012 revision. . Rome: FAO 2012. Contract No.: ESA Working paper No. 12-03.
90. van der Bie R, Hermans B, Pierik C, Stroucken L, Wobma E. Smakelijk weten. Den Haag/Heerlen: Centraal Bureau voor de Statistiek,; 2012.
91. FAOSTAT Food Supply [Internet]. FAO. 2014. Available from: <http://faostat.fao.org/site/610/DesktopDefault.aspx?PageID=610#ancor>.
92. CBS Statline [Internet]. 2012 [cited 11-10-2015]. Available from: <http://statline.cbs.nl/Statweb/>.
93. van der Bie R, Dehing P. Nationaal goed. Feiten en cijfers over onze samenleving (ca.) 1800-1999. Amsterdam: CBS; 1999.
94. Bijman J, Pronk B, de Graaff R. Wie voedt Nederland? Den Haag: LEI; 2003.
95. van der Knijff A, Bolhuis J, van Galen M, Beukers R. Verduurzaming voedselproductie. Inzicht in productie, import, export en consumptie van voedsel. Den Haag: LEI, onderdeel van Wageningen UR; 2011.
96. Khoury CK, Bjorkman AD, Dempewolf H, Ramirez-Villegas J, Guarino L, Jarvis A, et al. Increasing homogeneity in global food supplies and the implications for food security. Proceedings of the National Academy of Sciences. 2014;111(11):4001-6.

97. Westhoek H, Rood T, van Eerdt M, van Gelder M, van Grinsven H, Reudink M, et al. De macht van het menu. Opgaven en kansen voor duurzaam en gezond voedsel. Den Haag: PBL; 2013.
98. Euromonitor International. Packaged food in the Netherlands. Euromonitor International; 2015.
99. Mandemakers J, Roeters M. Fast or slow food? Explaining trends in food-related time in the Netherlands, 1975-2005. *Acta Sociologica*. 2014.
100. Rensen E. AH stuwt omzet kant en klare salades. *Distrifood*. 2015.
101. Marketing Tribune. Maaltijdboxen zijn steeds meer in trek bij Nederlandse consument. 2015.
102. Monteiro CA, Moubarac JC, Cannon G, Ng SW, Popkin B. Ultra-processed products are becoming dominant in the global food system. *Obesity reviews : an official journal of the International Association for the Study of Obesity*. 2013;14 Suppl 2:21-8.
103. International E. Packaged food in the Netherlands. Euromonitor International; 2015.
104. Slimani N, Deharveng G, Southgate DA, Biessy C, Chajes V, van Bakel MM, et al. Contribution of highly industrially processed foods to the nutrient intakes and patterns of middle-aged populations in the European Prospective Investigation into Cancer and Nutrition study. *European journal of clinical nutrition*. 2009;63 Suppl 4:S206-25.
105. De Bakker E, Dagevos H, Van Mil E, Van der Wielen P, Terluin I, Van der Ham A. Energieke zoektochten naar verduurzaming in landbouw en voedsel; Paradigma's en praktijken. Wageningen: Wettelijke Onderzoekstaken Natuur & Milieu; 2013.
106. Logatcheva K. Monitor Duurzaam Voedsel 2014. Wageningen: Wageningen University; 2015.
107. Centraal bureau levensmiddelenhandel. De niche voorbij: 2 miljard omzet producten met duurzaamheidskeurmerk. 2015.
108. Network For Food Experts (NVVE). Voedseltrends. Amsterdam: NVVE; 2015.
109. EUFIC. The science behind superfoods: are they really super? 2012; 11/2012.



.....

**M. Geurts | A.M. van Bakel | C.T.M. van Rossum |
E. de Boer | M.C. Ocké**

.....

RIVM Report 2016-0195

Published by

**National Institute for Public Health
and the Environment**

P.O. Box 1 | 3720 BA Bilthoven
The Netherlands
www.rivm.nl/en

March 2017

Committed to *health and sustainability*