Technical University of Denmark

DTU

Nutritional evaluation of lowering consumption of meat and meat products in the Nordic context

Tetens, Inge; Hoppe, Camilla ; Frost Andersen, Lene ; Helldan, Anni; Warensjö Lemming, Eva; Trolle, Ellen; Holm Totland, Torunn; Lindross, Anna Karin

DTU Library
Technical Information Center of Denmark

Nutritional evaluation of lowering consumption of meat and meat products in the Nordic context

Nutritional evaluation of lowering consumption of meat and meat products in the Nordic context

*Inge Tetens, Camilla Hoppe, Lene Frost Andersen, Anni Helldán,
Eva Warensjö Lemming, Ellen Trolle. Torunn Holm Totland and
Anna Karin Lindroos*

Nutritional evaluation of lowering consumption of meat and meat products in the Nordic context

Inge Tetens, Camilla Hoppe, Lene Frost Andersen, Anni Helldán, Eva Warensjö Lemming,
Ellen Trolle. Torunn Holm Totland and Anna Karin Lindroos

Layout: NMR
Cover photo: ImageSelect

www.norden.org/en/publications

Nordic co-operation

Nordic co-operation is one of the world's most extensive forms of regional collaboration, involv-
ing Denmark, Finland, Iceland, Norway, Sweden, and the Faroe Islands, Greenland, and Åland.

Nordic co-operation has firm traditions in politics, the economy, and culture. It plays an im-
portant role in European and international collaboration, and aims at creating a strong Nordic
community in a strong Europe.

Nordic co-operation seeks to safeguard Nordic and regional interests and principles in the
global community. Common Nordic values help the region solidify its position as one of the
world's most innovative and competitive.

Nordic Council of Ministers
Ved Stranden 18
DK-1061 Copenhagen K
Phone (+45) 3396 0200

www.norden.org

Content

Preface

In recent years the role of meat as an important part of the diet has been challenged. Not only with regard to animal welfare, climate and environmental changes but also in relation to health issues.

Quantitative guidelines about optimal amounts of meat and meat products in the habitual diet should be based on estimations on the actual diets. The Nordic countries conduct representative national dietary surveys that can serve as a base for estimating the nutritional consequences of changes in meat intake.

The Nordic Council of Ministers provided funding via a grant from the Nordic Working Group for Diet, Food and Toxicology (NKMT) to four Nordic countries to conduct a modeling study on the nutritional consequences of change in the current habitual intake of meat and meat products. The present report is the result of this study. The study was headed by the National Food Institute, Technical University of Denmark (Inge Tetens, Camilla Hoppe, Ellen Trolle) with participation from Institute of Basic Medical Sciences, University of Oslo, Norway (Lene Frost Andersen, Torunn Holm Totland), National Food Agency, Sweden (Anna Karin Lindroos , Eva Warensjö Lemming), and National Institute for Health and Welfare, Finland (Anni Helldán).

Søborg November 28th, 2012,

Gitte Gross
Head of Division of Nutrition,
The National Food Institute,
Technical University of Copenhagen

Summary

Based on a systematic review of the available literature and in particular with reference to the evidence on the association between colorectal cancer and meat consumption, The World Cancer Research Fund (WCRF) recommended in 2007 that the dietary intake on red meat should be limited and processed meat avoided. The personal recommendation to individuals consuming meat was to consume less than 500 g red meat per week (equivalent to 70 g/d) with very little – if any – processed meat. The specific public health goal was an average consumption of red meat to be no more than 300 g of red meat per week (equivalent to 43 g/d) and very little – if any processed meat.

The aim of this report was to assess the overall nutritional consequences of lowering the daily consumption of meat from current intake to the level suggested by the WCRF, with specific emphasis on processed meat.

Five scenarios were generated, and dietary modeling was conducted for each of the four Nordic countries for women 18–75 y, men 18–75 y, children 4–9 y, and adolescents 10–17 y. Scenario 1 was the average habitual diet; Scenario 2 was the average habitual diet where the habitual red meat intake was reduced to 70 g/d and the intake of processed meat intake was 0 g/d. The meat was substituted with X g white meat/fish; Scenario 3 was the average habitual diet where the habitual red meat intake was reduced to 70 g/d and the intake of processed meat intake was 0 g/d. The meat was substituted with a proportional amount of other food products but meat; Scenario 4 the average habitual diet where the habitual red meat intake was reduced to 43 g/d and the intake of processed meat intake was 0 g/d. The meat was substituted with X g white meat/fish; and Scenario 5 was the average habitual diet where the habitual red meat intake was reduced to 43 g/d and the intake of processed meat intake was 0 g/d. The meat was substituted with a proportional amount of other food products but meat.

The present study showed that the average meat intake in the Nordic countries in 18–75-y-old women and men, 4–9-y-old children, and 10–17-y-old adolescents was not very high in comparison with the levels recommended by the WCRF. The largest change observed in the modelling of the dietary intake to the levels recommended by the WCRF was the exclusion of processed meat.

The overall impact on the average intake of nutrients that should be limited in the diet and on the nutrients that should be increased in the diet in relation to the nutrition recommendations differed little in the different scenarios studied, where white meat and fish or other food items substituted red meat and processed meat.

Despite methodological challenges when comparing nutritional data from representative samples from four different countries, results were markedly similar across countries

The present study suggests that the current habitual level of intake of meat is not far from the level suggested by WCRF at individual level. The greatest difference was the reduction in processed meat, with neglectable nutritional consequences of this reduction.

1. Background

Based on a systematic review of the available literature and in particular with reference to the evidence on the association between colorectal cancer and meat consumption, The World Cancer Research Fund (WCRF) recommended in 2007 that the dietary intake on red meat should be limited and processed meat avoided (World Cancer Research Fund and American Institute for Cancer Research, 2007). The personal recommendation to individuals consuming meat was to consume less than 500 g red meat per week (equivalent to 70 g/d) with very little – if any – processed meat. The specific public health goal was an average consumption of red meat to be no more than 300 g of red meat per week (equivalent to 43 g/d) and very little – if any processed meat. Amounts are for weigt of meat as eaten.

In the Nordic countries meat and meat products are part of the traditional diets and contribute protein, readily available iron (heme iron), zinc, selenium and a range of B-vitamins. Meat also provides fat, especially saturated fatty acids in varying amount depending on the animal species and the specific cut from the animal and on the processing. Processed meat products may contain relatively high amounts of sodium (as salt). Like in other countries each of the Nordic countries has its own food based dietary guidelines (FGDG). However, until the recent Norwegian FBDG (Nasjonalt råd for ernæring, 2011), none of the Nordic countries had specific guidelines regarding the amounts of meat or meat products as part of the existing FBDG. In order to form the basis for future guidelines on meat intake, work is needed to estimate the nutritional consequences of a change of the present meat intake to the level suggested by the WCRF or to other levels.

1.1 Aim

The aim of this report was to assess the overall nutritional consequences of lowering the daily consumption of meat from current intake to the level suggested by the The World Cancer Research Fund, with specific emphasis on processed meat.

2. Meat products and constituents

In this report the term *meat* includes all animal flesh from mammals and birds. The term *red meat* refers to flesh from beef, pork, lamb and goat. The term *white meat* refers to meat from poultry like chicken and turkey. The term *meat products* include food items that completely or partially are prepared by meat ingredients with the exception of whole, coherent meat pieces. The term *processed meat* is used in relation to meat and meat products that are salted, smoked, or treated in any other way in order to prolong the shelf life. Meat and meat products that are temperature treated (freezing or cooking) is not regarded as processed meat in this context (World Cancer Research Fund and American Institute for Cancer Research, 2007).

Meat usually contains 20–35% protein (weight basis). Meat and meat products can be important sources of vitamin B_6, vitamin B_{12}, iron, zinc and selenium. There are large differences between different meat sources and meat products concerning content of energy, fat, fatty acids, and salt (Table 1). The fat content varies from below 1% to above 40%. The fatty acid composition also varies between species. The percentage of saturated fatty acids is approximately 30% of fat content in chicken, 35% in pork, 45–50% in lamb and beef. The percentage of trans fatty acids is below 1% in chicken and pork, and approximately 4% in ruminants such as beef and lamb. The content of salt is low in raw meat, but is often high in processed meat products (Danish Food Composition Databank, 2012).

Meat from wild animals is usually leaner, contains a larger percentage of polyunsaturated fatty acids and a smaller percentage of saturated fat than meat from domesticated animals.

2.1 Contributions from meat to energy and nutrients in the Nordic diets

Meat and meat products contribute with a number of nutrients to the overall habitual diet. On average meat and meat products contribute with 10–20% of the intake of fat and monounsaturated fatty acids, protein, vitamin A, several B vitamins, and iron, zinc and selenium in the Danish, Finnish, Norwegian and Swedish diet (Table 2). In Denmark, the contribution of especially fat soluble vitamins from meat is high in comparison to the other Nordic countries. This may be attributed to the relatively high intake of liver paste, which has a high content of vitamin A. Additionally, the intake of fish is lower in Denmark, resulting in a higher contribution of vitamin D from meat in Denmark.

Table 1. Content of energy, fat and sodium in selected Danish (Danish Food Composition Databank, 2012 and Swedish (National Food Agency, Sweden, Food Composition Table) meat and meat products (values per 100 g food)

	Energy,	Fat,	Saturated fat,	Mono un-saturated fat,	Trans fatty acids,	Sodium,
	kJ	g	g	g	g	mg
Denmark						
Chicken, hen, flesh only	445	2.7	0.7	0.8	<0.1	52
Chicken, breast, boiled, sliced	475	3.2	0.8	1.1	<0.1	1120
Pork, liver paste, Danish, low fat	636	6.7	2.2	2.3	<0.1	802
Lamb, leg, average values, raw	704	9.8	4.5	3.6	0.6	66
Pork, collar, defatted, raw	757	12.2	4.4	5.0	<0.1	82
Pork, liver paste, Danish	989	19.2	6.7	8.0	<0.1	718
Bacon, sliced, raw	1076	21.4	7.5	9.3	<0.1	1225
Beef, entrecote, "cap on," raw	1098	21.3	9.0	10.2	0.6	54
Pork, sausage, frankfurter	1144	23.2	8.4	10.7	<0.1	1164
Sausage, salami	2107	49.0	18.8	22.5	<0.1	1988
Sweden						
Chicken, breast, boiled	625	4.0	1.1	1.6	na	430
Pork, liver paste, Swedish, low fat	767	9.0	3.2	3.9	na	600
Pork, collar, raw	717	11.2	4.9	4.6	na	57
Chicken, hen, flesh only	590	6.3	1.4	2.7	na	52
Pork, sausage, frankfurter	1146	215	7.9	10.4	na	850
Beef, boiled	723	5.4	2.2	2.4	na	194
Lamb steak, raw	555	5.9	3.0	2.2	na	66
Pork, liver paste, Swedish	1181	23.2	8.5	10.1	na	737
Bacon, sliced, raw	1441	32.8	13.7	14.8	na	820
Sausage, salami imported	2029	45.0	16.7	20.0	na	1850

"na" values are not available

Table 2. Contribution of energy and macronutrients, vitamins and minerals from meat and poultry in the Danish diet (Pedersen *et al.*, 2010), the Finnish diet (Findiet 2007, unpublished results), the Norwegian diet (Norkost3, 2006), and the Swedish diet (Riksmaten adults unpublished results, 2010) (% of total intake)

	Energy	Fat	Fatty acids				Carbohydrate	Added sugar	Fibre	Protein
			SFA	MUFA	PUFA	Trans				
Denmark										
Meat	10	20	18	25	11	11	-	-	-	25
Poultry	2	2	1	2	3	0	0	0	0	6
Finland										
Meat	9	16	16	18	11	12	0.5	-	-	20
Poultry	2	3	2	4	5	3	-	-	-	7
Norway										
Meat	6	10	10	12	5	na	-	-	-	14
Poultry	2	2	2	2	2	na	-	-	-	7
Sweden										
Meat	9	16	17	20	13	na	1	1	2	16
Poultry	2	3	2	3	2	na	0	0	0	6

"-" contribution is less than 0.5%, "na" values are not available

Table 2 – continued. Contribution of energy and macronutrients, vitamins and minerals from meat and poultry in the Danish diet (Pedersen *et al.*, 2010), the Finnish diet (Findiet 2007, unpublished results), the Norwegian diet (Norkost3), and the Swedish diet (Riksmaten, adults 2010, unpublished results) (% of total intake)

	Fat soluble vitamins					Water soluble vitamins						
	Vit A	Retinol	β-carotene	Vit D	Vit E	Thiamine	Riboflavin	Niacin	Vit B_6	Folate	Vit B_{12}	Vit C
Denmark												
Meat	34	50	0	19	3	31	15	25	19	7	35	6
Poultry	-	-	0	1	1	2	2	7	5	1	3	1
Finland												
Meat	1	1	-	4	3	24	9	19	19	1	13	-
Poultry	1	1	-	2	3	2	3	6	18	1	4	-
Norway												
Meat	1	1	-	-	2	11	7	na	10	1	13	-
Poultry	-	1	-	-	2	3	3	na	10	1	3	-
Sweden												
Meat	8	11	-	9	6	17	14	20	13	3	17	3
Poultry	1	1	-	4	4	4	3	9	6	2	1	0

"-" contribution is less than 0.5%

	Calcium	Phosphorus	Magnesium	Iron	Zinc	Iodine	Selenium	Potassium
Denmark								
Meat	1	14	6	18	30	1	25	10
Poultry	-	3	2	2	3	0	7	2
Finland								
Meat	1	10	5	11	18	2	24	7
Poultry	-	3	2	2	3	2	5	2
Norway								
Meat	1	Na	4	11	na	na	na	6
Poultry	-	Na	2	1	na	na	na	2
Sweden								
Meat	4	15	7	18	27	na	15	11
Poultry	0	4	3	2	3	na	6	3

"-" contribution is less than 0.5%,"na" values are not available

2.2 Trends in the supply of meat and meat products

2.2.1 Denmark

The annual per capita meat supply in Denmark increased during the 1970s and 1980s up to around 110 kg per capita per year in the 1990s and around 2000. Hereafter the meat supply has decreased. The increase was mainly due to the increase in supply of pork in the 1970s and 1980s. The supply of poultry has increased steadily from 3 kg per capita per year in 1955 to 22 kg in 2006–2008 while the supply of cattle was almost stable until the increase started in the 1990s. The decrease in the supply of pork started around 2000. It is important to notice that there was a large decrease from 2004 to 2005 in the supply of pork due to changes in data handling. Overall, the recent years show a decrease in supply of in all three types of meat and total meat consumption per capita was 83 kg in 2009 (Figure 1).

Figure 1. Per capita supply (kg/capita/y)
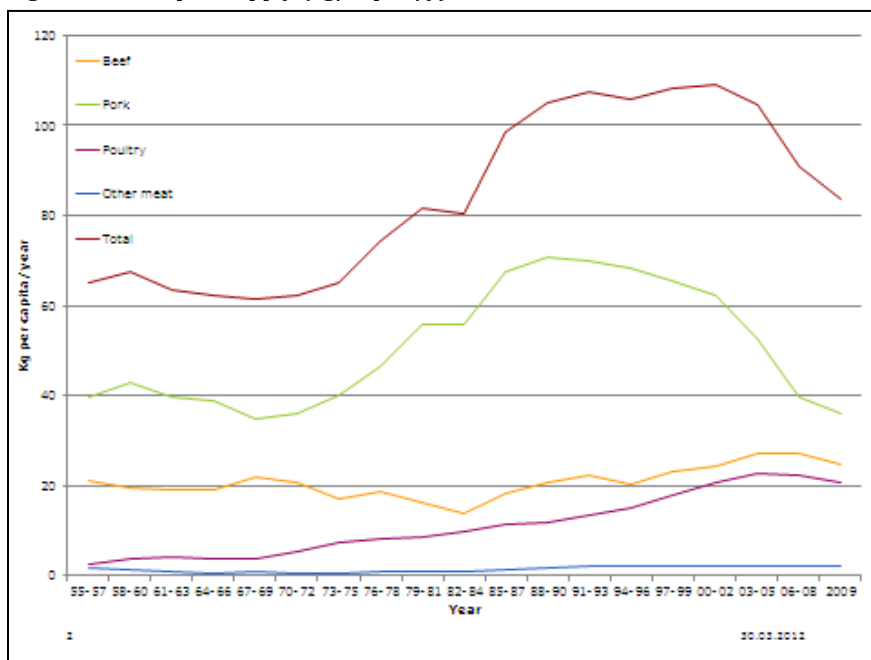
Beef (yellow), pork (green), poultry (pink), other meat (blue) and total meat (red) in Denmark (Fagt et al., unpublished results).

2.2.2   Finland

According to the previous Findiet studies (Anttolainen *et al.*, 1998; Män-nistö *et al.*, 2003; Paturi *et al.*, 2008; Kleemola *et al.*, 1992) the supply of meat has been relatively constant over the past 20 years. When compar-ing supply of different types of meat, it appears that the supply of red meat and processed meat has decreased slightly over time and that the intake of poultry has increased in the same period. However, according to the supply statistics of Ministry of Agriculture and Forestry the per capita supply of pork and poultry has increased during the past four decades from 21 to 35 and 1 to 18 kg per capita per year. Supply of beef has decreased slightly (Figure 2).

Figure 2. Per capita supply (kg/capita/y)
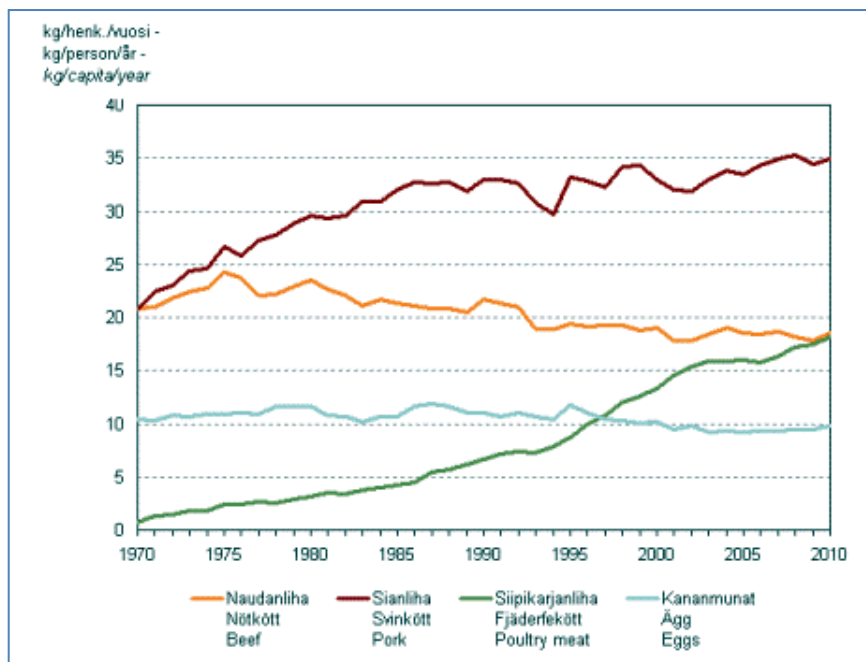
Beef (yellow), pork (red), poultry (green) and eggs (blue) in Finland (Information Centre of the Ministry of Agriculture and Forestry in Finland (Tike), 2012).

2.2.3   Norway

The supply of meat has increased considerably in Norway over a longer period of time, from 53 kg in 1989 to 77 kg per capita per year in 2008 (Helsedirektoratet, 2011). However, since 2010, the meat supply has decreased with almost 3 kg per capita per year (Figure 3). The supply of white meat (poultry) increased from 5 to 18 kg per capita per year in the

period 1989–2009, but decreased somewhat in 2010. Supply of red meat (pork, cattle, sheep and goat) increased from 43 to 53 kg per capita per year in the period 1989 to 2008, but has since decreased to 50 kg.

Figure 3. Per capita supply (kg/capita/y)
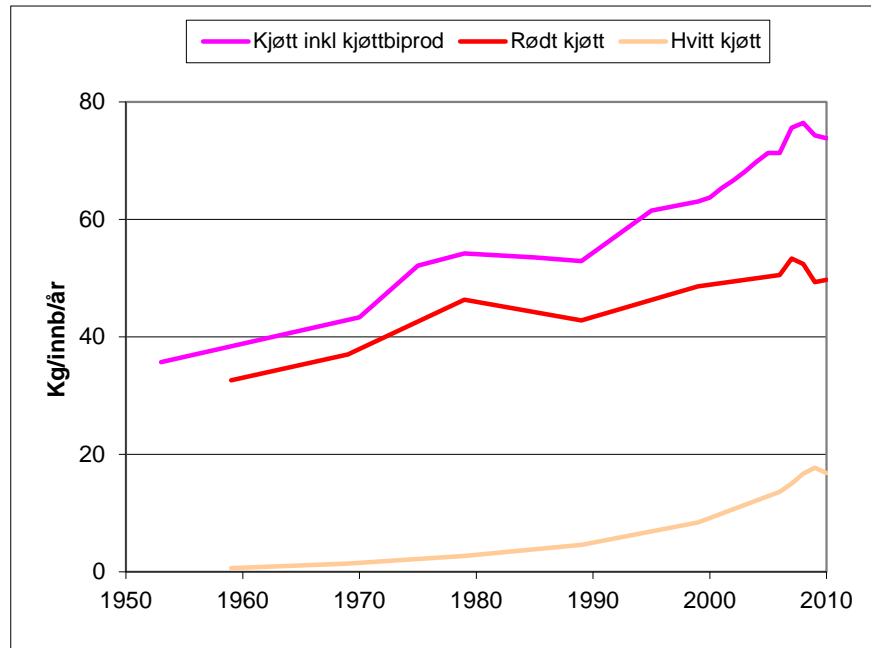
Meat, incl. meat products (pink), red meat (red), and white meat (yellow), in Norway (Helsedirektoratet, 2011).

2.2.4   Sweden

In Sweden the annual per capita total meat supply has increased from 51 kg in 1950 to about 85 kg in 2010 (Statens Jordbruksverk, 2012). Supply of red meat increased from 59 kg in 1980 to 67 kg in 2010, while the supply of white meat increased from approximately 5 kg to 18 kg in the same period (Figure 4).

Figure 4. Per capita supply (kg/capita/y)

4. Totalkonsumtion av kött, kg per person och år
4. Total consumption of meat, kg per capita and year
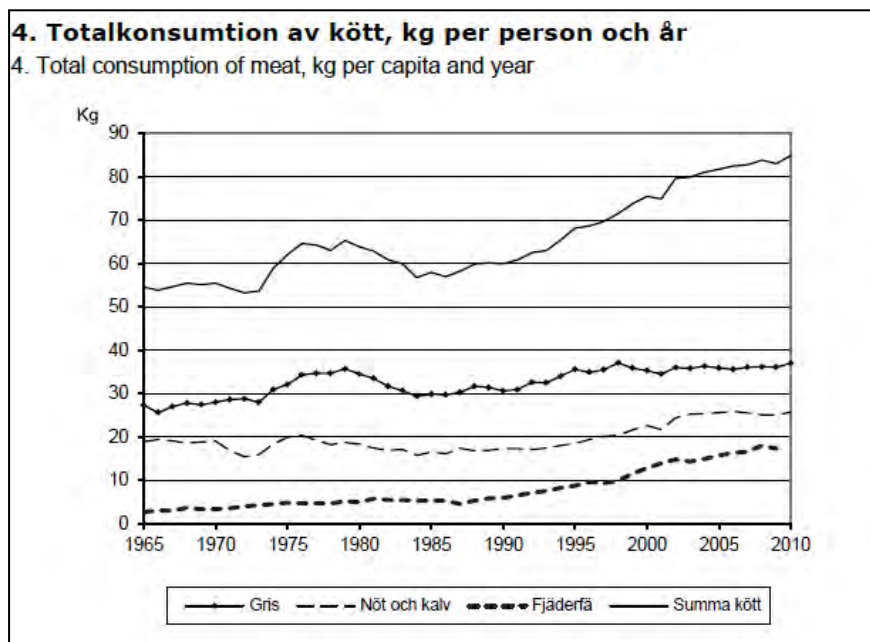
Total meat (full line), pig (dotted line), cattle and veil (thin dashed line), and poultry (thick dashed line), in Sweden (Statens Jordbruksverk, 2012).

3. Materials and Methods

The nutritional consequences of the WCRF recommendations was evaluated in the light of the diet in selected Nordic countries. Representative data on dietary intake and dietary patterns in the four participating Nordic countries, Denmark, Finland, Norway and Sweden, were used to estimate nutrient intakes in different age and sex groups at varying meat intakes and especially the categorization of meat was evaluated. Actual and recent meat intakes from the four participating countries were modulated to various predetermined levels, including the recommended level suggested by the WCRF and the nutritional consequences for adults, children and adolescents were assessed using the present nutritional recommendations (Nordic Council of Ministers, 2004) as the recommended level of nutrient intake.

It is expected that the present report can be used as a basis for setting future specific meat and meat product guidelines. It is expected that the results of the analyses will reflect the particular dietary patterns and cultures in the different Nordic countries.

3.1 Description of estimation of meat intake in the participating countries

3.1.1 Dietary data used in this project

Dietary data used in this project originate from four different countries. (Table 3) provides an overview of the methods used to collect dietary data, the period in which the dietary data were collected as well as the age groups, number of participants and food composition tables used.

Table 3. Dietary data to be used in this project

Country	Dietary study	Method	Period	Age groups	N	Food composi-tion table
DK	Danish National Survey of Diet and Physical Activity, DANSDA	7 d dietary record	2005–2008	4–9 y 10–17 y 18–75y	298 377 2025	Foodcomp.dk, release 7.0
FI-1	FINDIET 2007	48 h recall	2007	25–74	2039	Fineli Nutrition Database, release 7
FI-2	Dietary habits and well-being of secondary school pupils (DHWS)	48 h recall	2007–2008	7th graders (13–14 y)	306	Fineli Nutrition Database, release 8
NO – 1	Norkost	2*24 h recall and Food propensity questionnaire	2010–2011	18–70 y	1787	Norkost (based on the Norwe-gian Food composition table – 2006)
NO – 2	Ungkost 2000	4 d dietary record	2000 2001 2001	4 y 8–10 y 12–14 y	394 815 1009	Instiutt for Ernærings-forskning 1996 (based on the Norwegian Food composition table – 1995)
SE -1	The Swedish National Dietary Survey – Riks-maten children 2003	Open estimated food diary over 4 consecutive days	2003	4 y School children in: grade 2 grade 5	590 (4y) 889 (gr 2) 1016 (gr5)	Livsmedelsda-tabasen, ver. Riksmaten children 2003
SE -2	The Swedish National Dietary Survey – Riks-maten adults 2010–11	Web-based dietary record for 4 consecutive days	2010–2011	18–80 y	1797	Livsmedelsda-tabasen, release Riks-maten adults 2010

3.1.2 Participation rate and representativity

Denmark

Participation rate in the Danish National Survey of Dietary habits and Physical Activity (DANSDA) 2003–2008 was 53%; 50.2 % for adults (15–75 years of age) and 69.8 % for children (4–14 years of age). Partic-ipants were recruited through the Central Office of Civil Registration, using a random sample covering nationwide.

Finland

Participation rate in Findiet 2007 was 63% (Paturi *et al.*, 2008). Findiet is a part of a health survey called FINRISK which monitors risk factors of chronic diseases regularly every 5 years. In the FINRISK study the repre-sentative sample was a random sample from the Finnish Population

Information System, stratified according to sex, 10-year age groups, and the five geographical areas (Männistö *et al.*, 2012). Although the study does not cover the whole of Finland, it is assumed that the situation in non-studied areas does not critically differ from the areas being studied. One third of the people invited to participate in the FINRISK study was also invited to the Findiet 2007 study. It was tested statistically (t-test) that the age, weight and daily amount of smoking occations were parallel with the rest of the FINRISK participants (Paturi *et al.*, 2008).

Participation rate for adolescents in the Dietary Habits and Well-being of Secondary School Pupils survey was 52% (Hoppu *et al.*, 2008; Hoppu *et al.*, 2010). Participants were from 12 secondary schools including 77 classes located in three different cities. Initially 23 schools were asked to join the study, and 12 of these schools entered the study with the permission of the principal. It is possible that in this phase there were more active schools and schools that were more favourable towards development selected to the study. Although one common reason for declining to participate was participation already in other studies. Some schools did not justify their decision to be left out with any reason.

Random sampling was not used, but the study probably still describes quite well the situation with the young nowadays in Finland because there were different sizes of cities and diverse schools included. There were several differences between the schools already at baseline. City schools might have been different from suburban schools because of the family backgrounds of the pupils. Also the emphasis on special education such as music, languages or sports could affect the students to be diverse in different schools.

Norway
In Norkost the invited sample was representative of the Norwegian population aged 18–70 y. The adult participation rate was 37%. In Ungkost a representative sample of schools were invited to participate. The participation rate for the 9-y-olds was 81%, and for the 13-y-olds 86%.

Sweden
In the Riksmaten Adults survey, the invited sample for the adults was representative of the Swedish population and stratified on sex, age group (18–30 years, 30–44 years, 45–64 years and 65–80 years) and region. The participation rate was 36%.

In the Riksmaten Children survey, children that turned 4 years in 2003 and those who attended grade 2 or 5 during 2003 were invited to participate. When the sample was drawn income and educational level of the family plus region were taken into account to get a representative sample

in each age category. The participation rate was 64 % among the 4 year olds, among the two- graders 74 % and among the five-graders 79 %.

3.1.3 Under- and over-reporting

Denmark

In the Danish National Surveys of Dietary Habits and Physical Activity under-reporting was estimated according to the Goldberg method (Goldberg *et al.*, 1991) and expressed as the percentages having a ratio between energy intake and basal metabolic rate (EI/BMR) below 1.1 was in 2003–2006 26% among adults (15–75 years of age) and 16% among children (4–14 years of age).

Finland

In the Findiet report under-reporters were calculated as those subjects with an energy intake below their calculated basal metabolic rate (men 34%, women 41%). In this report only the nutrient intake distributions were done so that the under-reporters were excluded, but the results were shown also without the exclusion of under-reporters. (Paturi *et al.*, 2008). The exclusion of under-reporters from data had only a minor impact on the results. Analyses for this report therefore included the under-reporters. In a Findiet related study it was noticed that under-reporting was evenly distributed between different food items, which means that the ratio between energy nutrients remained correct (Hirvonen *et al.*, 1997).

The study on secondary school pupils included an intervention and the 48 h recall was repeated in 2008. The energy intake did not change when comparing results from years 2007 and 2008. This could reflect the increasing under-reporting with aging because these are growing children and thus it could have been assumed that the energy intake would have increased. On the other hand it also indicates that under-reporting has probably happened to a lesser extent – but was not taken into consideration for the present report.

Norway

In Norkost, under- and over-reporting has been assessed on the basis of values from (Black, 2000a; Black, 2000b), that participants who had a EI/BMR under 0.96 were very likely to under-report energy intake, and that those with EI/BMR > 2.49 were very likely to over-report energy intake. It was found that 16% under-reported energy intake, and 1.5% over-reported energy intake. The difference between the proportion of women (17%) and men (15%) who were under-reporting was small.

Sweden

In Riksmaten 2010–11 the degree of under- and over-reporting was calculated according to Black (Black, 2000b). There was a probability of under-reporting when EI/BMR<0.93 and of over-reporting when EI/BMR>3.01. Based on these cut-offs under-reporting was 16% in women and 21% in men. Over-reporting was very rare. In Riksmaten children 2003 the degree of under-reporting was evaluated with the Goldberg cut off (EI/BMR<1.06) and was 2% in the 4 year olds, 6% in the 2nd graders and 25% in the 5th graders.

3.1.4   Description of meat intake

A description of the meat intake in the four different countries is provided in Table 4.

Table 4. Description of meat intake

Country	Meat and meat groups by origin	Processed meat	Processing methods
DK	Meat: beef, veal, pork, lamb, no venison. Poultry: chicken, turkey, duck, goose Offal: liver	Cold cuts, sausages, ham, bacon, salami-type sausages, blood- and liver-containing pates and sausages	Can be estimated from household purchases surveys into: smoked, salted, other conservatives and others
FI	Meat: beef, pork, mutton, game. Poultry: chicken, turkey. Offal: liver	Cold cuts, sausages	Can be estimated from the name of the product but it has not been documented in the database
NO-1	Open questions (24 h recall); all types of meat are possibly reported. KBS (KostBeregningsSystem) contains a wide range of different types of meats, and the database is continually updated	Open questions (24 h recall); all types of processed meat are possibly reported. KBS (KostBeregningsSystem) contains a wide range of different types of meats, and the database is continually updated	Can be estimated, but are not described in reports
NO-2	Meat: beef, lamb, pork, moose, reindeer Poultry: chicken Offal: liver	Sausages, ham, bacon, liver paste, salami	No information about processing methods
SE -1	Meat: beef, veal, pork, lamb, moose, reindeer, horse Poultry: chicken, turkey, goose Offal: liver	Cold cuts; sausages; ham and bacon; salami-type sausages; blood- and liver-containing pates and sausages	Salted, smoked or cured to prolong self-life
SE-2	Meat: beef, veal, pork, lamb, moose, reindeer, horse, deer, roe deer, wild boar, hare, rabbit. Poultry: chicken, turkey, ostrich, goose, duck, grouse, pheasant, pigeon. Offal: Liver, kidney, tongue, heart, thymus	Cold cuts; sausages; ham and bacon; salami-type sausages; blood- and liver-containing pates and sausages	Salted, smoked or cured to prolong self-life

3.1.5 Short description of data processing from meat to nutrient intakes

In the present report, the amount of meat is reported in amount eaten. The calculation procedure from raw to consumed weight is described below for the different countries.

Denmark
The amount of meat (in grams) that is reported differs according to the type of meat. Meat reported in raw weight includes meat (pork, beef, lamb etc.), poultry, minced meat, and liver and the amount of meat eaten is calculated with 20% weight loss from raw meat to amount as eaten. Reported in product weight (as eaten) are processed meat like sausages, cold cuts, slices of ham etc. and liver paste.

Intake of vitamins and minerals is presented without estimated losses.

Finland
The final amount of meat (in grams) that is reported differs regarding the type of the meat. Meat reported in raw weight includes meat (pork, beef, lamb etc.), poultry and minced meat, and the amount of meat eaten is calculated with 20% weight loss from raw meat to amount as eaten. Reported in product weight are processed meat like sausages, cold cuts and slices of ham etc.

In this report nutrient losses have been taken into account for vitamin A, vitamin C, vitamin B_{12}, thiamine, niacin, folic acid, riboflavin and pyridoxine only for processed meat products (Bergström, 1994). Because other food products are analysed as raw products no nutrient losses are taken into account.

Norway
The final amount of meat (in grams) that is reported differs regarding of type of meat. Estimated in raw weight from the Norwegian diet calculation system is meat (pork, beef, lamb etc.), poultry, minced meat. Then raw meat weight is calculated with 20% weight loss to give amount as eaten, which is presented in the present report. Reported in product weight from the diet calculation system is processed meat like sausages, meatballs, slices of ham etc., liver paste, and ready meals.

Intake of vitamins and minerals is presented without estimated losses from raw weight.

Nutrient supplements were not included in the calculations.

Sweden

The final amount of meat (in grams) is reported in amount as eaten. Retention factors used in the Swedish database takes into consideration cooking method, food group and vitamin. The following vitamins are recalculated: vitamin C, thiamine, riboflavin, vitamin B_6, Folate and Vitamin B_{12} (National Food Agency, 2012).

3.2 Manual for the modelling exercise

3.2.1 Scenarios

This manual contains a definition of meat and a specification of the recommendations of the World Cancer Research Fund to be used in the modelling of the current habitual meat intake in Denmark, Finland, Norway and Sweden to fulfil the WCRF in selected age groups when following the different scenarios (1–5) described below.

Definition of meat (used in the current project):

- *Meat*: all animal flesh from mammals and birds.
- *Red meat*: beef, pork, lamb and goat from domesticated animals and that contained in processed foods
- *White meat*: poultry
- *Processed meat*: meat preserved by smoking, curing or salting, or addition of chemical preservatives, including that contained in processed foods.
- Note: Fish is separate and wild game is not defined.

Scenario 1

Average habitual diet

Step 1.1

The habitual diet is segregated into the main food groups and age groups. The segregation of the total habitual diet into food groups may deviate slightly between countries. The important point is that the total meat intake can be segregated into "Red meat", "White meat" and "Processed meat".

Step 1.2
The habitual dietary intakes at food group level are reported for adult women (18–75 y) and men (18–75 y), children (4–9 y) and adolescents (10–17 y).

Step 1.3
The macronutrient distribution and the micronutrient intake are reported for the selected age groups.

Scenario 2

Average habitual diet where the habitual red meat intake is reduced to 70 g/d and the intake of processed meat intake is 0 g/d. The meat is substituted with X g white meat/fish.

Step 2.1
The red meat intake in the habitual diet is reduced to a total of 70 g red meat/d and the intake of processed meat is reduced to 0 g/d. The missing amount of meat (g) is substituted with 50 % white meat (poultry) and 50% fish. The type of poultry and fish and its preparation is to be chosen in each country according to our knowledge of the habitual poultry/fish intake. The information should be included as a food-note to tables.

Step 2.2
Follow step 1.2

Step 2.3
Follow step 1.3

Scenario 3

Average habitual diet where the habitual red meat intake is reduced to 70 g/d and the intake of processed meat intake is 0 g/d. The meat is substituted with a proportional amount of other food products but meat.

Step 3.1
The red meat intake in the habitual diet is reduced to a total of 70 g red meat/d and the intake of processed meat is reduced to 0 g/d. The missing amount of meat is substituted with a proportional amount of energy of non-meat products to obtain the average energy intake level as the habitual diet. The amount of non-meat should reflect the composition in the national habitual diet.

Step 3.2
Follow step 1.2

Step 3.3
Follow step 1.3

Scenario 4

Average habitual diet where the habitual red meat intake is reduced to 43 g/d and the intake of processed meat intake is 0 g/d. The meat is substituted with X g white meat/fish.

Step 4.1
The red meat intake in the habitual diet is reduced to a total of 43 g red meat/d and the intake of processed meat is reduced to 0 g/d. The missing amount of meat (g) is substituted with 50% white meat (poultry) and 50% fish. The type of poultry and fish and its preparation is to be chosen in each country according to our knowledge of the habitual poultry/fish intake. The information should be included as a food-note to tables.

Step 4.2
Follow step 1.2

Step 4.3
Follow step 1.3

Scenario 5

Average habitual diet where the habitual red meat intake is reduced to 43 g/d and the intake of processed meat intake is 0 g/d. The meat is substituted with a proportional amount of other food products but meat.

Step 5.1
The red meat intake in the habitual diet is reduced to a total of 43 g red meat/d and the intake of processed meat is reduced to 0 g/d. The missing information amount of meat is substituted with a proportional amount of energy of non- meat products to obtain the average energy intake level as the habitual diet. The amount of non-meat should reflect the composition in the national habitual diet.

Step 5.2
Follow step 1.2

Step 5.3
Follow step 1.3

3.2.2 Calculation procedure

Denmark

Calculations were done for children 4–9 years (n=298), children 10–17 years (n=377), men 18–75 years (n=932), and women 18–75 years (n=1093) from the 2005–2008 population in The Danish National Survey of Dietary Habits and Physical Activity. Dietary intakes were recorded for seven consecutive days in a pre-coded food record. The food composition table used was foodcomp.dk, ver. 7.0.

In our analyses, food intakes are divided into food groups and are reported in eaten/cooked amounts. Intakes of vitamins and minerals are calculated from raw food items. All intakes of vitamins and minerals were without contribution from supplements.

Scenario 1
Scenario 1 represents an average diet for each of the four groups. Dietary intake is reported at food group level, and the macro- and micronutrient distributions in an average diet are presented.

Scenario 2
In scenario 2, the amount of red meat is reduced to 70 g per day (only men and older boys consume more than 70g red meat) and processed meat is reduced to 0 g per day (all groups). The removed amount (g) is distributed to poultry and fish (50% on each). The total amount of foods and drinks (g) is identical with that in Scenario 1, but the energy content differs.

Scenario 3
In scenario 3, the amount of red meat is reduced to 70 g per day (only men and older boys consume more than 70g red meat) and processed meat is reduced to 0 g per day (all groups). The removed energy from red meat and processed meat is distributed proportionally on all other food groups (incl. fish) in the average diet (scenario 1). The energy content in scenarios 1 and 3 are identical, but the amount (g) of foods and drinks differs.

Scenario 4

In scenario 4, the amount of red meat is reduced to 43 g per day (young children consume less than 43 g of red meat, making scenarios 4 and 5 identical to scenarios 2 and 3, respectively, and therefore irrelevant for this group) and processed meat is reduced to 0 g per day (all groups). The removed amount (g) is distributed to poultry and fish (50% on each). The total amount of foods and drinks (g) is identical with that in Scenario 1 and 2, but the energy content differs.

Scenario 5

In scenario 4, the amount of red meat is reduced to 43 g per day (young children consume less than 43 g of red meat, making scenarios 4 and 5 identical to scenarios 2 and 3, respectively, and therefore irrelevant for this group) and processed meat is reduced to 0 g per day (all groups). The removed energy from red meat and processed meat is distributed proportionally on all other food groups (incl. fish) in the average diet (scenario 1). The energy content in scenarios 1, 3 and 5 are identical, but the amount (g) of foods and drinks differs.

Finland

Calculations were done for men (n=958) and women (n=1080) aged 25–74 and for boys (n=136) and girls (n=170) aged 13 to 14. Both datasets are based on 48h recall.

In Finnish studies and analyses the eaten foods are split in to food items as they are in recipes and they are divided into the named food groups. These food items are thus counted as raw material (raw meat, raw vegetables etc.) and nutrient losses due to cooking processes are not taken into account.

Calculations were started with counting the average intake of different food groups in an average diet per grams and the average intake of specific nutrients from the whole diet. Also the average intakes of studied nutrients from each food groups were calculated for each gender and age groups. This information was used in calculations of scenarios 2–5. The food composition table used was Fineli Nutrition Database, release 7 and 8. All intakes of vitamins and minerals were without contribution from supplements.

Scenario 1

This is the "habitual" situation of Finnish adult diet. Dietary intake is reported at food group level and also the macro- and micronutrient distributions in an average diet are presented.

Scenario 2

In scenario 2 the amount of processed meat is reduced to 0 g per day and the removed amount (g) is distributed to poultry and fish (50% on each). The intake of red meat does not exceed 70 g/d in any of the population groups and that is why only processed meat is substituted.

Scenario 3

In scenario 3 the amount of processed meat is reduced to 0 g per day and the removed amount is substituted with most common non-meat food items so that the energy intake does not change. Non-meat products are chosen according to what is used the most as grams (potato, rice and pasta group, bread and cereals group, milk products and vegetables). The amounts of added non-meat products are balanced so that the ratio of energy intake gained from each group does not change. The intake of red meat does not exceed 70 g/d in any of the population groups and that is why only processed meat is substituted.

Scenario 4

In scenario 4 the amount of processed meat is reduced to 0 g per day and the intake of red meat to 43g/d, if relevant (only adolescents and men consume more than 43 g red meat per day). The removed amount of red meat and processed meat is substituted with white meat and fish (50% on each) so that the total gram does not change.

Scenario 5

In scenario 5 the amount of processed meat is also reduced to 0 g per day and the amount of red meat is reduced to 43 g/d, if relevant (only adolescents and men consume more than 43 g red meat per day). The amount of reduced red meat products is substituted with non-meat products so that the energy intake does not change. Non-meat products are chosen according to what is used the most as grams (potato, rice and pasta group, bread and cereals group, milk products and vegetables). The amount of added non-meat products are balanced so that the ratio of energy intake gained from each group is the same as in the beginning.

Norway

Calculations were done for men (n=862) and women (n=925) aged 18–70 years and children aged 9 (n=810) and 13 (n=1005) years. Data on adults were based on two independent 24 hour dietary recalls (Norkost 3, 2010–2011), and data on children were collected using pre-coded food diaries during 4 consecutive days (Ungkost, 2000).

In our studies and analyses the eaten foods are split into food items as they are in recipes and they are divided into the named food groups. All foods items are thus calculated as raw weight originally. For the purpose of these analysis the food groups of red meat (see description of food group below) and white meat (see description of food group below) was calculated into cooked/prepared weight (ready to eat) by removing 20% of the original weight. No recalculations to prepared/ready to eat weight were estimated for the food group of processed meat (see description of food group below) because most of the foods included in this group were already in ready to eat weight. No recalculations to prepared/ready to eat weight were estimated for any other foods than meat. All micronutrients were kept as in the original foods, no losses are estimated.

Red meat includes meat from mammal animals including game and whale meat. Minced meat from these animals and products made from minced meat are also included. White meat includes meat from all birds including duck and chicken, but excluding game. Minced meat from these and products made from minced meat are also included. Processed meat includes salted, preserved and canned red and white meat, including sausages, ham, liver paste and other products of blood and innards.

Calculations were started with counting the average intake of macro- and macronutrients from the different food groups in grams per day. The food composition table used was Norkost3. All intakes of vitamins and minerals were without contribution from supplements.

Sweden

Calculations were done with data from the two latest Swedish national dietary surveys (Riksmaten) from 2003 in children and 2010–11 in adults. We analysed data from children aged 4 and from grade 2 (age 8) and grade 5 (age 11), in total 1232 girls and 1263 boys. In the adults calculations were done in women (18–75 years, n=982) and men (18–75 years, n=762). The national survey in adults included individuals aged 18–80 years but for the present analyses those between 76 and 80 years of age were excluded (n=53).

For adults, dietary intakes were recorded in an internet-based dietary record for four consecutive days. The internet application contains 1900 food items and dishes. A printed portion guide, household measures, numbers and grams were used to estimate the amounts eaten. The application (version 04.1) is linked to the food composition database (Livsmedelsdatabasen, version Riksmaten adults 2010–11) held at the National Food Agency. All food items and dishes are linked to one main food group (dishes are intact) and to one or more composite food groups (dishes are broken into ingredients).

In the children, dietary intakes were recorded in an open written food diary for four consecutive days. A printed portion guide, household measures, numbers and grams were used to estimate the amounts eaten and main food groups were available in the survey in children.

All intakes of vitamins and minerals were without contribution from supplements.

Scenario 1

Scenario 1 represents an average diet of the Swedish population in men, women and children. Dietary intake is reported at food group level, and the macro- and micronutrient distributions of the average diet are presented.

Scenario 2

In scenario 2, the amount of red meat is reduced to 70 g per day, except in women who consumed less than 70 g red meat, and processed meat is reduced to 0g per day (all groups). The removed meat amount (g) is replaced with the same amount of poultry and fish (50% on each). The total amount of foods and drinks (g) is identical with that in Scenario 1, but the energy content differs.

Scenario 3

In scenario 3, the amount of red meat is reduced to 70 g per day, except in women who consumed less than 70 g red meat, and processed meat is reduced to 0g per day (all groups). The removed energy from red meat and processed meat is distributed proportionally on all other food groups (incl. fish) in the average diet (scenario 1). The energy content in scenario 1 and 3 are identical, but the amount (g) of foods and drinks differs.

Scenario 4
In scenario 4, the amount of red meat is reduced to 43 g per day and processed meat is reduced to 0 g per day (all groups). The removed meat amount (g) is replaced with the same amount of poultry and fish (50% on each). The total amount of foods and drinks (g) is identical with that in Scenario 1 and 2, but the energy content differs.

Scenario 5
In scenario 4, the amount of red meat is reduced to 43 g per day and processed meat is reduced to 0 g per day (all groups). The removed energy from red meat and processed meat is distributed proportionally on all other food groups (incl. fish) in the average diet (scenario 1). The energy content in scenarios 1, 3 and 5 are identical, but the amount (g) of foods and drinks differs.

4. Results

Results for the five scenarios, for women, men, children and adolescents from each of the four countries are provided in the appendix (Table A1–A45).

4.1 Women

The habitual intake of meat and fish in Danish, Finnish, Norwegian and Swedish women can be seen in (Table 5). The figures for women are similar across the four countries with the lowest intake of fish in Denmark, and the highest intake of meat in Norway.

Table 5. Habitual diet of women, Scenario 1. Intake of meat and fish (avg. g/d)

	Denmark 18–75y (n=1093)	Finland 25–74y (n=1080)	Norway 18–70y (n=925)	Sweden 18–75y (n=982)
Meat, total	86	76	100	89
Red meat	47	30	44	45
White meat	15	18	20	20
Processed meat	24	27	36	23
Fish	16	23	56	43

The distribution of macronutrients in the five scenarios for Danish, Finnish, Norwegian and Swedish women can be seen in Table 6. The macronutrient distribution for women is similar across the four countries with protein and carbohydrate intakes expressed as percentage of total energy intake within the recommended range, and fat energy percentage above 30 in the habitual diet. The distribution of macronutrients changes very little throughout the five scenarios.

Table 6. Macronutrient distribution in women in Scenarios 1–5

	Denmark 18–75y (n=1093)	Finland 25–74y (n=1080)	Norway 18–70y (n=925)	Sweden 18–75y (n=982)	NNR 2004
Scenario 1					
Protein, E%	15.0	17.5	17.6	17.3	10–20
Fat, E%	34.4	31.4	35.5	35.5	30
Carbohydrate, E%	50.7	51.1	46.9	47.2	50–60
Scenario 2					
Protein, E%	15.4	18.0	18.4	17.2	10–20
Fat, E%	33.4	31.1	34.2	35.3	30
Carbohydrate, E%	51.2	51.0	47.3	47.2	50–60
Scenario 3					
Protein, E%	14.6	16.9	17.1	16.6	10–20
Fat, E%	33.1	30.1	34.1	35.0	30
Carbohydrate, E%	52.3	53.1	48.8	48.3	50–60
Scenario 4					
Protein, E%	15.4	18.0	18.4	17.2	10–20
Fat, E%	34.4	31.1	34.2	35.3	30
Carbohydrate, E%	51.2	51.0	47.4	47.2	50–60
Scenario 5					
Protein, E%	14.5	16.9	17.1	16.5	10–20
Fat, E%	33.0	30.1	34.1	34.8	30
Carbohydrate, E%	52.6	53.1	48.8	48.3	50–60

Table 7 provides data on energy intake and contribution of saturated fat and intakes of selected micronutrients in women. The figures for women are similar across the four countries with very little changes throughout the five scenarios. Contributions from fat and saturated fat are higher than recommendations (Nordic Council of Ministers, 2004), but do not change markedly throughout the five scenarios. Intakes of vitamin D and iron are in general below recommendations (Nordic Council of Ministers, 2004), and do not change to any considerable degree with decreased intake of meat.

Table 7. Energy and micronutrient intakes and contribution of fat and saturated fat in women in Scenarios 1–5

	Denmark 18–75y (n=1093)	Finland 25–74y (n=1080)	Norway 18–70y (n=925)	Sweden 18–75y (n=982)	NNR 2004
Scenario 1					
Energy, MJ	7.9	6.6	8.0	7.4	
Saturated fat, E%	13.6	11.2	13.8	13.5	≤10
Vitamin B_6, mg	1.5	1.6	1.5	1.8	1.2
Vitamin B_{12}, µg	4.5	4.7	6.0	5.0	2
Vitamin D, µg	3.0	5.5	4.9	6.4	7.5/10*
Iron, mg	9.0	10.2	9.9	9.5	15/9**
Scenario 2					
Energy, MJ	7.8	6.6	7.9	7.4	
Saturated fat, E%	13.3	10.8	13.1	13.3	≤10
Vitamin B_6, mg	1.5	1.6	1.6	1.8	1.2
Vitamin B_{12}, µg	4.6	5.4	6.2	5.3	2
Vitamin D, µg	3.9	6.7	5.5	7.1	7.5/10*
Iron, mg	8.7	10.2	9.4	9.4	15/9**
Scenario 3					
Energy, MJ	7.9	6.6	8.0	7.4	
Saturated fat, E%	13.2	10.8	13.2	13.3	≤10
Vitamin B_6, mg	1.5	1.5	1.5	1.9	1.2
Vitamin B_{12}, µg	4.0	4.6	5.5	5.1	2
Vitamin D, µg	2.9	5.5	5.1	6.5	7.5/10*
Iron, mg	8.8	10.4	9.6	9.7	15/9**
Scenario 4					
Energy, MJ	7.8	6.6	7.9	7.4	
Saturated fat, E%	13.2	10.8	13.1	13.3	≤10
Vitamin B_6, mg	1.5	1.6	1.6	1.8	1.2
Vitamin B_{12}, µg	4.6	5.4	6.2	5.3	2
Vitamin D, µg	4.1	6.7	5.5	7.2	7.5/10*
Iron, mg	8.7	10.2	9.3	9.4	15/9**
Scenario 5					
Energy, MJ	7.9	6.6	8.0	7.4	
Saturated fat, E%	13.1	10.8	13.2	13.2	≤10
Vitamin B_6, mg	1.5	1.5	1.5	1.9	1.2
Vitamin B_{12}, µg	4.0	4.6	5.5	5.1	2
Vitamin D, µg	2.9	5.5	5.1	6.5	7.5/10*
Iron, mg	8.8	10.4	9.6	9.7	15/9**

*age≥61 years, **post menopause

4.2 Men

The habitual intake of meat and fish in Danish, Finnish, Norwegian and Swedish men can be seen in Table 8. The figures for men are similar across the four countries with the lowest intake of fish in Denmark, and the highest intake of meat in Norway.

Table 8. Habitual diet of men, Scenario 1. Intake of meat and fish (avg. g/d)

	Denmark 18–75y (n=932)	Finland 25–74y (n=958)	Norway 18–70y (n=862)	Sweden 18–75y (n=762)
Meat, total	141	128	156	137
Red meat	74	48	72	74
White meat	19	23	26	23
Processed meat	49	57	58	40
Fish	20	28	79	51

The distribution of macronutrients in the five scenarios for Danish, Finnish, Norwegian and Swedish men can be seen in Table 9. The macronutrient distribution for men is similar across the four countries with fat energy percentage above 30 and carbohydrate energy percentage below 50 in the habitual diet. The distribution of macronutrients changes very little throughout the five scenarios.

Table 9. Macronutrient distribution in men in Scenarios 1–5

	Denmark 18–75y (n=932)	Finland 25–74y (n=958)	Norway 18–70y (n=862)	Sweden 18–75y (n=762)	NNR 2004
Scenario 1					
Protein, E%	15.2	17.4	17.9	17.8	10–20
Fat, E%	36.6	33.6	35.5	35.3	30
Carbohydrate, E%	48.2	49.0	46.6	46.9	50–60
Scenario 2					
Protein, E%	15.8	18.4	18.9	17.8	10–20
Fat, E%	35.0	32.8	33.8	35.0	30
Carbohydrate, E%	49.2	48.8	47.3	46.9	50–60
Scenario 3					
Protein, E%	14.5	16.6	17.3	16.9	10–20
Fat, E%	34.4	31.0	33.5	34.3	30
Carbohydrate, E%	51.1	52.4	49.1	48.3	50–60
Scenario 4					
Protein, E%	15.8	18.4	19.0	17.7	10–20
Fat, E%	34.8	32.7	33.4	34.7	30
Carbohydrate, E%	49.4	48.9	47.6	47.5	50–60
Scenario 5					
Protein, E%	13.9	16.5	17.3	16.3	10–20
Fat, E%	33.8	30.8	33.5	33.6	30
Carbohydrate, E%	52.3	52.7	49.1	49.4	50–60

Table 10 provides data on energy intake and contribution of saturated fat and intakes of selected micronutrients in men. The figures for men are similar across the four countries with very little changes throughout the five scenarios. Contributions from fat and saturated fat are higher than recommendations (Nordic Council of Ministers, 2004), but do not change markedly throughout the five scenarios. Intake of vitamin D are below recommendations (Nordic Council of Ministers, 2004), in Danish men, and do not change to any considerable degree with decreased intake of meat.

Table 10. Energy and micronutrient intakes and contribution of fat and saturated fat in men in Scenarios 1–5

	Denmark 18–75y (n=932)	Finland 25–74y (n=958)	Norway 18–70y (n=862)	Sweden 18–75y (n=762)	NNR 2004
Scenario 1					
Energy, MJ	10.4	8.9	10.9	9.4	
Saturated fat, E%	14.4	12.0	13.7	13.5	≤10
Vitamin B_6, mg	1.9	2.1	1.9	2.3	1.6
Vitamin B_{12}, µg	6.5	6.6	8.9	6.0	2
Vitamin D, µg	3.8	7.5	6.7	7.6	7.5/10*
Iron, mg	11.5	13.3	12.6	11.5	9
Scenario 2					
Energy, MJ	10.3	8.9	10.7	9.4	
Saturated fat, E%	13.9	11.3	12.9	13.2	≤10
Vitamin B_6, mg	2.0	2.2	2.1	2.3	1.6
Vitamin B_{12}, µg	6.5	8.0	8.8	6.6	2
Vitamin D, µg	5.8	10.2	7.7	8.9	7.5/10*
Iron, mg	10.8	13.4	11.8	11.3	9
Scenario 3					
Energy, MJ	10.4	8.9	10.9	9.4	
Saturated fat, E%	13.9	11.1	13.0	13.1	≤10
Vitamin B_6, mg	1.9	2.0	1.9	2.4	1.6
Vitamin B_{12}, µg	5.3	6.5	7.9	6.2	2
Vitamin D, µg	3.7	7.6	7.1	7.7	7.5/10*
Iron, mg	10.9	13.7	12.1	11.7	9
Scenario 4					
Energy, MJ	10.3	8.9	10.6	9.3	
Saturated fat, E%	13.8	11.2	12.6	13.0	≤10
Vitamin B_6, mg	2.0	2.2	2.2	2.3	1.6
Vitamin B_{12}, µg	6.7	8.1	9.0	6.9	2
Vitamin D, µg	6.8	10.4	8.1	9.7	7.5/10*
Iron, mg	10.6	13.3	11.4	11.1	9
Scenario 5					
Energy, MJ	10.4	8.9	10.9	9.4	
Saturated fat, E%	13.5	11.0	13.0	12.9	≤10
Vitamin B_6, mg	1.8	2.0	1.9	2.4	1.6
Vitamin B_{12}, µg	4.9	6.4	7.9	6.2	2
Vitamin D, µg	3.7	7.6	7.1	7.8	7.5/10*
Iron, mg	10.8	13.7	12.1	11.9	9

*age ≥61 years

4.3 Children

The habitual intake of meat and fish in Danish, Norwegian and Swedish children can be seen in Table 11. The figures for children are similar across the four countries with the lowest intake of fish in Denmark, and the highest intake of meat in Sweden.

Table 11. Habitual diet of children, Scenario 1. Intake of meat and fish (avg. g/d)

	Denmark 4–9y (n=298)	Finland	Norway 9y (n=810)	Sweden 8y (n=1479)
Meat, total	89	-	85	123
Red meat	39	-	38	79
White meat	11	-	7	16
Processed meat	40	-	39	28
Fish	11	-	27	18

The distribution of macronutrients in the five scenarios for Danish, Norwegian and Swedish children can be seen in Table 12. The macronutrient distribution for children is similar across the three countries with fat energy percentage above 30 in the habitual diet. The distribution of macronutrients changes very little throughout the five scenarios.

Table 12. Macronutrient distribution in children in Scenarios 1–5

	Denmark 4–9y (n=298)	Finland	Norway 9y (n=810)	Sweden 8y (n=1479)	NNR 2004
Scenario 1					
Protein, E%	14.0	-	14.1	15.0	10–20
Fat, E%	34.0	-	31.4	31.6	30
Carbohydrate, E%	52.0	-	54.5	53.4	50–60
Scenario 2					
Protein, E%	14.7	-	15.1	14.8	10–20
Fat, E%	32.7	-	29.8	31.1	30
Carbohydrate, E%	52.6	-	55.1	53.5	50–60
Scenario 3					
Protein, E%	13.5	-	13.6	15.3	10–20
Fat, E%	31.8	-	29.4	32.1	30
Carbohydrate, E%	54.7	-	57.0	54.4	50–60
Scenario 4					
Protein, E%	-	-	-	14.7	10–20
Fat, E%	-	-	-	30.9	30
Carbohydrate, E%	-	-	-	53.5	50–60
Scenario 5					
Protein, E%	-	-	-	15.5	10–20
Fat, E%	-	-	-	32.6	30
Carbohydrate, E%	-	-	-	55.2	50–60

Table 13 provides data on energy intake and contribution of saturated fat and intakes of selected micronutrients in children. The figures for children are similar across the three countries with very little changes throughout the five scenarios. Contributions from fat and saturated fat are higher than recommendations (Nordic Council of Ministers, 2004), but do not change markedly throughout the five scenarios. Intakes of vitamin D and iron are in general below recommendations (Nordic Council of Ministers, 2004), and do not change to any considerable degree with decreased intake of meat.

Table 13. Energy and micronutrient intakes and contribution of fat and saturated fat in children in Scenarios 1–5

	Denmark 4–9y (n=298)	Finland	Norway 9y (n=810)	Sweden 8y (n=1479)	NNR 2004
Scenario 1					
Energy, MJ	8.0	-	8.3	9.4	
Saturated fat, E%	14.4	-	13.7	14.3	≤10
Vitamin B_6, mg	1.3	-	-	1.5	1.0
Vitamin B_{12}, µg	5.0	-	-	4.4	1.3
Vitamin D, µg	2.3	-	2.8	4.4	7.5
Iron, mg	8.0	-	8.8	8.3	9
Scenario 2					
Energy, MJ	7.9	-	8.2	9.4	
Saturated fat, E%	13.8	-	12.9	14.0	≤10
Vitamin B_6, mg	1.4	-	-	1.5	1.0
Vitamin B_{12}, µg	5.0	-	-	4.8	1.3
Vitamin D, µg	3.6	-	3.3	5.2	7.5
Iron, mg	7.5	-	8.4	8.0	9
Scenario 3					
Energy, MJ	8.0	-	8.3	9.4	
Saturated fat, E%	13.7	-	12.9	14.6	≤10
Vitamin B_6, mg	1.3	-	-	1.5	1.0
Vitamin B_{12}, µg	4.1	-	-	4.5	1.3
Vitamin D, µg	2.2	-	3.0	4.5	7.5
Iron, mg	7.6	-	8.4	8.4	9
Scenario 4					
Energy, MJ	-	-	-	9.4	
Saturated fat, E%	-	-	-	13.8	≤10
Vitamin B_6, mg	-	-	-	1.5	1.0
Vitamin B_{12}, µg	-	-	-	5.0	1.3
Vitamin D, µg	-	-	-	5.8	7.5
Iron, mg	-	-	-	7.9	9
Scenario 5					
Energy, MJ	-	-	-	9.4	
Saturated fat, E%	-	-	-	14.8	≤10
Vitamin B_6, mg	-	-	-	1.5	1.0
Vitamin B_{12}, µg	-	-	-	5.6	1.3
Vitamin D, µg	-	-	-	4.5	7.5
Iron, mg	-	-	-	8.6	9

4.4 Adolescents

The habitual intake of meat and fish in Danish, Finnish, Norwegian and Swedish adolescents can be seen in Table 14. The figures for adolescents are similar across the four countries with the lowest intake of fish in Denmark, and the highest intake of meat in Sweden.

Table 14. Habitual diet of adolescents, Scenario 1. Intake of meat and fish (avg. g/d)

	Denmark 10–17y (n=377)	Finland 13–14y (n=306)	Norway 13y (n=1005)	Sweden 11y (n=1016)
Meat, total	104	95	95	135
Red meat	57	44	51	89
White meat	15	23	8	17
Processed meat	32	28	36	30
Fish	9	15	24	19

The distribution of macronutrients in the five scenarios for Danish, Finnish, Norwegian and Swedish adolescents can be seen in Table 15. The macronutrient distribution for adolescents is similar across the four countries with fat energy percentage above 30 in the habitual diet. The distribution of macronutrients changes very little throughout the five scenarios.

Table 15. Macronutrient distribution in adolescents in Scenarios 1–5

	Denmark 10–17y (n=377)	Finland 13–14y (n=306)	Norway 13y (n=1005)	Sweden 11y (n=1016)	NNR 2004
Scenario 1					
Protein, E%	14.5	16.3	14.2	15.7	10–20
Fat, E%	32.9	29.9	30.6	31.5	30
Carbohydrate, E%	52.5	53.7	55.2	52.8	50–60
Scenario 2					
Protein, E%	15.1	16.9	15.1	15.6	10–20
Fat, E%	31.7	29.3	29.4	32.3	30
Carbohydrate, E%	53.2	53.7	55.5	54.0	50–60
Scenario 3					
Protein, E%	14.1	15.8	13.8	16.0	10–20
Fat, E%	31.4	28.4	29.0	32.3	30
Carbohydrate, E%	54.5	55.6	57.3	54.0	50–60
Scenario 4					
Protein, E%	15.1	16.9	15.1	15.2	10–20
Fat, E%	31.6	29.2	29.3	30.7	30
Carbohydrate, E%	53.3	53.8	55.6	52.8	50–60
Scenario 5					
Protein, E%	13.7	15.7	13.8	16.2	10–20
Fat, E%	31.1	28.1	29.0	32.7	30
Carbohydrate, E%	55.2	56.1	57.3	54.7	50–60

Table 16 provides data on energy intake and contribution of saturated fat and intakes of selected micronutrients in adolescents. The figures for adolescents are similar across the four countries with very little changes throughout the five scenarios. Contributions from fat and saturated fat are higher than recommendations (Nordic Council of Ministers, 2004), and do not change markedly throughout the five scenarios. Intakes of vitamin D and iron are in general below recommendations

(Nordic Council of Ministers, 2004), and do not decreased noticeably with decreased intake of meat.

Table 16. Energy and micronutrient intakes and contribution of fat and saturated fat in adolescents in Scenarios 1–5

	Denmark 10–17y (n=377)	Finland 13–14y (n=306)	Norway 13y (n=1005)	Sweden 11y (n=1016)	NNR 2004 (F/M)
Scenario 1					
Energy, MJ	8.5	7.4	8.9	7.4	
Saturated fat, E%	13.8	11.0	13.5	14.0	≤10
Vitamin B_6, mg	1.5	1.8	-	1.5	1.1/1.3
Vitamin B_{12}, µg	4.6	4.5	-	4.4	2/2
Vitamin D, µg	2.4	5.7	2.5	4.1	7.5
Iron, mg	8.7	9.6	9.4	8.3	15/11
Scenario 2					
Energy, MJ	8.4	7.4	8.8	7.3	
Saturated fat, E%	13.8	10.6	12.8	13.9	≤10
Vitamin B_6, mg	1.5	1.9	-	1.6	1.1/1.3
Vitamin B_{12}, µg	4.6	5.1	-	4.8	2/2
Vitamin D, µg	3.7	6.7	3.0	5.2	7.5
Iron, mg	8.3	9.6	9.1	8.1	15/11
Scenario 3					
Energy, MJ	8.5	7.4	8.9	7.4	
Saturated fat, E%	13.4	10.5	12.9	14.4	≤10
Vitamin B_6, mg	1.4	1.8	-	1.6	1.1/1.3
Vitamin B_{12}, µg	3.9	4.5	-	4.4	2/2
Vitamin D, µg	2.3	5.8	2.6	4.2	7.5
Iron, mg	8.4	9.7	9.1	8.5	15/11
Scenario 4					
Energy, MJ	8.4	7.4	8.8	7.3	
Saturated fat, E%	13.3	10.5	12.7	13.5	≤10
Vitamin B_6, mg	1.5	1.9	-	1.5	1.1/1.3
Vitamin B_{12}, µg	4.8	5.2	-	5.0	2/2
Vitamin D, µg	4.3	6.9	3.1	5.7	7.5
Iron, mg	8.2	9.5	9.0	7.8	15/11
Scenario 5					
Energy, MJ	8.5	7.4	8.9	7.4	
Saturated fat, E%	13.2	10.4	12.9	14.6	≤10
Vitamin B_6, mg	1.4	1.8	-	1.6	1.1/1.3
Vitamin B_{12}, µg	3.8	4.5	-	4.5	2/2
Vitamin D, µg	2.3	5.8	2.6	4.2	7.5
Iron, mg	8.3	9.6	9.1	8.6	15/11

5. Discussion

5.1 Main findings

The habitual intakes of meat and fish for women, men, children and adolescents differed across the four Nordic countries involved in the present project with the highest intake of meat in Norway, and the lowest intake of fish in Denmark for adults and with the highest intake of meat in Sweden, and the lowest intake of fish in Denmark for children and adolescents.

The macronutrient distribution for women, men, children and adolescents was quite similar across the four countries with fat energy percentage above 30, and carbohydrate energy percentage below 50 for all except Danish and Finnish women, in the habitual diet. The distribution of macronutrients changed very little throughout the five scenarios, where scenario 1 was the average habitual diet and the following scenarios mirrored the levels of meat intake recommended by the World Cancer Research Fund (WCRF) as the personal recommendation and the public health goal, respectively; scenario 2 was the average habitual diet where the habitual red meat intake was reduced to 70 g/d and the intake of processed meat intake was 0 g/d. The meat was substituted with X g white meat/fish; scenario 3 was the average habitual diet where the habitual red meat intake was reduced to 70 g/d and the intake of processed meat intake was 0 g/d. The meat was substituted with a proportional amount of other food products but meat; scenario 4 the average habitual diet where the habitual red meat intake was reduced to 43 g/d and the intake of processed meat intake was 0 g/d. The meat was substituted with X g white meat/fish; and scenario 5 was the average habitual diet where the habitual red meat intake was reduced to 43 g/d and the intake of processed meat intake was 0 g/d. The meat was substituted with a proportional amount of other food products but meat.

Regarding intakes of micronutrients and contribution of fat and saturated fat, the figures for women, men, children and adolescents were similar across the four countries with surprisingly little changes throughout the five scenarios. Contributions from fat and saturated fat were higher than recommended (Nordic Council of Ministers, 2004), but did not change markedly throughout the five scenarios. Mean intakes of vitamin D were below recommendations (Nordic Council of Ministers,

2004), in women, children and adolescents, and Danish men, and did not decrease with reduced intakes of meat. Mean intakes of iron were below recommendations (Nordic Council of Ministers, 2004) in women, children and adolescents, and did not decrease noticeably with reduced intake of meat.

The present study showed that the dietary intake of meat and meat products in the four Nordic countries estimated with the applied dietary methods was relatively low – and actually so low in comparison with the recommended levels suggested by the WCRF that the modeling applied in the present study meant relatively low reductions of intake of meat and meat products.

Only men from Denmark, Sweden, and Norway had average habitual daily intakes of red meat exceeding 70 g as well as Swedish children and adolescents. Thus, all women and most children and adolescents as well as men from Finland had average mean habitual daily intakes of red meat below 70 g.

5.2   Intake of meat and meat products and health

The basis for the WCRF recommendations was a systematic literature review mainly based on prospective cohort studies. WCRF concluded that there is convincing evidence that both red meat and processed meat increase risk of developing colorectal cancer (World Cancer Research Fund and American Institute for Cancer Research, 2007). A dose-response relationship was found in cohort studies. However, since the evidence originates from epidemiological studies, they do not document unambiguously that the relationship is causal (The German Federal Institute for Risk Assessment, 2009). And, in several later reviews of prospective epidemiological studies on an association between colorectal cancer and red and processed meat as well as in meta-analyses (Alexander and Cushing, 2011; Chan *et al.*, 2011; Smolinska and Paluszkiewicz, 2010; Alexander *et al.*, 2010; Chan *et al.*, 2011; Magalhaes *et al.*, 2012; Bastide *et al.*, 2011; Alexander *et al.*, 2011; Chan *et al.*, 2011; Larsson and Wolk, 2006), it was concluded that there is a significant association, but that there is probably insufficient evidence to conclude a causal relationship. This has left the discussion open as to the recommended level of intake of meat and meat products.

Other systematic reviews from FAO/WHO and American Dietetic Association have concluded that there is convincing (Food and Agriculture Organization World Health Organization, 2009) or probable (Van *et al.*,

2008) evidence that saturated fatty acids increase risk of coronary heart disease. Furthermore, WHO/FAO (Food and Agriculture Organization World Health Organization, 2009) concluded that there is probable evidence that intake of trans fatty acids increase the risk for developing type 2 diabetes, and that there is possible evidence that intake of saturated fatty acids increase the risk for developing type 2 diabetes.

The studies that have formed the basis of these expert reports often are derived from other countries than the Nordic countries. This signifies that the studies are mainly derived from populations with different lifestyles, including different dietary intakes. Also, most of the studies have used FFQs as dietary assessment methods to assess food and nutrient intakes. It is well recognized that FFQs are suitable and largely applied in large population studies – however, they may suffer from various drawbacks such as the lack of specificity of food products assessed (Thompson and Subar, 2008).

5.3 Intake of meat and meat products and nutrients

The mechanisms for possible adverse health effects of meat and meat products are mainly related to nutrients such as saturated fat, trans fat, and chemicals produced during processing such as nitroso compounds, heterocyclic amines, polycyclic aromatic hydrocarbons, and sodium (Na) and iron (Fe) (World Cancer Research Fund and American Institute for Cancer Research, 2007; Bastide *et al.*, 2011). At the same time, the mechanisms for the beneficial health effects of meat and meat products are also related to their contribution of certain nutrients such as protein, Fe, Zn (Stoltzfus, 2001; Tetens *et al.*, 2007; World Health Organization Food and Agriculture Organization and United Nations University, 2007). Thus, the intake of nutrients associated with meat intake – those that we are recommended to reduce and those that we are recommended to increase – are to be weighed together (Millward and Garnett, 2010).

The value of meat as a rich source of bioavailable macro- and micronutrients is distinct, and the nutritional value of meat and meat products should be based on an overall weighing of both nutrients that are supplied in too high amounts and too low amounts according to current recommendations. Many meat products are a major source of saturated fat in the diet and a high intake of saturated fat has convincingly been linked to the circulatory diseases associated with increasing BMI. Consumption of red and processed meat has been associated with an increased risk of colorectal cancer in adults (World Cancer Research Fund

and American Institute for Cancer Research, 2007), however not in all studies (Key *et al.*, 2009).

The literature on the effects of meat intakes in children is remarkably restricted. In low-income countries, there is little difference in linear growth between children with negligible amounts of dietary meat or with meat-free lacto-ovo vegetarian diets and that of the omnivore healthy population (Sanders, 1999; O'Connell *et al.*, 1989). However, for vegan preschool children, slower growth has been observed (Sanders and Manning, 1992).

Inadequate intakes of bioavailable iron may result in deficiency in tissue iron, which may be one of the causes of anaemia (iron-deficiency anaemia). However, anaemia may also be caused by vitamin B12 and folate deficiency. Impaired work performance in adults, and poor motor and possibly cognitive development in children are possible long-term adverse consequences of severe iron-deficiency and anaemia. Additionally, increased perinatal, maternal and child mortality may be caused by very severe deficiency and anaemia (Stoltzfus, 2001).

Regulation of iron homeostasis occurs only through regulation of iron absorption, as there are no specific excretory pathways in the body for iron. Absorption of heme-iron, which is mainly found in meat and meat products, depends only to a small degree on the composition of the food. The absorption of non-heme-iron, which is found mostly in vegetable food sources, is highly dependent on the content of vitamin C, and muscle protein (meat, fish), that increases absorption and of the content of calcium, phosphates, especially phytate and certain polyphenols, that inhibits absorption (Scientific Advisory Committee on Nutrition, 2010). Additionally, the absorption of iron is highly dependent of the iron status of the individual with very little absorption if iron stores are replete (Hunt and Roughead, 2000).

Meat intake is an important determinant of iron stores, with lower serum ferritin concentrations in vegetarians compared with omnivores (Donovan and Gibson, 1995). However, vegetarians do not have a greater incidence of iron-deficiency anaemia than omnivores (Hunt, 2002).

When meat is part of the diet, it may have a marked influence on overall dietary protein content (Table 2), and in addition will also improve overall dietary protein quality in terms of digestibility and biological value. Protein digestibility corrected amino acid score (PDCAAS) is higher for meat than for many plant protein sources. However, for many mixed plant-food-based diets, PDCAAS is high. Diets based on cereals, or especially on starchy roots only, and little else will have a low PDCAAS (Schaafsma, 2000).

Elderly adults are the group most vulnerable to low-protein diets because they are the group with the highest protein requirement relative to energy requirements because of a higher reduction in energy requirements than protein requirements with increasing age. Dietary protein has been associated with both favourable anabolic influences on bone health through insulin-like growth factor-1 and unfavourable influences on bone health as a source of acid due to oxidation of S-containing amino acids, cysteine and methionine, which may induce a calciuria (World Health Organization Food and Agriculture Organization and United Nations University, 2007). However, the balance between these effects is still being debated.

5.4   Our results – dietary patterns

The present study showed that the dietary intake of meat and meat products estimated with the applied dietary methods was relatively low – and actually so low in comparison with the recommended levels suggested by the WCRF that the modeling applied in the present study meant relatively low reductions of intake of meat and meat products.

Only men from Denmark and Sweden (74 g), and Norway (72 g) had average habitual daily intakes of red meat exceeding 70 g as well as Swedish children (79 g) and adolescents (89 g). Thus all women and most children and adolescents as well as men from Finland (48 g) had average habitual daily intakes of red meat below 70 g.

In the present study, the macronutrient distribution for the average habitual diet for women, men, children and adolescents was rather similar across the four countries with fat energy percentage above the recommendation of 30 (Nordic Council of Ministers, 2004), and carbohydrate energy percentage below the recommended range of 50–60 (Nordic Council of Ministers, 2004) for all except Finnish women, in the habitual diet. The distribution of macronutrients changed very little throughout the five scenarios. Energy percentage of saturated fat in the habitual diet varied from 11 to 15, which is above the recommendation of ≤10 (Nordic Council of Ministers, 2004), and it remained within this range in all five scenarios. Protein energy percentages was within the recommended range of 10–20 (Nordic Council of Ministers, 2004) in the average habitual diet of all four countries in women, men, children and adolescents, and it remained within this recommended range throughout the five scenarios.

In the present study, data for elderly were not being analysed separately as we only had data for men and women to the age of 75 years.

5.5 Our results – nutrients

In the present study no decrease in protein energy percentages in the different scenarios of decreased intake of meat in either women, men, children or adolescents was seen and all protein energy percentages were within the recommendations (Nordic Council of Ministers, 2004). Overall there seems to be little nutritional concern among the general population in the age range from 4 to 75 years of age in the 4 Nordic countries for lower protein intakes with reduced meat consumption to the level suggested by the WCRF.

In the present study, habitual intakes of vitamin D were far below recommendations (Nordic Council of Ministers, 2004) for children, adolescents, women, and for Danish men in the present study. The estimated intake of vitamin D differed little through the five different scenarios of reduced meat intake. However, in scenarios 2 and 4, where the reduction of meat intake was substituted by similar amounts of white meat and fish, the intake of vitamin D increased, although not meeting the recommended levels.

Habitual intakes of iron were below recommendations (Nordic Council of Ministers, 2004) for children, adolescents, and for Danish women, but not for men. The estimated intake of iron differed remarkably little between the five different scenarios of reduced meat intake. Thus, reducing red meat intake to 70 g/d or 43 g/d and reducing intake of processed meat to 0 g/d has little impact on total iron intakes. However, it has to be considered that bioavailability of iron in the diet may decrease with the decreased meat intake. This aspect was not possible to study further in the present project with the data available.

5.6 Methodological issues

In all four countries, data were provided from representative national samples, which makes this study unique. However, the year of data collection varied from 2000 in Norwegian children to 2010–2011 in Norwegian and Swedish adults. The participation rate differed from 36% and 37% in adults in Sweden and Norway, respectively to 83% in Norwegian children. It is of note that the four countries evaluated under-

reporting and over-reporting differently. However, the degree of under-reporting/over-reporting was comparable in the data.

The dietary assessment methods used in this project differed across the four countries. Three countries used food record with either seven days (Denmark) or four days (Sweden, Norway's UNGKOST), and two countries used recalls with either 48 hours (Finland) or 2x24 non-consecutive hours (Norway's Norkost). Different age groups, especially in children and adolescents, were included in the study. Further, it should be noted that the four countries have used their country specific food composition databases in the processing of data.

The aim of this study was to estimate the overall nutritional consequences of reducing meat intake at group level. No attempts were therefore taken to do any further modelling to estimate whether the proportion of individuals with low nutrient intakes would increase if average meat intake is reduced. However, reducing average red and processed meat intake from the current level to the WCRF population level of 300 g per week only changed average nutrient intakes marginally suggesting that the proportion of participants in these representative studies with a poor nutrient intake would not increase substantially.

Although dietary modelling and calculations were carried out similarly in the four Nordic countries, there were some differences in the approach of calculating meat weight across the countries. In Denmark, Finland and Norway, the calculation of the final amount of meat consumed (in grams) differed by type of meat. Meat, poultry, minced meat and liver were reported in raw weight and 20% weight loss was used to convert the amount of raw meat to amount as eaten. Processed meat like cold cuts sausages, slices of ham etc. and liver paste was reported in product weight (as eaten). In Sweden, the final amount of meat (in grams) was reported as eaten for all types of meat. Another difference was that Denmark and Norway did not consider nutrient losses from cooking, whereas Finland and Sweden did. These methodological differences should be kept in mind when comparing mean values across the countries, but it is considered that these differences will not influence the final conclusions since the scenarios are compared within each country.

Categorization of meat and meat products used in this project was based on the WCFR categorization, which however, is very broad, and mainly based on food frequency questionnaires (FFQs) as dietary assessment methods to assess food and nutrient intakes. Therefore, it was necessary to consider this aspect further in relation to this project. In this project the specific products available in the Nordic countries, espe-

cially with respect to the processed meat products, was taken into consideration in the categorization of meat products (Table 4).

The issue on reducing processed meat is not merely related to a reduction in nutrient intake, but also to other issues, since a restriction of intake of processed meat may in general result in restriction of intake of salt and saturated fat. Processed meat may also contain sodium nitrate and their long-time storage may yield cholesterol oxidation products (Santarelli *et al.*, 2008).

6. Conclusion

With the aim to assess the overall nutritional consequences of lowering the average daily consumption of meat from current intake to the levels suggested by the WCRF with special emphasis on processed meat, the present study showed that the average meat intake in the Nordic countries in 18–75-y-old women and men, 4–9-y-old children, and 10–17-y-old adolescents was not very high in comparison with the levels recommended by the WCRF. The largest change observed in the modelling of the dietary intake to the levels recommended by the WCRF was the exclusion of processed meat.

The overall impact on the average intake of nutrients that should be limited in the diet and on the nutrients that should be increased in the diet in relation to the nutrition recommendations differed little in the different scenarios studied, where white meat and fish or other food items substituted red meat and processed meat.

Despite methodological challenges when comparing nutritional data from representative samples from four different countries, results were markedly similar across countries

The present study suggests that the current habitual level of intake of meat is not far from the level suggested by WCRF at individual level. The greatest difference was the reduction in processed meat, with neglectible nutritional consequences of this reduction.

7. Acknowledgements

8. References

Alexander DD and Cushing CA. Red meat and colorectal cancer: a critical summary of prospective epidemiologic studies. *Obes. Rev.* 2011:12:e472-e493.

Alexander DD, Miller AJ, Cushing CA, Lowe KA. Processed meat and colorectal cancer: a quantitative review of prospective epidemiologic studies. *Eur. J Cancer Prev.* 2010:19:328–341.

Alexander DD, Weed DL, Cushing CA, Lowe KA. Meta-analysis of prospective studies of red meat consumption and colorectal cancer. *Eur. J Cancer Prev.* 2011:20:293–307.

Anttolainen M, Javainainen J, Kaartinen P, Lahti-Koski M, Laurinen J, and Männistö S. The 1997 Dietary survey of Finnish Adults. 1998. Helsinki, Publications of the National Public Health Institute B8/1998.

Bastide NM, Pierre FH, Corpet DE. Heme iron from meat and risk of colorectal cancer: a meta-analysis and a review of the mechanisms involved. *Cancer Prev. Res. (Phila)* 2011:4:177–184.

Bergström. NLG, Nutrient Losses and Gains in the Preparation of Foods. 1994. National Food Agency report 32/1994.

Black AE. Critical evaluation of energy intake using the Goldberg cut-off for energy intake:basal metabolic rate. A practical guide to its calculation, use and limitations. *Int. J. Obes. Relat Metab Disord.* 2000b:24:1119–1130.

Black AE. The sensitivity and specificity of the Goldberg cut-off for EI:BMR for identifying diet reports of poor validity. *Eur. J. Clin. Nutr.* 2000a:54:395–404.

Chan DS, Lau R, Aune D, Vieira R, Greenwood DC, Kampman E *et al.* Red and processed meat and colorectal cancer incidence: meta-analysis of prospective studies. *PLoS One* 2011:6:e20456.

Danish Food Composition Databank ed70. DTU Food National Food Institute Technical University of Denmark. 2012.

Donovan UM and Gibson RS. Iron and zinc status of young women aged 14 to 19 years consuming vegetarian and omnivorous diets. *J Am. Coll. Nutr* 1995:14:463–472.

Food and Agriculture Organization World Health Organization. Fats and fatty acids in human nutrition. Proceedings of the Joint FAO/WHO Expert Consultation. November 10–14 2008. 2009. Geneva, Switzerland.

Goldberg GR, Black AE, Jebb SA, Cole TJ, Murgatroyd PR, Coward WA *et al.* Critical evaluation of energy intake data using fundamental principles of energy physiology: 1. Derivation of cut-off limits to identify under-recording. *Eur. J. Clin. Nutr.* 1991:45:569–581.

Helsedirektoratet. Utviklingen i norsk kosthold 2011 (IS-1947). 2011. Helsedirektoratet.

Hirvonen T, Mannisto S, Roos E, Pietinen P. Increasing prevalence of underreporting does not necessarily distort dietary surveys. *Eur. J. Clin. Nutr.* 1997:51:297–301.

Hoppu U, Kujala J, and Lahtisalo J. Nutrition and Wellbeing of Secondary School Pupils [In Finnish]. 2008. Helsinki, Publications of the National Public Health Institute B30/2008.

Hoppu U, Lehtisalo J, Tapanainen H, Pietinen P. Dietary habits and nutrient intake of Finnish adolescents. *Public Health Nutr.* 2010:13:965–972.

Hunt JR. Moving toward a plant-based diet: are iron and zinc at risk? *Nutr Rev.* 2002:60:127–134.

Hunt JR and Roughead ZK. Adaptation of iron absorption in men consuming diets with high or low iron bioavailability. *Am. J Clin. Nutr* 2000:71:94–102.

Information Centre of the Ministry of Agriculture and Forestry in Finland (Tike). Balance Sheet for Food Commodities 2010, preliminary. Matilda, Agricultural Statistics. 6/7/2011. 2012.

Key TJ, Appleby PN, Spencer EA, Travis RC, Roddam AW, Allen NE. Cancer incidence in vegetarians: results from the European Prospective Investigation into Cancer and Nutrition (EPIC-Oxford). *Am. J. Clin. Nutr.* 2009:89:1620S–1626S.

Kleemola P, Virtanen M, and Pietinen P. The 1992 Dietary Survey of Finnish Adults. Publications of the National Public Helath Institute B2/1994. 1992.

Larsson SC and Wolk A. Meat consumption and risk of colorectal cancer: a meta-analysis of prospective studies. *Int. J Cancer* 2006:119:2657–2664.

Magalhaes B, Peleteiro B, Lunet N. Dietary patterns and colorectal cancer: systematic review and meta-analysis. *Eur. J Cancer Prev.* 2012:21:15–23.

Männistö S, Laatikainen T, Helakorpi S, Valsta LM. Monitoring diet and diet-related chronic disease risk factors in Finland. *Public Health Nutr.* 2012:13:907–914.

Männistö S, Ovaskainen ML, and Valsta LM. The National Findiet 2002 Study. 2003. Helsinki, Publications of the National Public Health Institute B3/2003.

Millward DJ and Garnett T. Food and the planet: nutritional dilemmas of greenhouse gas emission reductions through reduced intakes of meat and dairy foods. *Proceedings of the Nutrition Society* 2010:69:103–118.

Nasjonalt råd for ernæring. Kostråd for å fremme folkehelsen og forebygge krosniske sykdommer. Metodologi og vitenskapelig kunnskapsgrunnlag. 2011. Helsedirektoratet.

National Food Agency S. The National Food Administration's food database, version 26/01/2012. 2012.

Nordic Council of Ministers (2004): Nordic Nutrition Recommendations 2004, 4 edn. Copenhagen: Nordic Council.

Norkost3. 2006.

O'Connell JM, Dibley MJ, Sierra J, Wallace B, Marks JS, Yip R. Growth of vegetarian children: The Farm Study. *Pediatrics* 1989:84:475–481.

Paturi M, Tapanainen H, Reinivuo H, and Pietinen P. The national FINDIET 2007 Survey. 2008:B23/2008. Helsinki, KTL-National Public Health Institute, Department of Health Promotion and Chronic Disease Prevention, Nutrition Unit. Publications of the National Public Health Institute.

Pedersen AN, Fagt S, Groth MV, Christensen T, Biltoft-Jensen A, Matthiessen J et al. [Dietary habits in Denmark 2003–2008. Main results]. 2010. National Food Institute, Technical University of Denmark.

Riksmaten adults unpublished results. 2010.

Sanders TA. The nutritional adequacy of plant-based diets. *Proc. Nutr. Soc.* 1999:58:265–269.

Sanders TAB and Manning J. The growth and development of vegan children. *J Hum Nutr Diet* 1992:5:21.

Santarelli RL, Pierre F, Corpet DE. Processed meat and colorectal cancer: a review of epidemiologic and experimental evidence. *Nutr Cancer* 2008:60:131–144.

Schaafsma G. The protein digestibility-corrected amino acid score. *J Nutr* 2000:130:1865S–1867S.

Scientific Advisory Committee on Nutrition. Iron and Health. 2010. London, The Stationery Office.

Smolinska K and Paluszkiewicz P. Risk of colorectal cancer in relation to frequency and total amount of red meat consumption. Systematic review and meta-analysis. *Arch. Med. Sci.* 2010:6:605–610.

Statens Jordbruksverk. Livsmedelskonsumtion och näringsinnehåll tom 2010. 2012. Statistik Rapport 2012:01.

Stoltzfus RJ. Iron-deficiency anemia: reexamining the nature and magnitude of the public health problem. Summary: implications for research and programs. *J Nutr* 2001:131:701S.

Tetens I, Bendtsen KM, Henriksen M, Ersboll AK, Milman N. The impact of a meat- versus a vegetable-based diet on iron status in women of childbearing age with small iron stores. *Eur. J Nutr* 2007:46:439–445.

The German Federal Institute for Risk Assessment . Study on meat intake and mortality. BfR Opinion No. 023/2009, 29 May 2009. 2009.

Thompson FE & Subar AF (2008) Dietary assessment methodology. In *Nutrition in the prevention and treatment of disease,* ed. Coulston AM & Boushey CJ, pp. 3–39. London: Elsevier Academic Press.

Van HL, McCoin M, Kris-Etherton PM, Burke F, Carson JA, Champagne CM *et al.* The evidence for dietary prevention and treatment of cardiovascular disease. *J Am. Diet Assoc.* 2008:108:287–331.

World Cancer Research Fund and American Institute for Cancer Research. Food, Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective. 2007. Washington DC: AICR.

World Health Organization Food and Agriculture Organization and United Nations University. Protein and Amino Acid Requirements in Human Nutrition. Report of a Joint WHO/FAO/UNU Expert Consultation. WHO Technical Report Series no. 935. 2007. Geneva, WHO.

9. Sammenfatning

The World Cancer Research Fond (WCRF) anbefalede i 2007, at forbrugernes indtag af rødt kød begrænses og at forarbejdet kød helt undgås. Anbefalingen var baseret på en systematisk gennemgang af den tilgængelige litteratur om sammenhængen mellem kødforbrug og kræft, især tarmkræft. Anbefalingen til enkeltpersoner var at indtage mindre end 500 g rødt kød pr. uge, svarende til 70 gram pr. dag og med meget lidt – hvis noget– forarbejdet kød. Anbefalingen på gruppeniveau var et gennemsnitligt forbrug af rødt kød på højst 300 g rødt kød pr. uge, svarende til 43 gram pr. dag og meget lidt – hvis noget – forarbejdet kød. Rødt kød betegner kødet fra dyr med fire ben, for eksempel svin, kvæg, får, geder, rådyr mm. Forarbejdet kød betegner kød, der er behandlet ved for eksempel saltning, lagring rygning, eller tilsat konserveringsmidler, for eksempel kødpålæg i form af skinke og pølse og bacon.

DTU Fødevareinstituttet har i en ny undersøgelse vurderet de ernæringsmæssige konsekvenser af at efterleve anbefalingen for befolkningen i de fire nordiske lande Norge, Sverige, Finland og Danmark. Befolkningen blev inddelt i fire grupper: kvinder 18–75 år, mænd 18–75 år, børn 4–9 år og unge 10–17 år. For hver gruppe blev kosten sat sammen på fem forskellige måder. Model 1 var den gennemsnitlige sædvanlige kost. Model 2 var den gennemsnitlige sædvanlige kost, hvor indtaget af rødt kød blev reduceret til 70 gram pr. dag og indtaget af forarbejdet kød til 0 gram pr. dag. Kødet blev erstattet med hvidt kød eller fisk. Model 3 var den gennemsnitlige sædvanlige kost, hvor indtaget af rødt kød blev reduceret til 70 gram pr. dag indtaget af forarbejdet kød til 0 gram pr. dag. Kødet blev erstattet med en proportional mængde af andre fødevarer end kød, for eksempel frugt, og grønt, mælkeprodukter og kornprodukter. Model 4 var den sædvanlige gennemsnitlige kost, hvor indtaget af rødt kød blev reduceret til 43 gram pr. dag og indtag af forarbejdet kød til 0 gram pr. dag. Kødet blev erstattet med hvidt kød eller fisk. Model 5 var den gennemsnitlige sædvanlige kost, hvor indtaget af rødt kød blev reduceret til 43 gram pr. dag og indtaget af forarbejdet kød til 0 gram pr. dag. Kødet blev erstattet med en proportional mængde af andre fødevarer end kød, for eksempel frugt, og grønt, mælkeprodukter og kornprodukter.

Undersøgelsen viser, at det nuværende gennemsnitlige indtag af kød i de nordiske lande for 18–75-årige kvinder og mænd, 4–9-årige børn og

10–17-årige teenagere ikke var højt i forhold til de niveauer, WCRF anbefaler. Det gennemsnitlige sædvanlige indtag for rødt kød ligger således for kvinder på 30–47 g/d, mens det gennemsnitlige indtag af forarbejdet kød ligger for kvinder på 23–36 g/d. Den største ændring, modellerne gav anledning til, var således udelukkelsen af forarbejdet kød, som WCRF anbefaler.

Undersøgelsen viser også, at det ikke har nogen nævneværdige ernæringsmæssige konsekvenser at efterleve WCRF's anbefalinger. I det omfang man skifter det røde kød ud med fisk, lyst kød eller andre fødevarer, får kosten ikke en ringere ernæringsmæssig sammensætning, når man sammenligner den med de nordiske ernæringsmæssige anbefalinger. Trods de metodemæssige udfordringer ved at sammenligne ernæringsmæssige data fra fire forskellige lande, var resultaterne meget ens på tværs af landene.

Denne undersøgelse tyder på, at det aktuelle indtag af kød i de Nordiske lande ikke er langt fra det niveau, WCRF har foreslået på individuelt niveau. Undersøgelsen viser også, at det ikke vil have nogen nævneværdige ernæringsmæssige konsekvenser at nedsætte indtaget af kød, hverken når det gælder rødt kød eller forarbejdet kød.

10.   Appendix

10.1 Denmark

10.1.1   Women

Table A1. Food intake in major food groups in 18 to 75 year-old women in Denmark, n=1093

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Meat, total, g/d	86	74	62	72	58
Red meat, g/d[1]	47	47	47	43	43
White meat, g/d[1]	15	27	15	29	15
Processed meat, g/d[2]	24	0	0	0	0
Fish and other seafood, g/d[3]	16	28	17	30	17
Egg, g/d[3]	9	9	9	9	9
Potatoes, rice and pasta, g/d[3]	98	98	101	98	102
Bread and cereals, g/d[3]	164	164	169	164	170
Fat spread (on bread), g/d[3]	14	14	14	14	14
Fat used in cooking, g/d[3,4]	21	21	21	21	22
Fruit and berries, g/d[3]	226	226	234	226	235
Juice, g/d[3]	69	69	71	69	72
Vegetables, g/d[3]	159	159	165	159	165
Milk and milk products, g/d[3]	279	279	289	279	290
Cheese, g/d[3]	29	29	30	29	30
Beverages, g/d[3]	2,155	2,155	2,231	2,155	2,243
Water, tea and coffee, g/d[3]	1,779	1,779	1,842	1,779	1,851
Soda and fruit nectar, g/d[3]	214	214	222	214	223
Alcohol, beer and vine, g/d[3]	162	162	168	162	168
Snacks, sweets, ice cream, g/d[3]	80	80	83	80	84
Other, g/d[3]	43	43	44	43	45

[1] Cooked meat and minced meat, calculated 20% weight loss from raw meat
[2] Prepared processed meat products, not weight loss calculated
[3] Measured in raw weight
[4] Incl. gravy/sauce

Table A2. Macronutrient intake 18 to 75 year-old women in Denmark, n=1093

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Protein, E%	14.3	14.7	13.9	14.7	13.8
Fat, E%	32.8	32.2	31.6	32.2	31.5
Saturated fat, E%	13.6	13.3	13.2	13.2	13.1
Monounsaturated fat, E%	11.6	11.2	11.0	11.2	10.9
Polyunsaturated fat, E%	4.9	5.0	4.8	5.0	4.8
Carbohydrate, E%	48.4	48.7	49.9	48.7	50.1
Added sugar, E%	9.2	9.3	9.5	9.3	9.5
Dietary fibre, g/MJ[1]	2.6	2.6	2.6	2.6	2.6
Alcohol, E%	4.5	4.5	4.6	4.5	4.6

1 Dietary fibre is included in the total carbohydrate (E%).

Table A3. Micronutrient intake 18 to 75 year-old women in Denmark, n=1093

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Energy intake, MJ	7.9	7.8	7.9	7.8	7.9
Dietary fibre, g	20.11	20.09	20.74	20.08	20.83
Vitamin A, RE	1075	894	901	890	897
Vitamin D, µg	3.0	3.9	2.9	4.1	2.9
Vitamin E, α-TE	7.8	8.1	8.0	8.1	8.0
Thiamine, mg	1.2	1.1	1.1	1.1	1.1
Riboflavin, mg	1.5	1.5	1.5	1.5	1.5
Niacin, NE	29	30	28	30	28
Vitamin B_6, mg	1.5	1.5	1.5	1.5	1.5
Folate, µg	350	346	352	346	353
Vitamin B_{12}, µg	4.5	4.6	4.0	4.6	4.0
Vitamin C, mg	134	130	134	130	135
Calcium, mg	1,025	1,029	1,056	1,029	1,060
Phosphorus, mg	1,256	1,253	1,246	1,252	1,243
Magnesium, mg	320	321	326	321	326
Iron, mg	9.0	8.7	8.8	8.7	8.8
Zinc, mg	9	9	9	9	9
Copper, mg	4.3	4.3	4.4	4.3	4.4
Iodine (µg)	178	186	183	187	183
Selenium, µg	38	41	36	41	36
Potassium, g	3.1	3.1	3.2	3.1	3.2

10.1.2 Men

Table A4. Food intake in major food groups in 18 to 75 year-old men in Denmark, n=932

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Meat, total, g/d	141	115	89	102	62
Red meat, g/d[1]	74	70	70	43	43
White meat, g/d[1]	19	45	19	59	19
Processed meat, g/d[2]	49	0	0	0	0
Fish and other seafood, g/d[3]	20	46	21	59	22
Egg, g/d[3]	12	12	12	12	13
Potatoes, rice and pasta, g/d[3]	156	156	166	156	170
Bread and cereals, g/d[3]	219	219	233	219	239
Fat spread (on bread), g/d[3]	24	24	25	24	26
Fat used in cooking, g/d[3,4]	27	27	29	27	30
Fruit and berries, g/d[3]	163	163	173	163	177
Juice, g/d[3]	72	72	76	72	78
Vegetables, g/d[3]	124	124	132	124	136
Milk and milk products, g/d[3]	307	307	326	307	335
Cheese, g/d[3]	38	38	40	38	41
Beverages, g/d[3]	2,271	2,271	2,412	2,271	2,475
Water, tea and coffee, g/d[3]	1,611	1,611	1,711	1,611	1,755
Soda and fruit nectar, g/d[3]	255	255	271	255	278
Alcohol, beer and vine, g/d[3]	405	405	430	405	441
Snacks, sweets, ice cream, g/d[3]	90	90	96	90	98
Other, g/d[3]	56	56	59	56	61

[1] Cooked meat and minced meat, calculated 20% weight loss from raw meat

[2] Prepared processed meat products, not weight loss calculated

[3] Measured in raw weight

[4] Incl. gravy/sauce

Table A5. Macronutrient intake 18 to 75 year-old men in Denmark, n=932

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Protein, E%	14.2	14.7	13.5	14.7	12.9
Fat, E%	34.2	33.1	32.1	33.0	31.6
Saturated fat, E%	14.4	13.9	13.8	13.7	13.5
Monounsaturated fat, E%	12.1	11.5	11.1	11.4	10.7
Polyunsaturated fat, E%	4.9	5.1	4.8	5.2	4.8
Carbohydrate, E%	45.0	45.5	47.4	45.5	48.4
Added sugar, E%	8.8	9.0	9.4	9.1	9.6
Dietary fibre, g/MJ[1]	2.2	2.2	2.3	2.2	2.3
Alcohol, E%	6.6	6.7	7.0	6.7	7.2

[1] Dietary fibre is included in the total carbohydrate (E%).

Table A6. Micronutrient intake 18 to 75 year-old men in Denmark, n=932

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Energy intake, MJ	10.4	10.3	10.4	10.3	10.4
Dietary fibre, g	22.56	22.53	23.78	22.47	24.27
Vitamin A, RE	1436	1001	996	971	960
Vitamin D, µg	3.8	5.8	3.7	6.8	3.7
Vitamin E, α-TE	8.8	9.3	9.0	9.6	9.1
Thiamine, mg	1.6	1.5	1.5	1.4	1.4
Riboflavin, mg	1.9	1.9	1.9	1.8	1.8
Niacin, NE	39	41	37	41	35
Vitamin B_6, mg	1.9	2.0	1.9	2.0	1.8
Folate, µg	388	377	386	375	388
Vitamin B_{12}, µg	6.5	6.5	5.3	6.7	4.9
Vitamin C, mg	132	124	130	124	133
Calcium, mg	1,124	1,131	1,180	1,130	1,199
Phosphorus, mg	1,598	1,591	1,574	1,586	1,553
Magnesium, mg	394	397	406	397	409
Iron, mg	11.5	10.8	10.9	10.6	10.8
Zinc, mg	12	12	12	11	11
Copper, mg	3.5	3.5	3.6	3.5	3.7
Iodine (µg)	214	232	223	240	225
Selenium, µg	49	55	46	58	44
Potassium, g	3.8	3.8	3.9	3.8	3.8

10.1.3 Children

Table A7. Food intake in major food groups in 4 to 9 year-old children in Denmark, n=298

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Meat, total, g/d	89	69	50	-	-
Red meat, g/d[1]	39	39	39	-	-
White meat, g/d[1]	11	31	11	-	-
Processed meat, g/d[2]	40	0	0	-	-
Fish and other seafood, g/d[3]	11	30	11	-	-
Egg, g/d[3]	6	6	6	-	-
Potatoes, rice and pasta, g/d[3]	91	91	97	-	-
Bread and cereals, g/d[3]	181	181	193	-	-
Fat spread (on bread), g/d[3]	19	19	20	-	-
Fat used in cooking, g/d[3,4]	15	15	16	-	-
Fruit and berries, g/d[3]	163	163	173	-	-
Juice, g/d[3]	76	76	81	-	-
Vegetables, g/d[3]	102	102	108	-	-
Milk and milk products, g/d[3]	472	472	502	-	-
Cheese, g/d[3]	17	17	18	-	-
Beverages, g/d[3]	740	740	787	-	-
Water, tea and coffee, g/d[3]	449	449	478	-	-
Soda and fruit nectar, g/d[3]	290	290	308	-	-
Alcohol, beer and vine, g/d[3]	1	1	1	-	-
Snacks, sweets, ice cream, g/d[3]	91	91	97	-	-
Other, g/d[3]	39	39	41	-	-

[1] Cooked meat and minced meat, calculated 20% weight loss from raw meat

[2] Prepared processed meat products, not weight loss calculated

[3] Measured in raw weight

[4] Incl. gravy/sauce

Table A8. Macronutrient intake 4 to 9 year-old children in Denmark, n=298

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Protein, E%	14.0	14.7	13.5	-	
Fat, E%	34.0	32.7	31.8	-	-
Saturated fat, E%	14.4	13.8	13.7	-	-
Monounsaturated fat, E%	11.6	10.9	10.4	-	-
Polyunsaturated fat, E%	4.9	4.9	4.6	-	-
Carbohydrate, E%	52.0	52.6	54.7	-	-
Added sugar, E%	12.1	12.4	12.9	-	-
Dietary fibre, g/MJ[1]	2.2	2.2	2.3	-	-
Alcohol, E%	0	0	0	-	-

[1] Dietary fibre is included in the total carbohydrate (E%).

Table A9. Micronutrient intake 4 to 9 year-old children in Denmark, n=298

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Energy intake, MJ	8.0	7.9	8.0	-	-
Dietary fibre, g	17.42	17.38	18.37	-	-
Vitamin A, RE	1079	754	764	-	-
Vitamin D, µg	2.3	3.6	2.2	-	-
Vitamin E, α-TE	6.8	7.2	7.0	-	-
Thiamine, mg	1.2	1.2	1.2	-	-
Riboflavin, mg	1.7	1.6	1.6	-	-
Niacin, NE	23	25	22	-	-
Vitamin B_6, mg	1.3	1.4	1.3	-	-
Folate, µg	291	282	290	-	-
Vitamin B_{12}, µg	5.0	5.0	4.1	-	-
Vitamin C, mg	108	102	108	-	-
Calcium, mg	1,082	1,087	1,140	-	-
Phosphorus, mg	1,312	1,310	1,308	-	-
Magnesium, mg	267	269	275	-	-
Iron, mg	8.0	7.5	7.6	-	-
Zinc, mg	9	9	9	-	-
Copper, mg	2.7	2.6	2.8	-	-
Iodine (µg)	183	197	192	-	-
Selenium, µg	36	41	34	-	-
Potassium, g	2.6	2.7	2.7	-	-

10.1.4 Adolescents

Table A10. Food intake in major food groups in 10 to17 year-old adolescents in Denmark, n=377

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Meat, total, g/d	104	88	72	81	58
Red meat, g/d[1]	57	57	57	43	43
White meat, g/d[1]	15	31	15	38	15
Processed meat, g/d[2]	32	0	0	0	0
Fish and other seafood, g/d[3]	9	25	10	32	10
Egg, g/d[3]	5	5	5	5	5
Potatoes, rice and pasta, g/d[3]	117	117	123	117	125
Bread and cereals, g/d[3]	189	189	197	189	201
Fat spread (on bread), g/d[3]	13	13	14	13	14
Fat used in cooking, g/d[3,4]	20	20	21	20	21
Fruit and berries, g/d[3]	150	150	157	150	159
Juice, g/d[3]	99	99	104	99	105
Vegetables, g/d[3]	99	99	104	99	105
Milk and milk products, g/d[3]	396	396	415	396	422
Cheese, g/d[3]	24	24	25	24	26
Beverages, g/d[3]	1,032	1,032	1,079	1,032	1,097
Water, tea and coffee, g/d[3]	638	638	668	638	679
Soda and fruit nectar, g/d[3]	355	355	371	355	377
Alcohol, beer and vine, g/d[3]	39	39	41	39	41
Snacks, sweets, ice cream, g/d[3]	92	92	96	92	98
Other, g/d[3]	56	56	58	56	59

[1] Cooked meat and minced meat, calculated 20% weight loss from raw meat

[2] Prepared processed meat products, not weight loss calculated

[3] Measured in raw weight

[4] Incl. gravy/sauce

Table A11. Macronutrient intake 10 to 17 year-old adolescents in Denmark, n=377

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Protein, E%	14.4	14.9	14.0	15.0	13.6
Fat, E%	32.7	31.8	31.2	31.8	30.8
Saturated fat, E%	13.8	13.5	13.4	13.3	13.2
Monounsaturated fat, E%	11.3	10.8	10.5	10.7	10.3
Polyunsaturated fat, E%	4.7	4.8	4.6	4.9	4.6
Carbohydrate, E%	52.2	52.5	54.1	52.5	54.7
Added sugar, E%	12.4	12.5	12.9	12.6	13.1
Dietary fibre, g/MJ[1]	2.1	2.1	2.1	2.1	2.2
Alcohol, E%	0.7	0.7	0.8	0.7	0.8

1 Dietary fibre is included in the total carbohydrate (E%).

Table A12. Micronutrient intake 10 to 17 year-old adolescents in Denmark, n=377

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Energy intake, MJ	8.5	8.4	8.5	8.4	8.5
Dietary fibre, g	17.7	17.6	18.3	17.5	18.5
Vitamin A, RE	935	712	715	717	718
Vitamin D, µg	2.4	3.7	2.3	4.3	2.3
Vitamin E, α-TE	7.0	7.3	7.2	7.5	7.2
Thiamine, mg	1.3	1.3	1.3	1.3	1.3
Riboflavin, mg	1.6	1.6	1.6	1.6	1.6
Niacin, NE	27	28	26	29	25
Vitamin B_6, mg	1.5	1.5	1.4	1.5	1.4
Folate, µg	311	305	311	306	313
Vitamin B_{12}, µg	4.6	4.6	3.9	4.8	3.8
Vitamin C, mg	116	112	116	112	118
Calcium, mg	1,100	1,104	1,142	1,101	1,152
Phosphorus, mg	1,358	1,358	1,349	1,356	1,341
Magnesium, mg	284	287	290	287	291
Iron, mg	8.7	8.3	8.4	8.2	8.3
Zinc, mg	10	10	10	10	9
Copper, mg	3.2	3.2	3.3	3.2	3.3
Iodine (µg)	183	193	189	196	190
Selenium, µg	38	43	36	45	35
Potassium, g	2.8	2.8	2.8	2.8	2.8

10.2 Finland

10.2.1 Women

Table A13. Food intake in major food groups in 25 to 74 year-old women in Finland, n=1080

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Meat, total, g/d	75.7	62.1	48.4	62.1	48.4
Red meat, g/d[1,13]	30.2	30.2	30.2	30.2	30.2
White meat, g/d[2,13]	18.3	31.9	18.3	31.9	18.3
Processed meat, g/d[3,14]	27.2	0.0	0.0	0.0	0.0
Fish, g/d[15]	23.3	36.9	23.3	36.9	23.3
Egg, g/d[15]	13.1	13.1	13.1	13.1	13.1
Potatoes, rice, pasta, g/d[4,15]	85.1	85.1	90.5	85.1	90.5
Bread and cereals, g/d[5,15]	120.1	120.1	127.8	120.1	127.8
Fat spread (on bread), g/d[6,15]	19.8	19.8	19.8	19.8	19.8
Fat used in cooking, g/d[7,15]	12.6	12.6	12.6	12.6	12.6
Fruit (excl. juice), g/d[8,15]	195.0	195.0	195.0	195.0	195.0
Juice, g/d[15]	41.9	41.9	41.9	41.9	41.9
Vegetables[9,15]	159.9	159.9	170.1	159.9	170.1
Milk and milk products, g/d[10,15]	380.4	380.4	404.7	380.4	404.7
Cheese, g/d[15]	31.8	31.8	31.8	31.8	31.8
Beverages, g/d[15]	1,745.4	1,745.4	1,745.4	1,745.4	1,745.4
Water, tea and coffee, g/d[15]	1,576.2	1,576.2	1,576.2	1,576.2	1,576.2
Soda and fruit nectar , g/d[15]	116.6	116.6	116.6	116.6	116.6
Alcohol, beer and vine, g/d1[5]	52.6	52.6	52.6	52.6	52.6
Savoury, sweets, g/d[11,15]	14.7	14.7	14.7	14.7	14.7
Other, g/d[12,15]	34.2	34.2	34.2	34.2	34.2

[1] Beef, Pork, Lamb

[2] Poultry

[3] Sausage, meat products (cold cuts)

[4] Potatoes, potato products, rice, pasta

[5] Wheat, rye, oat, barley, other cereal, hard bread, biscuit, starch

[6] butter, butter-oil mixes and margarine

[7] oil, animal fat (suet, lard), other fat (salad dressings, mayonnaise, fish oil), cooking fat and fat used by industry

[8] Apple fruit, citrus, other fruit, canned fruit, berries

[9] Leaf vegetables, fruit vegetables, cabbage, onion, root, mushroom, canned vegetables, pulse, nuts and seeds, soy products

[10] Milk, sour milk products, cream, ice cream, other milk (powdered milk, milk protein)

[11] Sweets, chocolate, snacks

[12] Offal, game, sugar and syrup, other sugar prod, herbs, flavourings and spices, spice sauces, salt, sweeteners, other miscellaneous, industrial meals, baby foods, formula milk, vitamin/mineral /fatty acid/fibre supplements, enzymes, herb suppl, homeopathic suppl, yeast, probiotic and prebiotic etc.

[13] Cooked meat and minced meat, calculated 20% weight loss from raw meat

[14] Prepared processed meat products, not weight loss calculated

[15] Partially cooked fish, calculated 10% weight loss from raw fish.

Table A14. Macronutrient intake 25 to 74 year-old women in Finland, n=1080

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Protein, E%	17.3	17.8	16.7	17.8	16.7
Fat, E%	31.0	30.7	29.7	30.7	29.7
Saturated fat, E%	11.2	10.8	10.8	10.8	10.8
Monounsaturated fat, E%	10.2	10.0	9.6	10.0	9.6
Polyunsaturated fat, E%	5.3	5.4	5.1	5.4	5.1
Carbohydrate, E%	50.5	50.3	52.4	50.3	52.4
Added sugar, E%	10.2	10.3	10.4	10.3	10.4
Dietary fibre, g/MJ[1]	3.3	3.1	3.3	3.2	3.3
Alcohol, E%	1.3	1.3	1.3	1.3	1.3

[1] Dietary fibre is included in the total carbohydrate (E%).

Table A15. Micronutrient intake 25 to 74 year-old women in Finland, n=1080

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Energy intake, MJ	6.6	6.6	6.6	6.6	6.6
Dietary fibre, g	20.8	20.8	21.7	20.8	21.7
Vitamin A, RE	707	714.1	723.2	714.1	723.2
Vitamin D, µg	5.5	6.7	5.5	6.7	5.5
Vitamin E, α-TE	8.0	8.3	8.1	8.3	8.1
Thiamine, mg	1.1	1.0	1.1	1.0	1.1
Riboflavin, mg	1.6	1.6	1.6	1.6	1.6
Niacin, NE	25.7	26.7	24.6	26.7	24.6
Vitamin B_6, mg	1.6	1.6	1.5	1.6	1.5
Folate, µg	222	225.0	230.2	225.0	230.2
Vitamin B_{12}, µg	4.7	5.4	4.6	5.4	4.6
Vitamin C, mg	113.5	113.5	116.5	113.5	116.5
Calcium, mg	984	995.7	1,015.9	995.7	1,015.9
Phosphorus, mg	1,349	1,364.8	1,354.6	1,364.8	1,354.6
Magnesium, mg	338	340.3	345.4	340.3	345.4
Iron, mg	10.2	10.2	10.4	10.2	10.4
Zinc, mg	9.9	9.9	9.8	9.9	9.8
Copper, mg	1.2	1.2	1.2	1.2	1.2
Iodine (µg)	191	199.1	194.8	199.1	194.8
Selenium, µg	53.3	54.6	50.3	54.6	50.3
Potassium, g	3.4	3.4	3.5	3.4	3.5

10.2.2   Men

Table A16. Food intake in major food groups in 25 to 74 year-old men in Finland, n=958

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Meat, total, g/d	127.7	99.2	70.7	96.9	66.0
Red meat, g/d[1,13]	47.7	47.7	47.7	43.0	43.0
White meat, g/d[2,13]	23.0	51.5	23.0	53.9	23.0
Processed meat, g/d[3,14]	57.0	0.0	0.0	0.0	0.0
Fish, g/d[15]	27.7	56.2	27.7	58.5	27.7
Egg, g/d[15]	18.7	18.7	18.7	18.7	18.7
Potatoes, rice, pasta, g/d[4,15]	121.0	121.0	134.8	121.0	136.0
Bread and cereals, g/d[5,15]	161.3	161.3	179.6	161.3	181.3
Fat spread (on bread), g/d[6,15]	31.1	31.1	31.1	31.1	31.1
Fat used in cooking, g/d[7,15]	16.5	16.5	16.5	16.5	16.5
Fruit (excl. juice), g/d[8,15]	149.6	149.6	149.6	149.6	149.6
Juice, g/d[15]	50.3	50.3	50.3	50.3	50.3
Vegetables[9,15]	134.4	134.4	149.6	134.4	151.0
Milk and milk products, g/d[10,15]	462.1	462.1	514.3	462.1	519.8
Cheese, g/d[15]	36.1	36.1	36.1	36.1	36.1
Beverages, g/d[15]	1,836.1	1,836.1	1,836.1	1,836.1	1,836.1
Water, tea and coffee, g/d[15]	1,452.6	1,452.6	1,452.6	1,452.6	1,452.6
Soda and fruit nectar , g/d[15]	200.7	200.7	200.7	200.7	200.7
Alcohol, beer and vine, g/d1[5]	182.8	182.8	182.8	182.8	182.8
Savoury, sweets, g/d[11,15]	11.0	11.0	11.0	11.0	11.0
Other, g/d[12,15]	51.4	51.4	51.4	51.4	51.4

[1] Beef, Pork, Lamb

[2] Poultry

[3] Sausage, meat products (cold cuts)

[4] Potatoes, potato products, rice, pasta

[5] Wheat, rye, oat, barley, other cereal, hard bread, biscuit, starch

[6] butter, butter-oil mixes and margarine

[7] oil, animal fat (suet, lard), other fat (salad dressings, mayonnaise, fish oil), cooking fat and fat used by industry

[8] Apple fruit, citrus, other fruit, canned fruit, berries

[9] Leaf vegetables, fruit vegetables, cabbage, onion, root, mushroom, canned vegetables, pulse, nuts and seeds, soy products

[10] Milk, sour milk products, cream, ice cream, other milk (powdered milk, milk protein)

[11] Sweets, chocolate, snacks

[12] Offal, game, sugar and syrup, other sugar prod, herbs, flavourings and spices, spice sauces, salt, sweeteners, other miscellaneous, industrial meals, baby foods, formula milk, vitamin/mineral /fatty acid/fibre supplements, enzymes, herb suppl, homeopathic suppl, yeast, probiotic and prebiotic etc.

[13] Cooked meat and minced meat, calculated 20% weight loss from raw meat

[14] Prepared processed meat products, not weight loss calculated

[15] Partially cooked fish, calculated 10% weight loss from raw fish.

Table A17. Macronutrient intake 25 to 74 year-old men in Finland, n=958

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Protein, E%	16.9	17.9	16.1	17.9	16.0
Fat, E%	32.7	31.9	30.2	31.8	30.0
Saturated fat, E%	12.0	11.3	11.1	11.2	11.0
Monounsaturated fat, E%	11.1	10.8	10.0	10.7	9.9
Polyunsaturated fat, E%	5.5	5.6	5.2	5.7	5.2
Carbohydrate, E%	47.7	47.5	50.9	47.6	51.3
Added sugar, E%	9.6	9.6	9.7	9.7	9.8
Dietary fibre, g/MJ[1]	2.8	2.7	3.0	2.7	3.0
Alcohol, E%	2.7	2.7	2.7	2.7	2.7

[1] Dietary fibre is included in the total carbohydrate (E%).

Table A18. Micronutrient intake 25 to 74 year-old men in Finland, n=958

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Energy intake, MJ	8.9	8.9	8.9	8.9	8.9
Dietary fibre, g	23.8	23.8	25.98	23.8	26.2
Vitamin A, RE	933	949.2	958	950.4	960.5
Vitamin D, µg	7.5	10.2	7.6	10.4	7.6
Vitamin E, α-TE	9.9	10.6	10.0	10.6	10.0
Thiamine, mg	1.4	1.3	1.3	1.3	1.3
Riboflavin, mg	2.0	2.0	2.0	2.0	2.0
Niacin, NE	34.1	36.7	32.5	36.7	32.2
Vitamin B_6, mg	2.1	2.2	2.0	2.2	2.0
Folate, µg	263	269.4	280	270.0	281.5
Vitamin B_{12}, µg	6.6	8.0	6.5	8.1	6.4
Vitamin C, mg	96.5	96.5	101	96.5	101.7
Calcium, mg	1,162	1,188.0	1,229	1,190.3	1,235.8
Phosphorus, mg	1,738	1,778.9	1,764	1,779.7	1,765.5
Magnesium, mg	417	422.0	434	422.1	435.9
Iron, mg	13.3	13.4	13.7	13.3	13.7
Zinc, mg	13.3	13.3	13.2	13.1	13.1
Copper, mg	1.5	1.5	1.6	1.5	1.6
Iodine (µg)	247	263.3	255	264.7	256.3
Selenium, µg	71.5	74.7	65.9	74.6	65.2
Potassium, g	4.1	4.2	4.2	4.2	4.2

10.2.3   Adolescents

Table A19. Food intake in major food groups in 13 to 14 year-old adolescents in Finland, n=306

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Meat, total, g/d	94.8	80.8	66.9	84.3	66.0
Red meat, g/d[1,13]	44.2	44.2	44.2	39.2	39.6
White meat, g/d[2,13]	22.6	36.6	22.6	39.1	26.4
Processed meat, g/d[3,14]	27.9	0.0	0.0	0.0	0.0
Fish, g/d[15]	14.9	28.9	14.9	31.4	15.1
Egg, g/d[15]	10.6	10.6	10.6	10.6	10.7
Potatoes, rice, pasta, g/d[4,15]	126.0	126.0	134.0	126.0	138.4
Bread and cereals, g/d[5,15]	110.5	110.5	117.4	110.5	120.2
Fat spread (on bread), g/d[6,15]	20.8	20.8	20.8	20.8	21.0
Fat used in cooking, g/d[7,15]	12.5	12.5	12.5	12.5	12.6
Fruit (excl. juice), g/d[8,15]	111.3	111.3	111.3	111.3	109.1
Juice, g/d[15]	94.4	94.4	94.4	94.4	95.0
Vegetables[9,15]	129.4	129.4	137.2	129.4	137.5
Milk and milk products, g/d[10,15]	599.2	599.2	636.8	599.2	658.4
Cheese, g/d[15]	22.0	22.0	22.0	22.0	22.1
Beverages, g/d[15]	861.3	861.3	861.3	861.3	861.3
Water, tea and coffee, g/d[15]	595.3	595.3	595.3	595.3	580.2
Soda and fruit nectar , g/d[15]	264.3	264.3	264.3	264.3	273.4
Alcohol, beer and vine, g/d1[5]	1.8	1.8	1.8	1.8	1.8
Savoury, sweets, g/d[11,15]	24.8	24.8	24.8	24.8	25.1
Other, g/d[12,15]	30.0	30.0	30.0	30.0	30.1

[1] Beef, Pork, Lamb

[2] Poultry

[3] Sausage, meat products (cold cuts)

[4] Potatoes, potato products, rice, pasta

[5] Wheat, rye, oat, barley, other cereal, hard bread, biscuit, starch

[6] butter, butter-oil mixes and margarine

[7] oil, animal fat (suet, lard), other fat (salad dressings, mayonnaise, fish oil), cooking fat and fat used by industry

[8] Apple fruit, citrus, other fruit, canned fruit, berries

[9] Leaf vegetables, fruit vegetables, cabbage, onion, root, mushroom, canned vegetables, pulse, nuts and seeds, soy products

[10] Milk, sour milk products, cream, ice cream, other milk (powdered milk, milk protein)

[11] Sweets, chocolate, snacks

[12] Offal, game, sugar and syrup, other sugar prod, herbs, flavourings and spices, spice sauces, salt, sweeteners, other miscellaneous, industrial meals, baby foods, formula milk, vitamin/mineral /fatty acid/fibre supplements, enzymes, herb suppl, homeopathic suppl, yeast, probiotic and prebiotic etc.

[13] Cooked meat and minced meat, calculated 20% weight loss from raw meat

[14] Prepared processed meat products, not weight loss calculated

[15] Partially cooked fish, calculated 10% weight loss from raw fish.

Table A20. Macronutrient intake 13 to 14 year-old adolescents in Finland, n=306

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Protein, E%	16.3	16.9	15.8	16.9	15.7
Fat, E%	29.9	29.3	28.4	29.2	28.1
Saturated fat, E%	11.0	10.6	10.5	10.5	10.4
Monounsaturated fat, E%	10.3	10.0	9.6	10.0	9.5
Polyunsaturated fat, E%	5.0	5.0	4.8	5.0	4.7
Carbohydrate, E%	53.7	53.7	55.6	53.8	56.1
Added sugar, E%	12.6	12.7	12.8	12.7	12.8
Dietary fibre, g/MJ[1]	2.3	2.3	2.4	2.3	2.4
Alcohol, E%	0.0	0.0	0.0	0.0	0.0

[1] Dietary fibre is included in the total carbohydrate (E%).

Table A21. Micronutrient intake 13 to 14 year-old adolescents in Finland, n=306

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Energy intake, MJ	7.4	7.4	7.4	7.4	7.4
Dietary fibre, g	16.7	16.7	17.6	16.7	17.8
Vitamin A, RE	531.2	535.6	542.9	536.2	545.3
Vitamin D, µg	5.7	6.7	5.8	6.9	5.8
Vitamin E, α-TE	7.5	7.8	7.6	7.9	7.6
Thiamine, mg	1.2	1.1	1.1	1.1	1.1
Riboflavin, mg	1.9	1.9	2.0	1.9	2.0
Niacin, NE	24.7	25.9	23.9	26.0	23.5
Vitamin B6, mg	1.8	1.9	1.8	1.9	1.8
Folate, µg	195.8	198.8	203.6	199.3	205.3
Vitamin B12, µg	4.5	5.1	4.5	5.2	4.5
Vitamin C, mg	90.4	90.4	93.0	90.4	93.6
Calcium, mg	1,139.1	1,148.6	1,185.9	1,150.3	1,198.0
Phosphorus, mg	1,418.8	1,438.5	1,436.5	1,439.2	1,439.4
Magnesium, mg	298.9	301.0	306.8	301.1	308.8
Iron, mg	9.6	9.6	9.7	9.5	9.6
Zinc, mg	10.6	10.5	10.5	10.4	10.4
Copper, mg	1.1	1.1	1.2	1.1	1.2
Iodine (µg)	215.8	225.0	221.6	226.7	223.0
Selenium, µg	57.8	59.5	55.4	59.4	54.5
Potassium, g	3.3	3.3	3.3	3.3	3.4

10.3 Norway

10.3.1 Women

Table A22. Food intake in major food groups in 18 to 70 year-old women in Norway, n=925

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Meat, total, g/d	99.8	82.0	64.2	81.3	62.8
Red meat, g/d[1]	44.4	44.4	44.4	43.0	43.0
White meat, g/d[1]	19.8	37.6	19.8	38.3	19.8
Processed meat, g/d[2]	35.6	0.0	0.0	0.0	0.0
Fish and other seafood, g/d[3]	56.1	73.9	58.6	74.6	60.4
Egg, g/d[3]	22.8	22.8	23.8	22.8	24.5
Potatoes, rice and pasta, g/d[3]	68.7	68.7	71.8	68.7	74.0
Bread and cereals, g/d[3]	160.6	160.6	167.8	160.6	172.9
Fat spread (on bread), g/d[3]	19.8	19.8	20.7	19.8	21.3
Fat used in cooking, g/d[3]	10.4	10.4	10.9	10.4	11.2
Fruit and berries (excl. juice), g/d[3]	169.0	169.0	176.6	169.0	181.9
Juice, g/d[3]	100.0	100.0	104.5	100.0	107.7
Vegetables, g/d[3]	155.1	155.1	162.1	155.1	167.0
Milk and milk products, g/d[3]	261.6	261.6	273.4	261.6	281.6
Cheese, g/d[3]	42.0	42.0	43.9	42.0	45.2
Beverages, g/d[3]	2,132.3	2,132.3	2,228.2	2,132.3	2,295.4
Water, tea and coffee, g/d[3]	1,841.9	1,841.9	1,924.7	1,841.9	1,982.8
Soda and fruit nectar, g/d[3]	201.5	201.5	210.6	201.5	216.9
Alcohol, beer and vine, g/d[3]	88.9	88.9	92.9	88.9	95.7
Snacks, sweets, ice cream, g/d[3]	83.3	83.3	87.0	83.3	89.7
Other, g/d[3]	91.6	91.6	95.7	91.6	98.6

[1] Cooked meat and minced meat, calculated 20% weight loss from raw meat

[2] Prepared processed meat products, not weight loss calculated

[3] Measured in raw weight

Table A23. Macronutrient intake 18 to 70 year-old women in Norway, n=925

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Protein, E%	17.2	18.0	16.7	18.0	16.7
Fat, E%	34.7	33.5	33.3	33.4	33.3
Saturated fat, E%	13.5	12.8	12.9	12.8	12.9
Monounsaturated fat, E%	11.6	11.0	10.9	11.0	10.9
Polyunsaturated fat, E%	6.2	6.3	6.2	6.3	6.2
Carbohydrate, E%	45.8	46.2	47.6	46.3	47.6
Added sugar, E%	7.7	7.8	8.0	7.8	8.0
Dietary fibre, g/MJ[1]	2.77	2.79	2.88	2.79	2.88
Alcohol, E%	2.3	2.3	2.4	2.3	2.4

[1] Dietary fibre is included in the total carbohydrate (E%).

Table A24. Micronutrient intake 18 to 70 year-old women in Norway, n=925

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Energy intake, MJ	7.99	7.90	7.99	7.90	7.99
Dietary fibre, g	22.1	22.0	23.0	22.0	23.0
Vitamin A, RE	769	652	672	652	672
Vitamin D, µg	4.88	5.52	5.09	5.54	5.09
Vitamin E, α-TE	10.01	10.35	10.31	10.36	10.31
Thiamine, mg	1.37	1.33	1.33	1.33	1.33
Riboflavin, mg	1.58	1.55	1.55	1.55	1.55
Niacin, NE	-	-	-	-	-
Vitamin B6, mg	1.49	1.61	1.48	1.62	1.48
Folate, µg	230	228	233	228	233
Vitamin B12, µg	6.00	6.15	5.50	6.16	5.50
Vitamin C, mg	109	109	114	109	113.90
Calcium, mg	810	810	838	810	838
Phosphorus, mg	-	-	-	-	-
Magnesium, mg	346	351	354	351	354
Iron, mg	9.90	9.35	9.57	9.33	9.57
Zinc, mg	-	-	-	-	-
Copper, mg	-	-	-	-	-
Iodine (µg)	-	-	-	-	-
Selenium, µg	-	-	-	-	-
Potassium, g	3.37	3.42	3.42	3.42	3.42

10.3.2 Men

Table A25. Food intake in major food groups in 18 to 70 year-old men in Norway, n=862

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Meat, total, g/d	156.1	126.0	95.8	112.5	68.8
Red meat, g/d[1]	72.2	70.0	70.0	43.0	43.0
White meat, g/d[1]	25.8	56.0	25.8	69.5	25.8
Processed meat, g/d[2]	58.1	0.0	0.0	0.0	0.0
Fish and other seafood, g/d[3]	79.4	109.5	86.5	123.0	116.2
Egg, g/d[3]	27.5	27.5	30.0	27.5	40.2
Potatoes, rice and pasta, g/d[3]	105.3	105.3	114.7	105.3	154.1
Bread and cereals, g/d[3]	250.5	250.5	272.9	250.5	366.6
Fat spread (on bread), g/d[3]	33.3	33.3	36.3	33.3	48.7
Fat used in cooking, g/d[3]	12.9	12.9	14.1	12.9	18.9
Fruit and berries (excl. juice), g/d[3]	144.3	144.3	157.2	144.3	211.2
Juice, g/d[3]	113.6	113.6	123.7	113.6	166.2
Vegetables, g/d[3]	154.3	154.3	168.1	154.3	225.8
Milk and milk products, g/d[3]	397.9	397.9	433.4	397.9	582.3
Cheese, g/d[3]	46.0	46.0	50.1	46.0	67.3
Beverages, g/d[3]	2,143.6	2,143.6	2,335.0	2,143.6	3,137.1
Water, tea and coffee, g/d[3]	1,672.1	1,672.1	1,821.4	1,672.1	2,447.1
Soda and fruit nectar, g/d[3]	282.0	282.0	307.2	282.0	412.7
Alcohol, beer and vine, g/d[3]	189.5	189.5	206.4	189.5	277.3
Snacks, sweets, ice cream, g/d[3]	90.0	90.0	98.0	90.0	131.7
Other, g/d[3]	102.7	102.7	111.9	102.7	150.3

[1] Cooked meat and minced meat, calculated 20% weight loss from raw meat

[2] Prepared processed meat products, not weight loss calculated

[3] Measured in raw weight

Table A26. Macronutrient intake 18 to 70 year-old men in Norway, n=862

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Protein, E%	17.4	18.4	16.8	18.5	16.8
Fat, E%	34.5	32.9	32.6	32.4	32.6
Saturated fat, E%	13.3	12.5	12.6	12.2	12.6
Monounsaturated fat, E%	11.6	10.8	10.6	10.5	10.6
Polyunsaturated fat, E%	6.3	6.4	6.3	6.5	6.3
Carbohydrate, E%	45.4	46.0	47.7	46.3	47.7
Added sugar, E%	7.5	7.7	8.0	7.8	8.0
Dietary fibre, g/MJ[1]	2.42	2.46	2.56	2.48	2.56
Alcohol, E%	2.7	2.7	2.8	2.8	2.8

[1] Dietary fibre is included in the total carbohydrate (E%).

Table A27. Micronutrient intake 18 to 70 year-old men in Norway, n=862

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Energy intake, MJ	10.89	10.72	10.89	10.64	10.89
Dietary fibre, g	26.4	26.4	27.9	26.4	27.9
Vitamin A, RE	1011	804	836	808	836
Vitamin D, µg	6.69	7.67	7.07	8.10	7.07
Vitamin E, α-TE	12.19	12.74	12.66	12.97	12.66
Thiamine, mg	1.85	1.80	1.79	1.76	1.79
Riboflavin, mg	2.13	2.10	2.10	2.10	2.10
Niacin, NE	-	-	-	-	-
Vitamin B_6, mg	1.93	2.12	1.91	2.18	1.91
Folate, µg	279	276	283	278	283
Vitamin B_{12}, µg	8.90	8.84	7.86	9.00	7.86
Vitamin C, mg	104	104	110	104	110.17
Calcium, mg	1038	1035	1084	1035	1084
Phosphorus, mg	-	-	-	-	-
Magnesium, mg	439	448	454	449	454
Iron, mg	12.60	11.80	12.08	11.40	12.08
Zinc, mg	-	-	-	-	-
Copper, mg	-	-	-	-	-
Iodine (µg)	-	-	-	-	-
Selenium, µg	-	-	-	-	-
Potassium, g	4.24	4.31	4.32	4.31	4.32

10.3.3 Children

Table A28. Food intake in major food groups in 9 year-old children in Norway, n=810

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Meat, total, g/d	84.5	65.0	45.5	-	-
Red meat, g/d[1]	38.4	38.4	38.4	-	-
White meat, g/d[1]	7.1	26.6	7.1	-	-
Processed meat, g/d[2]	39.0	0.0	0.0	-	-
Fish and other seafood, g/d[3]	26.6	46.1	28.1	-	-
Egg, g/d[3]	9.7	9.7	10.2	-	-
Potatoes, rice and pasta, g/d[3]	60.6	60.6	63.9	-	-
Bread and cereals, g/d[3]	145.5	145.5	153.5	-	-
Fat spread (on bread), g/d[3]	18.9	18.9	19.9	-	-
Fat used in cooking, g/d[3]	1.6	1.6	1.7	-	-
Fruit and berries (excl. juice), g/d[3]	78.7	78.7	83.0	-	-
Juice, g/d[3]	68.6	68.6	72.4	-	-
Vegetables, g/d[3]	65.7	65.7	69.3	-	-
Milk and milk products, g/d[3]	422.4	422.4	445.6	-	-
Cheese, g/d[3]	20.2	20.2	21.3	-	-
Beverages, g/d[3]	587.8	587.8	620.1	-	-
Water, tea and coffee, g/d[3]	209.7	209.7	221.2	-	-
Soda and fruit nectar, g/d[3]	378.1	378.1	398.9	-	-
Alcohol, beer and vine, g/d[3]	0.1	0.1	0.1	-	-
Snacks, sweets, ice cream, g/d[3]	118.1	118.1	124.6	-	-
Other, g/d[3]	120.0	120.0	126.6	-	-

[1] Cooked meat and minced meat, calculated 20% weight loss from raw meat

[2] Prepared processed meat products, not weight loss calculated

[3] Measured in raw weight

Table A29. Macronutrient intake 9 year-old children in Norway, n=810

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Protein, E%	14.1	15.1	13.6	-	-
Fat, E%	31.4	29.8	29.4	-	-
Saturated fat, E%	13.7	12.9	12.9	-	-
Monounsaturated fat, E%	9.8	9.0	8.7	-	-
Polyunsaturated fat, E%	5.7	5.8	5.7	-	-
Carbohydrate, E%	54.5	55.1	57.0	-	-
Added sugar, E%	16.5	16.8	17.4	-	-
Dietary fibre, g/MJ[1]	1.79	1.82	1.89	-	-
Alcohol, E%	0.0	0.0	0.0	-	-

[1] Dietary fibre is included in the total carbohydrate (E%).

Table A30. Micronutrient intake 9 year-old children in Norway, n=810

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Energy intake, MJ	8.25	8.13	8.26	-	-
Dietary fibre, g	14.8	14.8	15.6	-	-
Vitamin A, RE	817	609	631	-	-
Vitamin D, μg	2.80	3.26	2.95	-	-
Vitamin E, α-TE	6.07	6.27	6.30	-	-
Thiamine, mg	1.10	1.07	1.08	-	-
Riboflavin, mg	1.44	1.39	1.41	-	-
Niacin, NE	-	-	-	-	-
Vitamin B_6, mg	-	-	-	-	-
Folate, μg	155	152	155	-	-
Vitamin B_{12}, μg	-	-	-	-	-
Vitamin C, mg	84	84	89	-	-
Calcium, mg	833	830	867	-	-
Phosphorus, mg	-	-	-	-	-
Magnesium, mg	237	241	242	-	-
Iron, mg	8.80	8.35	8.38	-	-
Zinc, mg	-	-	-	-	-
Copper, mg	-	-	-	-	-
Iodine (μg)	-	-	-	-	-
Selenium, μg	-	-	-	-	-
Potassium, g	-	-	-	-	-

10.3.4 Adolescents

Table A31. Food intake in major food groups in 13 year-old adolescents in Norway, n=1005

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Meat, total, g/d	94.7	76.6	58.5	72.6	50.5
Red meat, g/d[1]	51.0	51.0	51.0	43.0	43.0
White meat, g/d[1]	7.5	25.6	7.5	29.6	7.5
Processed meat, g/d[2]	36.2	0.0	0.0	0.0	0.0
Fish and other seafood, g/d[3]	24.3	42.4	25.4	46.4	29.2
Egg, g/d[3]	8.8	8.8	9.2	8.8	10.6
Potatoes, rice and pasta, g/d[3]	67.2	67.2	70.2	67.2	80.7
Bread and cereals, g/d[3]	145.8	145.8	152.4	145.8	175.1
Fat spread (on bread), g/d[3]	15.1	15.1	15.8	15.1	18.1
Fat used in cooking, g/d[3]	2.9	2.9	3.0	2.9	3.5
Fruit and berries (excl. juice), g/d[3]	58.2	58.2	60.8	58.2	69.9
Juice, g/d[3]	86.4	86.4	90.3	86.4	103.8
Vegetables, g/d[3]	69.5	69.5	72.6	69.5	83.5
Milk and milk products, g/d[3]	369.9	369.9	386.6	369.9	444.3
Cheese, g/d[3]	24.1	24.1	25.2	24.1	29.0
Beverages, g/d[3]	771.8	771.8	806.6	771.8	927.1
Water, tea and coffee, g/d[3]	270.8	270.8	283.0	270.8	325.3
Soda and fruit nectar, g/d[3]	500.6	500.6	523.2	500.6	601.4
Alcohol, beer and vine, g/d[3]	0.4	0.4	0.4	0.4	0.5
Snacks, sweets, ice cream, g/d[3]	134.1	134.1	140.1	134.1	161.1
Other, g/d[3]	134.3	134.3	140.4	134.3	161.3

[1] Cooked meat and minced meat, calculated 20% weight loss from raw meat

[2] Prepared processed meat products, not weight loss calculated

[3] Measured in raw weight

Table A32. Macronutrient intake 13 year-old adolescents in Norway, n=1005

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Protein, E%	14.2	15.1	13.8	15.1	13.8
Fat, E%	30.6	29.4	29.0	29.3	29.0
Saturated fat, E%	13.5	12.8	12.9	12.7	12.9
Monounsaturated fat, E%	9.7	9.1	8.8	9.1	8.8
Polyunsaturated fat, E%	5.3	5.3	5.2	5.3	5.2
Carbohydrate, E%	55.2	55.5	57.3	55.6	57.3
Added sugar, E%	18.3	18.5	19.1	18.5	19.1
Dietary fibre, g/MJ[1]	1.67	1.69	1.74	1.69	1.74
Alcohol, E%	0.0	0.0	0.0	0.0	0.0

[1] Dietary fibre is included in the total carbohydrate (E%).

Table A33. Micronutrient intake 13 year-old adolescents in Norway, n=1005

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Energy intake, MJ	8.86	8.77	8.87	8.76	8.87
Dietary fibre, g	14.8	14.8	15.4	14.8	15.4
Vitamin A, RE	774	574	590	576	590
Vitamin D, µg	2.53	3.00	2.64	3.10	2.64
Vitamin E, α-TE	6.87	7.08	7.09	7.11	7.09
Thiamine, mg	1.13	1.10	1.10	1.09	1.10
Riboflavin, mg	1.42	1.38	1.38	1.37	1.38
Niacin, NE	-	-	-	-	-
Vitamin B_6, mg	-	-	-	-	-
Folate, µg	162	160	163	161	163
Vitamin B_{12}, µg	-	-	-	-	-
Vitamin C, mg	89	89	93	89	93.01
Calcium, mg	858	856	885	857	885
Phosphorus, mg	-	-	-	-	-
Magnesium, mg	247	251	251	251	251
Iron, mg	9.40	9.12	9.14	9.00	9.14
Zinc, mg	-	-	-	-	-
Copper, mg	-	-	-	-	-
Iodine (µg)	-	-	-	-	-
Selenium, µg	-	-	-	-	-
Potassium, g	-	-	-	-	-

10.4 Sweden

10.4.1 Women

Table A34. Food intake in major food groups in 18 to 75 year-old women in Sweden, n=982

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Meat, total, g/d	88.7	77.1	65.5	75.5	60.4
Red meat, g/d	45.3	45.3	45.3	42	42
White meat, g/d	20.2	31.8	20.2	33.5	20.2
Processed meat, g/d	23.2	0	0	0	0
Fish, g/d	43.3	54.9	44.1	56.6	44.2
Egg, g/d	21.3	21.3	21.6	21.3	21.7
Potatoes, rice and pasta, g/d	140	140	143	140	143
Bread and cereals, g/d	122	122	124	122	125
Fat spread (on bread), g/d	9.7	9.7	9.8	9.7	9.9
Fat used in cooking, g/d	-	-	-	-	-
Fruit (excl. juice), g/d	138	138	140	138	140
Juice, g/d	53	53	54	53	54
Vegetables, g/d	138	138	140	138	141
Milk and milk products, g/d	249	249	253	249	254
Cheese, g/d	25.7	25.7	26.1	25.7	26.2
Beverages, g/d	1,310	1,310	1,331	1,310	1,337
Water, tea and coffee, g/d	1,115	1,115	1,134	1,115	1,138
Soda and fruit nectar, g/d	97	97	98	97	99
Alcohol, beer and vine, g/d	98	98	99	98	100
Savoury, sweets, ice cream, g/d	84	84	85	84	85
Other, g/d	128	128	130	128	131

Table A35. Macronutrient intake in 18 to 75 year-old women in Sweden, n=982

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Protein, E%	16.8	16.7	16.1	16.7	16.0
Fat, E%	34.4	34.2	33.9	34.2	33.7
Saturated fat, E%	13.1	12.9	12.9	12.9	12.8
Monounsaturated fat, E%	12.9	12.8	12.6	12.7	12.5
Polyunsaturated fat, E%	5.7	5.8	5.7	5.8	5.7
Carbohydrate, E%	46.0	46.0	47.1	46.0	47.1
Added sugar, E%[1]	8.2	8.2	8.4	8.2	8.4
Dietary fibre, g/MJ[2]	2.6	2.6	2.6	2.6	2.6
Alcohol, E%	2.8	2.8	2.9	2.8	2.9

[1] Sucrose.

[2] Dietary fibre is included in the total carbohydrate (E%).

Table A36. Micronutrient intake in 18 to 75 year-old women in Sweden, n=982

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Energy intake, MJ	7.4	7.4	7.4	7.4	7.4
Dietary fibre, g	18.8	18.9	19.2	19	19.2
Vitamin A, RE	824	802	794	799	786
Vitamin D, µg	6.4	7.1	6.4	7.2	6.4
Vitamin E, α-TE	11.6	11.7	11.7	11.7	11.7
Thiamine, mg	1.1	1.1	1.09	1.1	1.08
Riboflavin, mg	1.4	1.4	1.39	1.38	1.38
Niacin, NE	31.3	31	29.7	30.9	29.4
Vitamin B_6, mg	1.83	1.83	1.79	1.84	1.78
Folate, µg	253	252	256	252	255
Vitamin B_{12}, µg	5	5.3	4.8	5.3	4.8
Vitamin C, mg	95.7	95.5	98.0	95.5	98.0
Calcium, mg	818	820	837	820	836
Phosphorus, mg	1,241	1,241	1,230	1,241	1,223
Magnesium, mg	305	306	308	306	307
Iron, mg	9.5	9.4	9.3	9.4	9.2
Zinc, mg	9.5	9.3	9.1	9.2	9.0
Copper, mg	-	-	-	-	-
Iodine (µg)	-	-	-	-	-
Selenium, µg	41.7	43.5	40.8	43.8	40.5
Potassium, g	2885	2883	2890	2883	2878

10.4.2   Men

Table A37. Food intake in major food groups in 18 to 75 year-old men in Sweden, n=762

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Meat, total, g/d	136.9	115.2	93.4	101	65.4
Red meat, g/d	73.5	70	70	42	42
White meat, g/d	23.4	45.2	23.4	59,2	23.4
Processed meat, g/d	40	0	0	0	0
Fish, g/d	50.6	72.4	51.6	86,4	52.2
Egg, g/d	19	19	19	19	20
Potatoes, rice and pasta, g/d	232	232	236	232	239
Bread and cereals, g/d	158	158	161	158	163
Fat spread (on bread), g/d	13	13	13	13	13.5
Fat used in cooking, g/d	-	-	-	-	-
Fruit (excl. juice), g/d	97	97	99	97	100
Juice, g/d	65	65	66	65	67
Vegetables, g/d	113	113	115	113	116
Milk and milk products, g/d	289	289	295	289	298
Cheese, g/d	25.3	25.3	25.8	25.3	26.1
Beverages, g/d	1,312	1,312	1,338	1,312	1,355
Water, tea and coffee, g/d	958	958	977	958	989
Soda and fruit nectar, g/d	135	135	138	135	140
Alcohol, beer and vine, g/d	219	219	223	219	226
Savoury, sweets, ice cream, g/d	85	85	87	85	88
Other, g/d	169	169	172	169	175

Table A38. Macronutrient intake in 18 to 75 year-old men in Sweden, n=762

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Protein, E%	17.0	17.0	16.1	16.9	15.5
Fat, E%	33.9	33.6	32.9	33.3	32.2
Saturated fat, E%	13	12.7	12.6	12.5	12.4
Monounsaturated fat, E%	12.7	12.6	12.2	12.4	11.8
Polyunsaturated fat, E%	5.4	5.6	5.4	5.6	5.4
Carbohydrate, E%	45.2	45.2	46.6	45.8	47.7
Added sugar, E%[1]	7.2	7.2	7.4	7.2	7.6
Dietary fibre, g/MJ[2]	2.3	2.4	2.3	2.4	2.4
Alcohol, E%	3.9	3.9	4.1	3.9	4.2

[1] Sucrose.

[2] Dietary fibre is included in the total carbohydrate (E%).

Table A39. Micronutrient intake in 18 to 75 year-old men in Sweden, n=762

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Energy intake, MJ	9.4	9.4	9.4	9.3	9.4
Dietary fibre, g	21.3	21.7	21.9	21.9	22.4
Vitamin A, RE	806	793	792	785	784
Vitamin D, µg	7.6	8.9	7.6	9.7	7.6
Vitamin E, α-TE	13.2	13.4	13.3	13.5	13.5
Thiamine, mg	1.4	1.4	1.3	1.4	1.3
Riboflavin, mg	1.69	1.67	1.66	1.66	1.65
Niacin, NE	40.9	40.4	38.2	40.1	36.5
Vitamin B_6, mg	2.3	2.3	2.3	2.3	2.2
Folate, µg	266	266	271	267	275
Vitamin B_{12}, µg	6	6.6	5.8	6.9	5.6
Vitamin C, mg	92.7	92.6	95.7	92.5	98.0
Calcium, mg	944	948	971	950	992
Phosphorus, mg	1,543	1,545	1,518	1,546	1,505
Magnesium, mg	365	366	368	366	371
Iron, mg	11.5	11.3	11.1	11.1	10.8
Zinc, mg	12.4	11.9	11.5	11.6	11.0
Copper, mg	-	-	-	-	-
Iodine (µg)	-	-	-	-	-
Selenium, µg	50.4	53.9	48.7	56.2	47.7
Potassium, g	3413	3412	3401	3410	3402

10.4.3   Children

Table A40. Food intake in major food groups in 4 year olds and 2nd graders (age 8) in Sweden, n=1479

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Meat, total, g/d	122.6	104	85.5	90	57.5
Red meat, g/d	79.4	70	70	42	42
White meat, g/d	15.5	34	15.5	48	15.5
Processed meat, g/d	27.8	0	0	0	0
Fish, g/d	18.3	36.9	18.7	50.9	18.9
Egg, g/d	5.7	5.7	5.8	5.7	5.9
Potatoes, rice and pasta, g/d	175	175	178	175	181
Bread and cereals, g/d	129	129	131	129	133
Fat spread (on bread), g/d	12.8	12.8	13.0	12.8	13.2
Fat used in cooking, g/d	-	-	-	-	-
Fruit (excl. juice), g/d	108	108	110	108	111
Juice, g/d	68	68	69	68	70
Vegetables, g/d	61	61	62	61	63
Milk and milk products, g/d	453	453	462	453	468
Cheese, g/d	9.4	9.4	9.6	9.4	9.7
Beverages, g/d	384.2	384.2	391.3	384.2	396.3
Water, tea and coffee, g/d	155	155	158	155	160
Soda and fruit nectar, g/d	227	227	231	227	234
Alcohol, beer and vine, g/d	2.2	2.2	2.3	2.2	2.3
Savoury, sweets, ice cream, g/d	115	115	118	115	119
Other, g/d	100	100	107	100	114

Table A41. Macronutrient intake 4 year olds and 2nd graders (age 8) in Sweden, n=1479

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Protein, E%	15	14.8	15.3	14.7	15.5
Fat, E%	31.6	31.1	32.1	30.9	32.6
Saturated fat, E%	14.3	14	14.6	13.8	14.8
Monounsaturated fat, E%	11.4	11.1	11.6	11.0	11.7
Polyunsaturated fat, E%	3.7	3.8	3.7	3.9	3.8
Carbohydrate, E%	53.4	53.5	54.4	53.5	55.2
Added sugar, E%[1]	13.0	13.1	13.3	13.1	13.5
Dietary fibre, g/MJ[2]	1.8	1.8	1.8	1.8	1.8
Alcohol, E%	0.008	0.008	0.008	0.008	0,008

1 Sucrose.

2 Dietary fibre is included in the total carbohydrate (E%).

Table A42. Micronutrient intake 4 year olds and 2nd graders (age 8) in Sweden, n=1479

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Energy intake, MJ	7.1	7.0	7.1	7.0	7.1
Dietary fibre, g	12.6	12.5	12.8	12.4	13.0
Vitamin A, RE	733	708	747	689	757
Vitamin D, µg	4.4	5.2	4.5	5.8	4.5
Vitamin E, α-TE	6.0	6.2	6.2	6.3	6.3
Thiamine, mg	1.14	1.14	1.15	1.10	1.18
Riboflavin, mg	1.5	1.5	1.6	1.5	1.6
Niacin, NE	24	23	24	22	24
Vitamin B$_6$, mg	1.5	1.5	1.5	1.5	1.5
Folate, µg	176	174	179	173	181
Vitamin B$_{12}$, µg	4.4	4.8	4.5	5.0	5.6
Vitamin C, mg	76	75	77	75	78
Calcium, mg	912	913	929	913	942
Phosphorus, mg	1,138	1,130	1,160	1,124	1,176
Magnesium, mg	231	230	236	229	239
Iron, mg	8.3	8.0	8.4	7.9	8.6
Zinc, mg	8.7	8.3	8.9	8.0	9.0
Copper, mg	-	-	-	-	-
Iodine (µg)	-	-	-	-	-
Selenium, µg	28.3	30.1	28.9	31.5	29.2
Potassium, g	2574	2555	2623	2540	2660

10.4.4   Adolescents

Table A43. Food intake in major food groups in adolescents (5th graders, age 11) in Sweden, n=1016

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Meat, total, g/d	135,3	110.9	86.5	96.9	58.5
Red meat, g/d	89	70	70	42	42
White meat, g/d	16.5	40.9	16.5	54.9	16.5
Processed meat, g/d	29.8	0	0	0	0
Fish, g/d	18.5	42.9	18.9	56.9	19.1
Egg, g/d	4.5	4.5	4.6	4.5	4.7
Potatoes, rice and pasta, g/d	200	200	205	200	208
Bread and cereals, g/d	103	103	106	103	107
Fat spread (on bread), g/d	12	12	12	12	12
Fat used in cooking, g/d	-	-	-	-	-
Fruit (excl. juice), g/d	68	68	69	68	70
Juice, g/d	77	77	78	77	79
Vegetables, g/d	53	53	54	53	55
Milk and milk products, g/d	423	423	432	423	438
Cheese, g/d	11.2	11.2	11.4	11.2	11.6
Beverages, g/d	456.7	456.7	466.7	456.7	472.8
Water, tea and coffee, g/d	208	208	212	208	215
Soda and fruit nectar, g/d	244	244	250	244	253
Alcohol, beer and vine, g/d	4.7	4.7	4.7	4.7	4.8
Savoury, sweets, ice cream, g/d	102.2	102.2	104.6	102.2	105.6
Other, g/d	112	112	127	112	135

Table A44. Macronutrient intake in adolescents (5th graders, age 11) in Sweden, n=1016

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Protein, E%	15.7	15.6	16	15.2	16.2
Fat, E%	31.5	31.4	32.3	30.7	32.7
Saturated fat, E%	14.0	13.9	14.4	13.5	14.6
Monounsaturated fat, E%	11.5	11.4	11.8	11.0	12.0
Polyunsaturated fat, E%	3.7	3.9	3.8	4.0	3.9
Carbohydrate, E%	52.8	52.9	54.0	52.8	54.7
Added sugar, E%[1]	12.3	12.3	12.6	12.4	12.7
Dietary fibre, g/MJ[2]	1.8	1.7	1.8	1.8	1.8
Alcohol, E%	0.02	0.02	0.02	0.02	0.02

[1] Sucrose.

[2] Dietary fibre is included in the total carbohydrate (E%).

Table A45. Micronutrient intake in adolescents (5th graders, age 11) in Sweden, n=1016

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Energy intake, MJ	7.4	7.3	7.4	7.3	7.4
Dietary fibre, g	12.6	12.6	12.9	12.5	13.0
Vitamin A, RE	632	610	646	580	654
Vitamin D, µg	4.1	5.2	4.2	5.7	4.2
Vitamin E, α-TE	5.8	5.7	5.9	6.0	6.0
Thiamine, mg	1.2	1.2	1.2	1.1	1.2
Riboflavin, mg	1.5	1.5	1.5	1.5	1.6
Niacin, NE	26	25	26	24	27
Vitamin B_6, mg	1.5	1.6	1.6	1.5	1.6
Folate, µg	174	174	178	172	181
Vitamin B_{12}, µg	4.4	4.8	4.4	5.0	4.5
Vitamin C, mg	63	63	65	63	65
Calcium, mg	874	876	894	876	905
Phosphorus, mg	1,169	1,172	1,196	1,153	1,210
Magnesium, mg	239	239	244	237	247
Iron, mg	8.3	8.1	8.5	7.8	8.6
Zinc, mg	9.5	9.2	9.7	8.6	9.8
Copper, mg	-	-	-	-	-
Iodine (µg)	-	-	-	-	-
Selenium, µg	29.7	32.6	30.4	33.3	30.7
Potassium, g	2,603	2,600	2,662	2,564	2,695

norden

Nordic Council of Ministers

Nutritional evaluation of lowering consumption of meat and meat products in the Nordic context

The World Cancer Research Fund (WCRF) recommended in 2007 that consumer intake of red meat is minimized and processed meat eliminated. The recommendation was based on a systematic review of the available literature on the association between meat consumption and cancer. The recommendation to individuals was to ingest less than 500 grams of red meat per weeks, and very little - if anything - processed meats. In a new study, National Food Institute has assessed the nutritional consequences from living the recommendations of the WCRF, in Norway, Sweden, Finland and Denmark. The current consumption of meat in the Nordic countries is not far from the level WCRF has proposed on an individual level. The study also shows that it will have no significant nutritional consequences to reduce the intake of meat to the recommended, neither when it comes to red meat nor processed meat.

9 789289 324656