

- useful in the challenge to combat obesity and poor nutrition?



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## **Economic nutrition policy tools**

*- useful in the challenge to combat obesity and poor nutrition?*

ATV's object is to promote technological research and development and the application of research results for the benefit of Danish society and its trade and industry.

### **Economic nutrition policy tools**

*- useful in the challenge to combat obesity and poor nutrition?*

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# Preface

As is the case in large parts of the world, the Danish population is affected by an increase in the occurrence of overweight and obesity in all age groups. At the same time, many people are suffering from nutrition-related diseases such as e.g. cardiovascular diseases, some cancers, and type 2 diabetes. This has both human costs as well as huge economic consequences for society. This problem is anticipated to grow to such an extent that it will be necessary to consider the use of new measures to deal with a further increase.

This discussion paper is the Academy's contribution to the debate about whether and how economic measures can be used as part of the effort to promote healthy nutrition habits. Although the primary focus is on economic tools, the authors viewed these measures in relation to and with interaction of other nutrition policy tools.

This discussion paper presents a description of the present situation, and the authors point to the need for more in-depth understanding and further investigations before the implementation of economic tools.

The paper discusses:

- the extent of the nutrition problem,
- the desired extent of dietary changes and the population groups to which they should apply,
- which food products could be characterized as “healthy” and which could be characterized as “unhealthy”,
- to what extent the job of the government is to control the consumption of food products,
- which consequences the introduction of e.g. taxes and subsidies will have concerning the dietary composition, and to what extent regulatory

economic measures can be used to stimulate dietary changes in vulnerable groups,

- the effectiveness of economic measures compared to other measures, and
- whether economic measures can interact with other nutrition policy measures.

The discussion paper is primarily focused on the comparison of the latest knowledge and research in nutrition and consumer behaviour with the knowledge of the effect of economic tools, as this has often been neglected in the Danish debate about e.g. VAT exemption for fruit and vegetable and taxes on “unhealthy” food products.

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## **Abstract and Conclusions**

Today, in almost all parts of society there is an increasing awareness that in Denmark, as well as in many other countries, we are experiencing an obesity epidemic where 2.2 million Danes are overweight and 350,000 may be characterized as obese. To this should be added a wide range of serious, nutrition-related diseases, such as cardiovascular diseases, some cancers, and type 2 diabetes. These nutrition-related conditions and diseases make up the largest total disease complex in Denmark. Hence, 64 percent of all deaths are either related to cardiovascular diseases or cancer, and it is estimated that one third of these deaths may be prevented or postponed by improving the population's diet. There are, however, large social differences in the prevalence of the nutrition-related conditions. The problem is particularly significant among groups with a low level of education and low social status – there is a difference of 10 years between the number of expected good years to live between the highest and lowest social groups.

Health care system expenditure on the treatment of nutrition-related diseases and conditions are estimated at several billion Danish crowns (DKK). Today, the direct costs for the treatment of obesity alone amounts to 2-3 percent of the total health budget, corresponding to between 2 and 3 billion DKK. Added to this is the indirect loss of production which, when converted, amounts to the double of this amount. Type 2 diabetes which may primarily be attributed to overweight and obesity is responsible for a further 8-10 percent of the expenses. Each year, approx. 3 billion DKK are spent on treatment and care related to heart and circulatory diseases. Hence, a lot of money could be saved by preventing these diseases.

The population's food habits, and hence dietary intake, have changed dramatically during the last 50 years. Since the 1950s the consumption of food products like potatoes and rye flour has decreased while the consumption of meat, cheese, white flour, and alcohol has increased considerably. The level of carbohydrates and dietary fibres in our food has decreased, and the level of fat has increased. The result of this is that our

diet generally speaking has become nutritionally poorer. During the last 50 years the dietary energy intake has, however, also decreased, but it has decreased less than the decrease in the energy requirement of the population due to a less physically demanding work and everyday life. The social stratification is also reflected in the dietary habits, most clearly with regard to the level of education: People with medium-long or long educations have healthier dietary habits than people with lower education, both in terms of the fat content of the diet and its fruit and vegetable content.

Studies show a growing health interest among the population, including for healthy eating. However, a lot of people are encountering various obstacles when trying to accomplish this, e.g. that it is too expensive or too troublesome. However, the development in actual eating habits shows that it is possible to change this situation. For example, from 1985 to 2000 the part of the population who refrained from using fats on their rye bread rose e.g. from 7 to 40 percent. In addition, the total intake of fat decreased by 3 percent in 3 years – solely by the introduction of mini milk (0.5 % fat content). This illustrates that there is a great potential for dietary changes when the population consider them relevant and practical.

A change in the diet of Danes, to make it more in line with the dietary guidelines, would have a significant effect on the health status. A small reduction in the fat content of the diet, an increased intake of fruit and vegetables together with a considerable reduction in the intake of sugars from sugar-sweetened beverages will reduce the average weight of normal-weight and overweight Danish people by at least 3 kg. A conservative estimate of the importance of this for the prevalence of obesity in Denmark is that the current prevalence among adults of 17-18 percent will fall to 10-12 percent, corresponding to a reduction of 40-50 percent in the prevalence.

The desired changes in the Danish diet are significant, but by no means unrealistic. If Danes were to eat entirely as prescribed by the official Danish dietary guidelines, the intake of fruit and vegetables should be increased by 40 percent. This seems like a lot due to the low reference point. Measured in absolute quantities, the dietary changes might not be that extensive – the intake of fruit and vegetables will e.g. be increased by 25 percent if the

average Danish person would eat only one apple (100 g) more a day, and this would reduce the risk of cardiovascular disease by 4-10 percent.

It is particularly the lowest social classes that are in need of an improved diet. Children are, furthermore, a particularly vulnerable group when it comes to sugar as their consumption on average is double that of the recommendations. The sugar mainly derives from sweet soft drinks and sweets.

The role of government in connection with the improvement of the population's diet is and always has been much debated. It has often been stated that government's involvement in its citizen's diet and eating habits should be limited, and that each individual should be left with a free choice of what to eat. Therefore, many people are of the opinion that government efforts in relation to nutrition policy should focus on information and education, i.e. equip the individual to make sound choices. More direct public regulatory measures, e.g. in the form of taxes and subsidies, are however used in many fields of society – e.g. in the environmental field where a wide range of “green” taxes and subsidy schemes for environmentally friendly energy production have been introduced.

The traditional nutrition policy measures typically include information, education, nutritional labelling, marketing regulation, taxes and subsidies, and actual prohibition of unhealthy ingredients/food, such as trans fatty acids. Taxes and subsidies have been used in nutrition policy in almost all countries for decades, however, primarily with the aim of fighting starvation and malnutrition by securing adequate food supplies for their populations. For example, basically all countries impose a lower rate of VAT on food products than on other products. Furthermore, there are large direct and indirect subsidies for food production in the EU. There are also many examples of the government subsidising and imposing taxes on particular food products and beverages, however, mostly for other reasons than nutritional. Today, there are e.g. very high and differentiated taxes on chocolate, sugary food products, mineral water, spirits, wine, beer, ice cream, coffee, and packaging of typically 15-35 percent. The government's proceeds from taxes on alcoholic beverages amount to approx. 4 billion DKK a year, while the taxes on chocolate, sugary food products, and mine-

ral water together amount to approx. 2 billion DKK.

The workgroup has drawn the following main conclusions from its work:

- **Government is responsible for securing societal prudent regulation in the field of nutrition – in line with the responsibility assumed by government in a wide range of other fields.** From a market economic point of view the price of a food product should include all costs related to its consumption – and hence be subject to a “polluter pays” principle. This applies to consumer as well as society-related costs and the effects hereof, including sickness absence, public health care cost, and welfare benefits, as well as lost tax revenues. This can be implemented by making “healthy” food products more accessible and “unhealthy” ones less accessible through the use of subsidies and taxes. Society can also make it easier for its citizens to choose “healthy” food by requiring nutrition labelling of food products or by e.g. limiting TV commercials for “unhealthy” food and beverages aimed at children.
- **It is possible to achieve significant positive health effects for both the individual and society as a whole through government use of economic tools/incentives.** The use of measures such as prohibition is relatively unproblematic when it involves the protection of the individual against harm inflicted by the actions of other people (passive smoking, drunk-driving). When it comes to the protection of the individual against self-inflicted harm, e.g. smoking, drinking, and unhealthy eating, the matter is more controversial. Government cannot prohibit people from doing it, however, case studies of government interventions in connection with alcohol, smoking, and traffic safety shows that government can introduce guidelines by using taxation, limiting of commercials, and providing information. In the field of tobacco this has led to rather drastic intervention measures concerning each individual’s choice of options. In the field of food and nutrition, Denmark takes on the role of the pioneer by being the first country in the world to legally ban the

sale of food with a significant content of industrially produced trans fats.

- **An efficient action plan for improving public nutrition requires the use of a broad range of inter-supportive measures.** Nutrition policy measures have one thing in common, which is that none of them – not even the economic measures – in themselves are sufficient to achieve the desired objective. Although information and education are considered important measures, the message is easily drowned out or opposed by the massive product marketing which is directed at consumers by means of commercial communication. And the message is difficult to get through to precisely the population groups who need it the most. Furthermore, the individual measures affect the various population groups differently; information campaigns are typically better received by people with a high level of education, while taxes will have the greatest effect on low income groups. Therefore, to believe that economic measures alone could solve the problems would be a mistake, but they may make a difference by complementing other nutrition policy tools.
- **Tax regulation is an obvious choice for individual food products with a high content of fat or sugar, which are in themselves not harmful, but can be harmful to health if overconsumed. Similarly, economic incentives, such as subsidies, are the obvious choice for increasing the consumption of e.g. fruit and vegetables.** In the theory of economic regulation the general principle is that intervention measures should be aimed directly at the desired effect. In principle, taxes should be applied directly to the quantity of fat and sugar in the food, and the food products we should eat more of should be subsidies (or be subject to a reduction in VAT).
- **The classification of food products as “healthy” and “unhealthy” form part of the official dietary guidelines and this constitutes a basis for the**

**development of economic nutritional tools.** The “healthy” food products are those that we are recommended to eat more of (rice and pasta, potatoes, fresh fruit, frozen and canned fruit and vegetables, fresh vegetables, fish products, and fish). The “unhealthy” ones are those that we should eat less of (biscuits and cakes, sugar and sugar products, margarine, butter, and high-fat meat and dairy products). From a health-related point of view the content of fat and sugar is the most important criterion for the classification which can be made according to the following methods—according to food product group, nutrient content, or a combination of these. The calculation of the three scenarios of this discussion paper is based on the classification of food products as “healthy” and “unhealthy” according to food product group.

- **Analysis of the three scenarios indicates that subsidies and taxes of 20 and 30 percent, respectively, will result in notable changes in the food consumption.** To illustrate the effect of the economic measures on the consumption of “healthy” and “unhealthy” food, respectively, in different social classes, this discussion paper includes calculations and analysis of three scenarios:

1. *Exemption of VAT on “healthy” food, corresponding to a price reduction of 20 percent.*

According to the calculations, this will stimulate the consumption of “healthy” food, but may also result in increased consumption of certain “unhealthy” food products, e.g. butter and other fats.

2. *An increase of 30 percent in taxes on “unhealthy” food.*

Increased taxes may result in reduced consumption of some “unhealthy” food products, but may also result in increased consumption of other “unhealthy” products due to substitution effects.



3. *Exemption of VAT on “healthy” food and an increase of 30 percent in taxes on “unhealthy” food.*

The effects of a combination of increased taxes on “unhealthy” food and exemption of VAT on “healthy” food correspond roughly to the total effects of the first two scenarios. In the calculation, this combination results in a stimulation of the consumption of “healthy” food which seems to be relatively stronger for the lower social classes than for the higher ones.

- **By using the above mentioned taxes/subsidies the changes in consumption will be of the same scale as the changes which today are considered desirable in relation to the population’s diet as indicated in the official Danish dietary guidelines.** The positive effect will be most significant in the lower social classes where the need for dietary improvement is greatest. Hence, the analysis supports the assumption that subsidies and taxes are efficient measures compared to other nutrition policy measures, and that they also affect food consumption in the lower social classes, as opposed to e.g. information campaigns. It would probably be possible to enhance the effect by using other concurrent measures.
- **Changed taxes – and, hence, changed food prices – is an efficient measure which will entail economic consequences for consumers and which may be socially lopsided.** VAT exemption on “healthy” food will result in an economic gain for consumers; however, higher taxes on “unhealthy” food will result in financial strain. The calculations show a tendency for the consumers in the lower social classes to end up with the greatest financial net strain and the smallest economic gain from tax redistributions. The health-related gains are on the other hand also greatest for the consumers in the lowest social classes who are generally eating less healthily than consumers in the higher social classes.

- **In the long term, an expedient regulation will result in socio-economic gains.** The government's tax proceeds will at first be reduced with almost 5 billion DKK if "healthy" food is exempt from VAT. An increase in taxes on "unhealthy" food will result in an increase in tax proceeds of approx. 1 billion DKK. A combination of VAT exemption on "healthy" food and higher taxes on "unhealthy" food will result in a reduction in tax proceeds of around 2 billion DKK. The economic consequences for the government will, however, be on the same scale as the reduction which the health care system may expect regarding the direct costs of nutrition-related diseases if the tax changes are implemented. Considering the indirect and longer term socio-economic consequences of a "laissez faire" policy, it is estimated that the socio-economic advantages of government regulation with the right incentives will result in significant socio-economic gains in the long term.
- **The introduction and administration of differentiated taxes on certain food products will presumably be administratively manageable.** Contrary to the current arguments against differentiated VAT on food products, this is believed to be a viable option and is confirmed by the fact that most European countries have differentiated VAT on food products and beverages.
- **Our choice in food and beverages greatly affects the environment.** A study shows that a healthy diet is better for the environment than Danish people's current common, average diet. As with green taxes on cars and car-driving, a possibility could be taxes on food reflecting the costs that society incurs in the health and environmental area. This would in itself result in "unhealthy" food becoming more expensive and "healthy" food becoming cheaper.
- **Increased physical activity and exercise is an important factor for the health of each individual.** Although this discussion paper focuses on food consumption, increased physical activity is also of great impor-

tance to the health status of the population. The promotion of physical exercise may therefore also be considered a social task. Information and government support for better cycle lanes, green-light waves for cyclists, better bathing facilities at work places, exercise rooms, sports equipment etc. are obvious choices as regulatory measures. The investigation of how physical activity may be best promoted in the population would be an obvious choice for an independent study.

- **If subsidies and taxes are to be put into practice, the resulting effect should be subjected to a further and more exhaustive investigation.** The analysis of the three scenarios has been carried out using already existing data material which has been collected for other purposes. Therefore, the calculations and the resulting analysis of this discussion paper are in some cases based on an approximation. The scenarios must therefore be considered only an illustration of the huge – and as yet unexploited – potential for the use of subsidies and taxes in nutrition policy.

# Recommendations

- **New measures should be applied to combat overweight and obesity as well as nutrition-related diseases such as cardiovascular diseases, type 2 diabetes (old age diabetes), and some cancers.** The traditional tools, such as information, education, labelling and fortification, have proven effective in combating malnutrition and nutrient-deficiency diseases. They have however not been sufficiently effective when it comes to the prevalence of overweight and obesity which is rising dramatically in many countries. This indicates a pressing demand for using new measures.
- **The use of taxes and subsidies on food products should be a serious part of the government's considerations regarding nutrition policy.** In the public debate the use of economic measures is often rejected with the argument that they would be without effect because food costs only make up a small part of today's income expenditure. The scenarios analysed in this report however illustrate that taxes on "unhealthy" and subsidies for "healthy" food products can improve public nutrition. The estimated consumption changes attained through realistic tax changes are of the same scale as the desired ones. Moreover, the scenarios indicate that the effect would be most significant in the lower income groups who are the hardest to influence with traditional measures; and they are at the same time the ones where the need for dietary improvement is greatest.
- **Economic tools should not be used on their own but complementary to other measures, such as information, education, and nutrition labelling.** Although the scenarios indicate that the economic measures on their own may have a significant effect on the consumption of food products, they should be used in combination with other measures. This will result in a synergy effect.

- **Before implementing economic tools, exact calculations of the scale and area of the tax changes should be carried out to e.g. secure that the tax changes will have the desired effects.** The three scenarios have been analysed using existing data which have been collected for other purposes. Furthermore, the tax models that have been used in the scenarios are relatively simplified. Calculations have therefore been carried out to illustrate the possible scale of the effects that changes in food taxes could have.

# 1. Background

Many people eat too much compared to their activity level and they are in particularly eating too much sugar and fat. Today, WHO (WHO, 2002) considers poor dietary and physical exercise patterns to be at least as important contributors to ill health and premature death as tobacco smoking. WHO has estimated that approx. 10-15 percent of lost years of living in Europe can be attributed to poor nutrition. Wrong nutrition contributes to the prevalence of a number of chronic diseases such as cardiovascular diseases (including high blood pressure), some cancers, old age diabetes (type 2 diabetes), and osteoporosis, as well as conditions such as overweight and obesity. Overweight and obesity are furthermore the cause of a number of physical conditions, such as e.g. osteoarthritis, and may also result in infertility as well as reduced quality of life for psycho-social reasons.

Nutrition-related diseases and conditions demand considerable resources in the health sector and at Danish hospitals.

To illustrate the extent of the problem, the following sections include a brief description of the development in the occurrence of overweight and obesity as well as the prevalence of the most common nutrition-related diseases.

## 1.1 Nutrition-related conditions - overweight and obesity

A more visible result of wrong nutrition is a dramatic rise in the occurrence of overweight and obesity. In Denmark, the number of overweight and obese people has grown with 75 percent in the last 13 years. Today, 2.2 million Danish people are overweight – corresponding to approx. 40 percent of adult Danes – of these, approx. 13-15 percent suffers from actual obesity (BMI > 30), corresponding to approx. 350,000 persons (Richelsen et al., 2003). The increase is particularly high among children and adoles-

cents. Hence, the occurrence of overweight and obesity among children and adolescents has tripled in the last 13 years. This increase seems to be continuing and if this development continues (see the box on page 22) in Denmark and other countries, WHO estimates that 60-70 percent of all Europeans will be overweight in 2030.

### **Definition of overweight and obesity**

Overweight is defined as  $\text{BMI} > 25 \text{ kg/m}^2$ , and heavy overweight = obesity as  $\text{BMI} > 30 \text{ kg/m}^2$ , where BMI signifies the Body Mass Index [ $\text{weight (kg)}/\text{height}^2 (\text{m}^2)$ ].

Today, the direct costs related to obesity make up 2-3 percent of the total health budget in Denmark (Møller Pedersen & Worre-Jensen, 2006). This corresponds to between 2 and 3 billion DKK. A Swedish report (Livsmedelsverket/Statens Folkhälsoinstitut, 2005) calculates current expenses for illnesses, which are directly related to overweight and obesity, to 3 billion SEK per year. Added to this are the indirect costs related to lost production of 12 billion SEK per year. If these figures are applied to Danish conditions it corresponds to direct expenses for illnesses of 1.8 billion DKK, while loss of production amounts to approx. 6.2 billion DKK (expenses for sickness benefits have not been included as they are considered as economic redistribution and not as a loss for society). With the continued rise in the occurrence, expenses in Sweden are expected to increase by 120 percent in the period from 2003-2030 (Institutet för Hälso- och sjukvårdsekonomi, 2004).

### **Development in overweight and obesity**

There might be a problem in obtaining reliable and representative figures regarding the occurrence of overweight, as heavy overweight people would often not wish to participate in population studies and phone interviews about health-related matters. Those who do accept participation have a tendency to overstate their height and understate their weight (Bendixen, 2003). Errors in the statements of height and weight mean that the body mass index, BMI, is underestimated and, hence, that part of the heavy overweight people are classified as overweight, and part of the overweight people are classified as being of normal weight. The figures from military drafting, which is obligatory for young draftees, and where height and weight are measured by the staff are therefore particularly valuable. The occurrence of obesity in Denmark regarding this group of young men gives a picture of the development in the last 60 years, where the occurrence of obesity has increased from approx. 0.1 percent in 1950 to a good 7 percent in 2004 (Astrup, Hill & Rössner, 2004). This 70 times increase justifies the use of the term *epidemic* and emphasises that, even though Denmark is 10-15 years behind the development in England and the USA, the increase ratio is approximately the same. The occurrence of overweight among adult Danes is estimated at 40 percent, of which 13-15 percent is made up of the actual obese.

Denmark seems to have the advantage that there are conditions in society which protect a part of the population from developing obesity. This opens up the possibility of strengthening these conditions as part of a preventive strategy.

The disturbing development in the occurrence of obesity is also registered in other European countries where it appears that only the figures for Holland are relatively low – i.e. about the same



as in Denmark. The increasing prevalence of obesity is also a global phenomenon. Even in the developing countries the problem is increasing and of significant importance to illnesses and mortality. E.g. in Morocco and South Africa, where the occurrence of obesity is higher than in Denmark, and in most African states malnutrition exists along side with obesity. The tendency is for the part of the population that is underweight to decrease and the number of obese people to be rising. Particularly type 2 diabetes has implications for the increase in the occurrence of cardiovascular disease and premature death, and in the developing countries type 2 diabetes is often a disabling illness which is not diagnosed until late in its progress where failing vision brings the person into contact with the health care system. Blindness disables and reduces the quality of life during the last years of living, and it is estimated that the mean duration of life for type 2 diabetics even in developed countries is shortened with 12-14 years (Narayan et al., 2003).

## **1.2 Nutrition-related diseases**

*Cardiovascular diseases* are frequently occurring in Denmark as, in 2000, 6.5 percent of the population – corresponding to 277,000 persons – stated to be suffering from such diseases. Cardiovascular diseases are also the most frequent cause of death being responsible for 36 percent of all deaths in 2000, corresponding to 20,500 deaths (Christensen et al., 2005).

The risk of cardiovascular disease is two times as high for obese people as for normal-weight people. The same increased risk is also seen for a range of other diseases as illustrated in table 1.1. Due to the increased disease risk, prevention of overweight and obesity is an essential element in the prevention of cardiovascular diseases as well as the prevention of type 2 diabetes and high blood pressure.

The high prevalence of cardiovascular diseases imply that a relatively small risk reduction in percentages will prevent a large number of cases. For example, it has been estimated that an increase in the intake of fruit and vegetables of a mere 100 g per day will reduce the risk with 4-10 percent, corresponding to 800-2,000 fewer cardiovascular-related deaths per year (Astrup et al., 2005). Similarly, it has been estimated that if the Danish people reduce their consumption of fat through their diet to the recommended level, the occurrence of cardiovascular diseases will be reduced with 15 percent, corresponding to 2,000 fewer cardiovascular-related deaths per year. Hence, there are significant reductions to be obtained, both when it comes to human lives and health care cost. More than 12 percent of all

Table 1.1 Increased disease risk for obese people compared to normal-weight people.  
The table shows how many times the risk of a range of diseases is increased for obese (BMI>30) compared to normal-weight people (BMI 18.5-25).

Disease/condition	Increase in Risk
Type 2 diabetes (Diabetes mellitus)	5 - 10
Cardiovascular diseases	2
Apoplexy (stroke)	2 - 3
High blood pressure	3 - 5
Gallstone	3 - 4
Osteoarthritis	2 - 3
Respiratory distress (incl. sleep apnoea)	3 - 4
Hormone and fertility disturbances (women)	2
Cancer	1,4

Source: Richelsen et al. "Den danske fedmeepidemi. Oplæg til en forebyggelsesindsats", Ernæringsrådet, 2003.

admissions are related to cardiovascular diseases. In 1999, e.g. 138,000 people were admitted with cardiovascular diseases. They were hospitalised for a total of approx. 1 million bed-days. Furthermore, approx. 2.7 million yearly GP consultations can be attributed to heart diseases. Each year, approx. 3 billion DKK are spent on treatment and care related to heart and circulatory diseases. To this should be added the costs of home nursing and care, among other things because of sequela, as well as costs related to notifications of illness, incapacity benefit and premature death.

The prevalence of heart diseases is socially imbalanced among the population. Hence, there is a significantly higher mortality rate due to ischaemic heart diseases among people with lower education.

*Cancer* is also very common. Approx. 230,000 Danes are diagnosed with cancer each year. In 2000, 16,000 people died from cancer. This corresponds to 28 percent of all deaths. Not all cancers are related to the diet, however, WHO has estimated that up to 30 percent of deaths from cancer can be prevented by improving the diet. It is difficult to estimate how high the economic costs attributed to cancers are. Approx. 550,000 yearly GP consultations are cancer related, either due to anxiety of having cancer or in connection with diagnosis and treatment.

*Type 2 diabetes* is popularly called old age diabetes as it is most common among the older age groups. As opposed to type 1 diabetes it does normally not require insulin treatment. Most symptoms can be reduced by a change of lifestyle, i.e. towards a better diet, more physical exercise and, if necessary, weight loss. At least 200,000 Danish people are registered as having type 2 diabetes, however most likely there are an equal number of diabetic people who have just not been diagnosed. The prevalence is rising sharply and is found among increasingly younger age groups. Age standardised mortality has increased from 16 out of 100,000 in 1985 to 26 out of 100,000 in 2001. Serious late complications, as e.g. amputations, apoplexy, heart embolus and blindness, reduce the quality of life for the individual and require a lot of resources from the health care system and social agencies. The yearly expenses for nursing and treatment of diabetes patients amount to approx. 13 billion DKK. Of these, approx. 10 percent are used for

medicine and approx. 10 percent for check-up/routine visits, while the remaining 80 percent of the expenses are attributed to nursing and treatment in connection with late complications. To this should be added expenses for home nursing, home care etc., and for sickness benefits, disability retirement etc. The prevalence of type 2 diabetes is as such socially imbalanced as the prevalence is approx. two times as high among people with lower education as among people with higher education. The treatment ratio for type 2 diabetes is 3-8 times higher for immigrants than for the population as a whole.

### **1.3 Vulnerable groups**

In Denmark, as in other western countries, the social differences both with regard to life expectancy and disease occurrence are well-documented. These differences are particularly related to the level of education, job position level (which is closely related to the level of education), and to country/city demographics.

Hence, the life expectancy for a 30 year old man with a higher education is in total 77.8 years, while it is four years shorter for a person of the same age with only 10 years of school attendance. Even more important is perhaps the difference in number of expected years to live in good health, where a man with higher education can expect to live a total of 69.3 years in good health, while a man with lower education only can expect to live 59.5 such years in good health, i.e. a difference of 9.8 good years to live. The same is true for women (Brønnum-Hansen et al., 2004). These social differences are more pronounced in Copenhagen than in the country side as a whole, as the average life expectancy for men in Copenhagen is four years shorter than for men in the country side as a whole, and the difference in good years to live between men with high as compared to lower education is 11.5 years (Brønnum-Hansen et al., 2005).

Mortality due to cardiovascular diseases furthermore shows large variation among skilled worker groups. The highest mortality is found among

unskilled workers, and the lowest among people with high education (Danmarks Statistik, 2001).

The prevalence of obesity is highest among population groups with shorter educations, the lowest incomes, and unskilled jobs. Hence, the prevalence is 3-4 times more common among people with few years of school than among people with higher education.

Furthermore, there are more overweight people in the country side than in the city. The prevalence of obesity is e.g. 30-60 percent higher in (the former) County of West Zealand and County of North Jytland than in (the former) County of Copenhagen and County of Aarhus (Richelsen et al., 2003).

A special aspect of the socially imbalance is ethnicity. Some ethnic groups have other health problems than the background population. Immigrants from e.g. Turkey, Pakistan and the Middle East have for example an increased treatment ratio with regard to diabetes, cardiovascular disease, respiratory diseases, and muscle and skeleton diseases. The treatment ratio for diabetes among 35-64 year old Pakistanis is 8 times higher than for ethnic Danish people of the same age group. Less people among the ethnic minorities exercise and more are overweight than among the background population. On the other hand, there are fewer people among ethnic minorities who are smoking and drink alcohol (Dansk Sygeplejeråd, 2006).

## **1.4 Nutrition-related problems can be remedied**

Based on the summing up of the previous sections, the conclusion must be that the nutrition-related conditions and diseases constitute a significant problem for the Danish population and for the health care system, and that the problem can be reduced considerably by improving their diet. Something similar is the case in other European countries. Approximately one third of all cardiovascular-related deaths could be prevented by improving the diet. It is furthermore estimated that one third of deaths from cancer could be

prevented by optimisation of lifestyle, including the diet. WHO estimates that low intake of fruit and vegetables alone may account for 3–4 percent of the total disease burden, among these 28 percent of the heart diseases (WHO, 2002; Livsmedelsverket/Statens Folkhälsoinstitut, 2005). Similarly, the Danmarks Fødevareforskning (Danish Institute for Food and Veterinary Research) has estimated that if the entire Danish population would adhere to the dietary guide-lines and eat more fruit and vegetables, the risk of cardiovascular diseases would be decreased by 10–20 percent. (Andersen et al., 2005). Ernæringsrådet (Danish Nutrition Council) has estimated that if the entire Danish population would adhere to the dietary guidelines and eat less saturated fat, approx. 20 percent of all deaths due to ischaemic heart diseases could be prevented (Osler et al., 2000).

A report from New Zealand's Ministry of Health and the University of Auckland, 2003) estimates that approx. 11,000 yearly deaths in New Zealand – or 40 percent of all deaths and 37 percent of lost years of living – can be attributed to poor nutrition and lack of physical exercise. Of the 11,000 deaths it is estimate that 8–9,000 can be attributed to poor nutrition, and the rest to lack of physical exercise. It is concluded that nutrition – together with tobacco smoking – are the most important causes of premature deaths which could be prevented. It is estimated that, with the existing measures, it is possible to change the population's intake of fruit and vegetables together with its BMI to an extent that will significantly effect the health situation within a decade. Financial subsidies for fruit and vegetables as well as tax on fast food and soft drinks are pointed out as possible governmental measures.

With regard to Denmark it is estimated that nutrition-related diseases are, all in all, costing society a two figured amount in billion DKK, and that a considerable part of this amount could be saved through improved nutrition and more physical exercise.

The improvement of the diet and physical exercise patterns of the population has, therefore, moved up high on the agenda of governments as well as organisations who are working with health and prevention in Denmark as well as in other European countries. The latest development is that

WHO's European member countries have adopted a "European Charter on Counteracting Obesity" (WHO, 2006). This charter stresses that the obesity epidemic is reversible, but that the problem can only be contained through an extensive and comprehensive effort, as the origin of the growth in the prevalence of obesity lies in the rapid social, economic and environmental changes caused by peoples' lifestyles. It is stated that it is unacceptable to leave the responsibility to the individual alone. A balance must be achieved between the responsibility of the individual on one side, and the responsibility of the government and society on the other side. It is estimated that progress is likely to be achieved in the next 4-5 years in most European countries, especially among children and adolescents.

## **2. Trends in consumption and meal patterns**

### **2.1 Food consumption**

The development in the population's consumption of food through out the last 50 years has radically changed the nutrition situation in Denmark. Since the 1950s the consumption of food products like potatoes and rye flour has decreased while the intake of meat, cheese, white flour, and alcohol has increased considerably.

Nutritionally, these changes have caused the level of carbohydrates and fibres in the diet to fall, and the level of fat to rise from constituting 35-36 percent of the total energy intake in the 1950s to approx. 40 percent in the early 1960s. The fat energy percentage was relatively stable at this level until the mid-1990s when it fell to a value which roughly corresponded to the 1955 level. During the last 50 years the energy content of the diet fell somewhat – based on the intake statistics it is estimated that it fell from 13.1 MJ in 1955 to 12.9 MJ in 1990 (Ovesen, 2005), however this fall is smaller than the fall in the energy requirement of the population due to a less physically demanding work and everyday life (Fagt & Trolle, 2001).

Studies show that the diet of Danish people is less fat than is was in the mid-1990s, but that it at the same time contains more sugar, alcohol, and dietary fibres. In the period from 1995-2000, the adult consumption of sweets increased by more than 90 percent, the consumption of soft drinks increased by more than 20 percent, the consumption of wine by approx. 45 percent, and the consumption of fruit and vegetables increased likewise with approx. 45 percent. Hence, the development during this period is partly opposite the former development (Fagt et al., 2004), and studies of the consumption frequencies for key food products also point to opposite tendencies in the development. From a nutritional perspective it is positive that the consumption frequency of fruit and vegetables has increased during the period from 1995-2000, and that more and more people refrain from



using fats on their bread. But, at the same time, it is a negative feature of the development that the consumption of potatoes and rye bread is decreasing, and that people generally eat less fish (Haraldsdóttir et al., 2002).

The latest data concerning the diet of Danish people are related to the consumption frequency of a range of key food products. These data indicate that some of the positive features of the development are wearing off. The consumption frequency of fruit and vegetables is no longer rising, the number of consumers who refrain from using fats on their bread is not increasing further, and the negative features of the development – the decreasing consumption of potatoes and rye bread, and the low consumption of fish – continues.

The trend towards rising consumption of lean milk types at the expense of fat milk types is however continuing (Haraldsdóttir, Holm & Larsen, 2005).

The food consumption development varies from population group to population group. Generally, women eat more fruit and vegetables than men, and men eat more meat than women. There are typically also more women among those whose diet comes closest to the recommendations of the health authorities. The somewhat older age groups are also stronger represented here than the youngest (Dynesen et al., 2003).

The social stratification is also reflected in the dietary habits. This is most clearly seen with regard to the level of education: People with medium-long or long educations have healthier dietary habits than people with lower education, both in terms of the fat content of the diet and its fruit and vegetable content (Groth, Fagt & Brøndsted, 2001).

It also becomes clear that food consumption changes considerably both in the short and long term. The health-related indications of these changes are not unequivocal: Some changes have a health promoting effect, while others have the opposite effect. Not surprisingly, food consumption appears not to be governed entirely by health concerns but is affected by other criteria and influences.

## **2.2 Is our food culture disintegrating?**

Food and eating habits reflects cultural identity and social relations. Traditionally, food and meals are of great importance to cultural background and the preservation of social unities, as e.g. the family (DeVault, 1991; Murcott, 1982). This is reflected in the choice of diet and dishes and the subsequent choice of food and preparation methods. The compliance with cultural norms while at the same time adhering to family preferences and time-related and economic resources is a key element (Ekström, 1990). Norms and instructions regarding health and nutrition have to be filtered and adapted to such key concerns. This is however an adaptation process that may be experienced as contradictory and difficult (Holm, 1997; Jansson, 1988).

In recent years, myths have with regular intervals appeared in the public debate stating that people are unconcerned with what they eat; that the good and regular meal habits of former times are in disarray; that, today, people would eat anything and anywhere when they see something they fancy; that modern people are increasingly eating in front of the television, while they are walking down the street, or when they are alone, and that former time's regular meals where the family would sit down together at their regular places around the dinner table to eat and be together are disappearing (Andersen, 1997). In 2001, a Nordic population study documented, however, that the fear of this cultural disintegration is exaggerated. In all Nordic countries, distinct eating patterns were found reflecting common cultural norms indicating when it was time to eat. In Denmark, these patterns were particularly distinct (Gronow & Jääskeläinen, 2001). Furthermore, the study shows that people are still chiefly eating at home, and that people who live together with other people are still to a very large extent eating together placed around dinner tables. Only a minor number of meals are eaten while watching television, listening to the radio, or reading at the same time (Holm, 2001b). These study results indicate that everyday meals can still be considered social events and confirm the results from qualitative studies from Denmark as well as other countries which

show that the common meal which gathers the entire family is in fact of very high importance to family life (Iversen & Holm, 1999).

### **2.3 Are people interested in healthy eating?**

Population studies from Denmark show a growing health interest among consumers, including an interest for healthy eating. The interest is biggest among women where 78 percent in 2000 stated that they very often or often made an effort to eat healthily every day. The corresponding figure for men is 58 percent. Hence, the part of the population who only rarely make an effort to eat healthily makes up much less than half of the population (Fagt et al., 2004).

At the same time, another study shows that people are well aware what it means to be eating healthily and in complete accordance with the official dietary guidelines: 76 percent of Danish adults are aware that one should eat more vegetables and fruit, and less fat (Margetts et al., 1997).

The motivation for eating healthily is frequently stated as being a wish to be in good health (71 percent), because of their weight (40 percent), for the sake of their well-being (27 percent), or because of their children (11 percent). Only 14 percent state that they do it because they find that healthy food tastes better. A smaller part of the population (10 percent) state that they never make an effort to eat healthily. Most of these state that this is because they feel fine without (41 percent), that they have no interest in food (19 percent), that they don't have the time (17 percent), that healthy food doesn't taste good (9 percent), or that they don't care about being healthy (8 percent) (Fagt et al., 2004). In a previous study, 35 percent of adult Danes indicate lack of time as a factor which prevents them from eating healthily, 23 percent find that healthy cooking is troublesome, 20 percent lack knowledge about healthy food, 17 percent find that healthy food is too expensive, while 30 percent state that they lack the required self-control (Lappalainen et al., 1997).

The above results indicate that many people wish to eat healthily but that they encounter various obstacles that prevent them from fulfilling this wish. The perception that it is expensive, troublesome, and not attractive to eat healthily shows that a healthy diet is still perceived as a diet that requires special precautions, special shopping patterns, special cooking routines – in short, dietary choices that are contrary to the more deep-rooted habits and routines (Holm, 1993). Qualitative studies confirm the impression that a nutrition-ally correct diet is difficult to maintain in a busy every day life where practical and social considerations cross over – often in opposite directions (Holm, 1997; Jensen & Schøler, 1996).

That such habits and routines can be changed, can be seen from the development in the actual consumption habits: The period from 1985-2000 saw an increase in the part of the population who refrain from using fats on their rye bread from 7 to 40 percent. This spectacular development must be attributed to the public campaigns against using fat which, in fact, for the first time spoke up against the, until then, unheeded and deeply rooted routines of Danish food culture for health reasons (Holm et al., 2002).

Another example is the consumption of milk. During a 3 year period from 2001-2004, the proportion of women who drink the “low in fat” mini milk rose from 13 to 30 percent. During the same period, the proportion of men who drink mini milk rose from 8 to 23 percent. For the sake of comparison, it took the regular low-fat milk 11 year to overtake whole milk with regard to consumption!

Such changes show that there is a great potential for dietary changes when they are considered relevant and practicable. Changes in eating patterns which can easily be adapted to existing routines with regard to shopping and cooking as well as existing cultural food norms and rules can be implemented and probably maintained over time, unless they are opposed by other circumstances – e.g. development in prices, availability or the like.

## **2.4 The development in physical activity and choice of food products**

One of the underlying causes of the development in obesity is low physical activity. Compared to only 60-70 years ago, the every day energy expenditure is in most cases reduced by 400-500 kcal. This requires the diet to have quite important characteristics. If we are to feel full after having eaten without the intake of too many calories, the diet must indeed be significantly more satiating (per kcal) than it is today. Indeed, the development in recent decades has moved in the wrong direction as a number of factors concerning the range of food have changed in a way that make our diet more obesogenic. The portions that we buy have become bigger; the energy in the food is more concentrated; the content of fibres and wholemeal has fallen; we drink too many soft drinks with sugar (see the elaboration in the box at the next page). For persons with a high level of physical activity the composition of the diet is less important to the energy balance, however, for persons with a low level of physical activity the composition is paramount.

## **Obesogenic factors in dietary development**

### **Growing portion sizes**

The size of burgers, French fries portions and soft drinks have grown tremendously, especially at fast food chains such as McDonald's, KFC and Burger King. Overeating is often encouraged with an aim to financial gain (eat two – pay for one). While an ordinary coke contained 25 cl in 1960, today the ordinary size is 1.5 l. Bigger portions lead to unconscious overeating. Epidemiological observation studies, experimental meal studies, as well as intervention studies document that the energy intake has increased by growing portion sizes and, hence, the risk of weight gain and overweight (Astrup, 2005).

### **Energy density**

The energy density of the food is important for the calorie intake. Growing energy density increases the spontaneous energy intake which leads to unconscious overeating. In particular, a high level of fat in the food is of importance in connection with increased energy density, however, also a low intake from fruit, vegetables and potatoes – which have low energy density – contributes.

### **Fibre and wholemeal content**

A diet with a low content of dietary fibres and wholemeal reduces the feeling of being full, compared to a diet which is rich in dietary fibres and wholemeal. The tendency to replace rye bread with finely refined white bread which is what has happen in Denmark through the last 50 years, has e.g. reduced the satiating effects of the diet and, hence, contributed to an increase in the total energy intake.

**Very sugary beverages**

A number of studies show that the energy contribution from very sugary beverages is added to the total energy intake and does not reduce the intake of energy from other food and beverages. Hence, it appears that sugar which has been added to food products, e.g. porridge and sour-sweet sauce, saturate to the same extent as starch, while sugar in beverages hardly saturates.

### **3. What is the desired extent of dietary changes?**

**- and to which population groups should they apply as indicated in the Danish dietary guidelines?**

#### **3.1 The Danish dietary guidelines**

The official Danish dietary guidelines in the latest version from 2005 are shown in the box on page 39.

In the below section we will take a closer look at what changes would be desirable in the average Danish diet and at the population groups who are of most interest in this connection.

#### **3.2 Desired changes in the average diet**

A change in the Danish diet in line with the dietary guidelines is certain to help check the rise in the occurrence of obesity. As approx. half of the Danish population are overweight, it would be expedient to aim at securing an actual and small weight loss for this group and at the same time prevent weight gain among the normal-weight group.

A reduction in the fat content of the diet reduces the dietary energy density which is a well-documented determinant for the total energy intake. According to intervention study metaanalysis, a reduction of 5 percentage points in the dietary energy from fat – e.g. from the current 34 to 29 percent – among normal-weight and overweight people results in a weight loss of 1.7 kg, and among heavy overweight people in a weight loss of approx. 3 kg (Astrup, 2006; Astrup et al., 2000; Bray, Paeratakul & Popkin, 2004). If, at the same time, the intake of fruit and vegetables is increased so that the fat content of the diet is chiefly replaced by food products with low energy density, the weight loss will be bigger, probably around 2.5 kg,



### **The official Danish dietary guidelines**

- **Eat fruit and vegetables – 6 pieces/portions per day**  
(Adults should eat 600 g of fruit and vegetables a day)
- **Eat fish and fish products – several times per week**  
(Adults should eat 200-300 g of fish per week)
- **Eat potatoes, rice or pasta, and wholemeal bread – every day**  
(Adults should eat at least 500 g per day, equally distributed between potatoes, rice or pasta, and bread, and other cereal products)
- **Limit the intake of sugar** – particularly from soft drinks, sweets and cakes (No more than 10 percent of dietary energy should come from sugar. This corresponds to 35-40 g sugar a day for a nursery child, 45-55 g for a school child, 50-60 g for a woman, and 70 g for a man)
- **Eat less fat** – particularly fats from meat and dairy products  
(Adults and children should drink ½ l of lean milk a day)
- **Eat a varied diet** – and maintain a normal body weight
- **Drink water** when you are thirsty
- **Engage in physical activity** – at least 30 minutes per day

Source: Astrup et al., 2005: “Kostrådene 2005”. Ernæringsrådet og Danmarks Fødevareforskning, 2005.

Table 3.1 Examples of desired changes to get the Danish average diet in line with the official dietary guidelines.

<b>Product group</b>	<b>Recommended intake <sup>1</sup></b>	<b>Danish average intake <sup>2</sup></b>	<b>Desired change <sup>3</sup></b>
Fruit and vegetables <sup>4</sup>	600 g/day	430 g/day	+ 40 %
Fish	200-300 g/week	133 g/week	+ at least 50 % (50-126 %)
Bread/cereal/pasta/ rice/potatoes	500 g/day	335 g/day	+ 49 %
Milk/sour milk products	500 g/day	307 g/day	+ 63 %

1. The official Danish dietary guidelines are described in section 3.1.
2. The average intake in 2000-2002 for adults, 18-75 year old (n=3,151, composed of 1,684 women, 1,467 men), cf. the national dietary study (Andersen et al. "Danskernes kostvaner 2000-2002. Hovedresultater". Danmarks Fødevareforskning, 2005).
3. Required change if the average intake should be in line with the recommendation.
4. Potatoes not included.

among the group of normal-weight and overweight people. Reduced consumption of sugar-sweetened beverages will furthermore be able to contribute to a smaller, spontaneous weight loss in the population.

Hence, the Danish population's intake of sugar from beverages is another source of weight gain and obesity. Danish children from the age of 4 to 14 drink an average of 210 ml of soft drinks and 200 ml of cordial a day, corresponding to a sugar intake of approx. 40 g, and the problem is particularly significant in this group which represents a high intake of soft drinks. Based on population studies and lottery studies there is reason to assume that a reduction in the intake of sugar of 35 g per day from very sugary beverages, incl. yoghurt, will reduce the weight among overweight

adults with 0.6 kg (Raben et al., 2002; Schulze et al., 2004).

All in all, a small reduction in the fat content of the diet, an increased intake of fruits and vegetables together with a considerable reduction in the intake of sugars from sugar-sweetened beverages will reduce the average weight of normal-weight and overweight Danish people by at least 3 kg. A conservative estimate of the importance of this for the occurrence of obesity in Denmark is that the current occurrence among adults of 17-18 percent will fall to 10-12 percent, corresponding to a reduction of 40-50 percent in the occurrence (Rose & Day, 1990).

If the composition and quantity of the Danish average diet should correspond to the official Danish dietary guidelines, substantial changes are needed in the intake of certain food product groups. Table 3.1 shows that – for some food products – this requires a +50 percent change. Table 3.1 only shows the food products that are mentioned with actual quantities (g/day, g/week) in the dietary guidelines. However, two of the other aspects should also be highlighted:

- Eat less fat – particularly fats from meat and dairy products
- Limit the intake of sugar – particularly from soft drinks, sweets and cakes

It is not possible to make a simple, quantitative comparison of the recommended intake and the average intake for this two cross cutting aspects, which is why they have not been included in the table. The purpose of the two aspects is to contribute to a reduction of the total content of fat and sugar in the diet.

As the most important sources for the total intake of fat are fats (butter, oil, margarine etc.), milk/milk products/cheese, and meat/meat products, the recommendation to choose dairy products and meat products with a low content of fat is a central part of the dietary guidelines (cf. the calculation example in section 3.3). In 2000/2002, the content of fat in the Danish average diet constituted 34 percent of the energy content (= an energy

percentage, E%, of 34 which has been calculated exclusive of alcohol). The recommended max. content of fat is 30 E% (Nordisk Ministerråd, 2004). In 2000/2002, the three mentioned food product groups (fats, milk/cheese, and meat) contributed with 34, 19 and 20 percent, respectively, of the total intake of fat (Andersen et al., 2005). They are, at the same time, the biggest sources of saturated fat in the diet – the type of fat that it is most important to limit (saturated fat makes up 33, 29 and 18 percent, respectively, of the intake of fat from the three sources).

In 2000/2002, added sugar contributed with 10 E% in the average diet, i.e. equal to the recommended max. of 10 E% in the dietary guidelines. Among children and adolescents the average was higher, 13.5 E%.

### **3.3 Underlying factors of the average diet**

The Underlying factors of the average diet naturally hide a relatively large diversification of the intake. Table 3.2 illustrates the diversification of the intake of fruit and vegetables, as it shows the percentage of adults who in 2001/02 eat a given quantity.

The table shows that 23 percent, or almost a fourth of the population, eat less than 200 g of fruit and vegetables per day, i.e. less than a third of the recommended quantity, which is 600 g/day. Hence, for this group a tripling of the intake is needed to reach the recommended quantity. It is, however, important to emphasise that also a small increase would have an effect, as there is no lower threshold value for achieving a positive health effect. The risk of cardiovascular diseases is e.g. reduced by 4-10 percent for every additional intake of 100 g of fruit and vegetables (Ovesen et al., 2002). Even an increase of 100 g (= the weight of an apple), corresponding to 25 percent for those who are already eating 400 g, and to 50 percent for those who are eating 200 g, will contribute to a reduction in cardiovascular diseases.

The same is true for fat where a reduction of the fat-related E% of the diet will reduce the risk of disease. The highest effect is achieved by cutting

Table 3.2 The percentage of adults, 15-75 year old (n= 1,818 persons), who in 2000/2001 eat a given quantity of fruit and vegetables per day.

<b>Amount of fruit and vegetables, g/day</b>	<b>%</b>
Less than 200 g	23
Less than 300 g	47
Less than 400 g	65
Less than 500 g	79
Less than 600 g	87
Less than 800 g	96

Source: Fagt et al. "Udviklingen i danskernes kost 1985-2001. Med fokus på sukker og alkohol samt motivation og barrierer for sund livsstil". Danmarks Fødevare- og Veterinærforskning, 2004.

down on saturated fat, as illustrated above. It has e.g. been estimated that the risk of cardiovascular diseases could be reduced by 30 percent if the intake of saturated fat is reduced with a third, i.e. from the current 15 E% to the recommended 10 E%. A lesser reduction, by a couple of E% points, can also be expected to have a noticeable effect. A reduction of saturated fat in the Danish diet would primarily require a reduction in fats from butter/ butter mixtures and milk and meat products by choosing lean variants and/ or eating smaller quantities.

However, to develop obesity only the intake of saturated fat counts. In this case, the most important factor is the total intake of fat, as fat contains a particularly high amount of energy – in fact double the energy amount of protein and carbohydrate (38 kJ/g vs. 17 kJ/g).

### **A calculation example**

An intake of ½ litre milk per day will save 17 g of fat if drinking skimmed milk in stead of whole milk (3.5 g fat/100 g, respectively). Of these 17 g of fat, 2/3, i.e. 11 g, is saturated fat. This corresponds to approximately 1/4 of the average daily intake of saturated fat in 1995 (Andersen et al., 1996). Choosing skimmed milk in stead of whole milk will therefore result in a reduction in the intake of saturated fat of approx. 25 percent in itself. Moreover, there will be a reduction in energy intake of 0.58 MJ, corresponding to 7 percent of the average intake for women (8.2 MJ/day).

## **3.4 Vulnerable groups**

### **Low intake of fruit and vegetables**

Generally, men are eating less fruit and vegetables than women. The group of men with the lowest intake of fruit and vegetables had an intake of 145 g/day.

For Danish men, the level of education is the most significant factor regarding the intake of fruit and vegetables, as well as the intake of fat. The higher the education, the higher the intake of fruit and vegetables, and the lower the content of fat in the diet. Hence, men with only a basic school education have a 21 percent lower intake of fruit and vegetables than men with vocational education. Men with a long higher education, on the other hand, have a 48 percent higher intake than men with only vocational education (Groth & Fagt, 2003).

Also among women the educational level is of significant importance when it comes to the intake of fruit and vegetables. The higher the education, the higher the intake. However, also their age and the household composition in terms of children is of importance. Hence, women with a medium-long

or long higher education have an 27 percent higher intake than women without or with only vocational education. The lowest intake was registered among women with only a basic school education, adolescents in the age of 20-24 years and with children in the family. In the group of women with the lowest intake of fruit and vegetables, the intake was estimated at 209 g/day (Groth & Fagt, 2003).

### **Fatty diet**

For Danish men, the level of education is also the most significant factor regarding the fat content of the diet. The higher the education, the lower the fat-related E%. The highest content of fat in the diet was registered among men with only a basic school education (41 E%). Men with a long higher education, on the other hand, registered a diet with a fat-related E% of 37 (Groth & Fagt, 2003).

Also among women education is of significance when it comes to the intake of fat. However, the picture is less unambiguous as age, among other things, is also a factor. The highest level of fat was registered among 35-44 year old women with the Danish equivalent to GCSE as their highest education (40 E%), while the lowest level (34 E%) was registered among 20-24 year olds with a medium-long higher education (Groth & Fagt, 2003).

### **Much sugar**

Here the children are the largest consumers, even though a high sugar intake is also a problem among adults. The national dietary study in 2000/01 showed that 13 percent of the children who participated in the study had an intake of double the recommended maximum amount of sugar (i.e. more than 20 E% vs. maximum 10 E%). The development is furthermore moving hastily in the wrong direction. Hence, the study showed that children's and adult's diet contained 40 percent and 22 percent, respectively, more sugar-sweetened soft drinks than in 1995. 15 percent of all children drank soft drinks almost every day. Children's diet furthermore contained approx. 40 percent more sweets than in 1995. The two biggest sources of

sugar in children's diet are soft drinks etc. (42 percent) and sweets etc. (40 percent). See table 3.3 with figures from the dietary study in 2000/01 (Fagt et al., 2004).

Table 3.3 Sources of sugar in children's diet.

Source of sugar	Percentage of children's total sugar intake
Soft drinks, cordial etc.	42
Sweets, chocolate, cakes etc.	40
Milk products	5
Ice cream	4
Fruit and vegetables (incl. jam)	5
Other	3

Source: Fagt et al.: "Udviklingen i danskernes kost 1985-2001. Med fokus på sukker og alkohol samt motivation og barrierer for sund livsstil". Danmarks Fødevare- og Veterinærforskning, 2004, p. 27.

**Biggest need for dietary changes among people with low education**

Based on the analyses of the intake of fruit/vegetables and fat, which are the only aspects that have been thoroughly analysed for social differences in the national dietary study, the level of education stands out as the most important parameter. It will therefore only be natural to include this as a key parameter in any further analysis of the effect of economic measures on our diet. Education is, at the same time, a key parameter for social inequalities with regard to illness/health (cf. section 1.3). Hence, the need



for dietary changes appears to be the biggest among people with low education. Since such population groups typically are the ones with the lowest income, it can be expected that measures to change the price of food products will have a larger impact on consumption for these groups than for the population as a whole.

## **4. "Healthy" and "unhealthy" food**

### **4.1 Classification of food products as "healthy" and "unhealthy"**

In the public debate it is often suggested that government should support the application of the dietary guidelines in the population by making "healthy" food products cheaper and "unhealthy" ones more expensive. In this connection there is, therefore, a need for methods to classify food products as "healthy" or "unhealthy".

The dietary guidelines themselves express the opinion that some food products are pulling the nutritional content of the ordinary Danish diet in a desirable direction, while others are pulling in a undesirable direction. Converted to a nutrient level, this implies that the Danish population is recommended to hold back on food products with a lot of fat and sugar, and to eat a diet with more complex carbohydrates and dietary fibres. It is recommended to eat more of all kinds of fruit, vegetables, and fish without looking at the natural content of fat and sugar, while at the same time recommending people to eat less fatty milk and meat products. Hence, what is of relevance in connection with the current Danish nutritional problems are macro-nutrients as fat, sugar, complex carbohydrates and dietary fibres, not vitamins and minerals. The content of fat, sugar, complex carbohydrates and dietary fibres in the diet can therefore be used as criteria for the classification of food products as "healthy" and "unhealthy".

Fruit and vegetables are often mentioned as examples of healthy food products, while the unhealthy food products are often mentioned under names such as "junk food", soft drinks, sweets, snacks etc. Categorising food products as "healthy" and "unhealthy" is, however, by no means without problem. One point of view, that is often put forward, is that no food product on its own can be called healthy or unhealthy, as this depends on the quantity eaten, or on the person eating the product. Sugar and fat

are e.g. only unhealthy when they are consumed in too high quantities, but not if they are part of a balanced diet. According to this point of view, it is not the food product on its own but rather the diet in general that is important when talking about "healthy" and "unhealthy" in connection with the Danish diet as such.

With regard to nutrition policy, it is also not particularly important to make a definitive categorisation of food products as "healthy" and "unhealthy". The decisive point is to be able to turn the development in the population's diet round to a desirable, positive direction, that the measures used in the nutrition policy support the official Danish dietary guidelines, and that the measures in such case can be based on a comparatively simple food product categorisation and classification method.

The official dietary guidelines illustrate two different ways of categorising food products:

1. Into food product groups, e.g. bread, fish, fruit, and vegetables
2. According to nutrient content, e.g. dairy products and meat with a low content of fat

Both systems are already used for regulatory purposes in the field of food and nutrition in Denmark as well as internationally. On the "positive list", all food products are categorised very carefully into 16 main groups (dairy products, fats, fruit and vegetables etc.), while the rules concerning nutrition labelling and recommendations categorise the food products according to their nutrient content.

## **4.2 Examples of the use of food product groups**

In Great Britain food product groups are used to regulate which food products should be subject to VAT (Value Added Tax). Basically, basic food

products are exempt from VAT for the reason that basic food products should be financially affordable for even the weakest groups. Snacks and other non-life-supporting food products and beverages are subject to the normal VAT rate of 17.5 percent. The food product groups that are subject to VAT are confectionery, ice cream, soft drinks etc. The categorisation into groups has however never been sufficiently consistent and detailed, and the adjustment of the system has lead to many inconsistencies along the way. Milkshakes and chocolate milk are e.g. exempt from VAT, while juice and mineral water are subject to VAT. In the report "Obesity" (House of Commons Health Committee, 2004), the committee recommends to regulate the application of VAT to be in line with the nutritional recommendations.

In Canada, the system with VAT on food products is differentiated in the same way as in Great Britain. Basic food products are exempt from VAT (Excise Tax), while "junk food", like alcohol and carbonated beverages, sweets and confectionery, crisps, ice cream etc., is not.

In France, sweets, chocolate, margarine and the like are subject to a VAT rate of 19.6 percent, while other food products are subject to a VAT rate of 5.5 percent.

Although there are many real life examples of food products that are divided into "good" and "bad" categories according to food product group, and although this is done using a simple and easy method, it is at the same time a very crude method for deciding whether certain groups should e.g. be subsidised or subject to taxes. The method suffers e.g. from the serious deficiency that it does not allow for a possibility to distinguish between nutritionally good and bad food products within the individual groups, e.g. snacks which consist of both "healthy" and "unhealthy" products, or e.g. carbonated beverages which might include some with a lot of sugar and some with little sugar. Many nutritionally good food products would be placed in so-called "unhealthy" groups, which their producers would find unreasonable and unjust. The categorisation method appears furthermore to be discouraging for the product development within the individual group. To make it easier for the consumer to find out whether a food product is

### **4.3 Examples of the classification of food products according to nutrient content**

nutritionally good and bad, there has been an increase in the use of nutrition labelling based on the nutrient content of the food products. The Danish S-label, the Swedish Keyhole label, and the British Traffic Light label are all examples of this. In 2005, the Danish Minister of Family and Consumer Affairs proposed a Danish nutrition labelling scheme which, in principle, is similar to the Traffic Light (Danmarks Fødevareforskning, 2005). The departmental order concerning a nutrition label (Bekendtgørelsen for Ernæringsmærket) (the Danish Ministry of Family and Consumer Affairs, 2006) was sent out for public consultation on the 8th of August 2006 and was notified before the EU Commission in September 2006. After some delay the Nutrition label is likely to come into force during 2007. That apart, the Minister is working towards the establishment of a joint EU nutrition labelling scheme.

There are two nutrition labelling principles in play:

- The principle behind the S-label and Keyhole label is to use the label on the product that is the best choice in its group of food products. Each group has its own threshold level for fat and sugar. For the S-label to be used on minced meat, the meat should contain less than 12 percent fat, while the threshold for ice cream is 6 percent fat. The advantage is that this helps the consumer make the healthiest choice when shopping, e.g. at the cold counter with cold cuts, when there are various types of cold cut meat to choose between. The disadvantage is that it is not possible to make comparisons across the groups. Minarine with less than 41 percent fat could for example be labelled with the S-label as this is a better choice than margarine with 80 percent fat, while cold cut meat can only be labelled with the S-label if it contains less than 5 percent fat. Hence, it is not possible to deduct that minarine with an S-label is nutritionally as good as the S-labelled cold meat.

- The principle behind the future Danish nutrition labelling is a categorisation of the food products into three groups according to their content of fat, saturated fat, sugar, salt, and fibre. The nutrition label indicates whether the food product in question should be consumed: 1) Most, 2) Less, or 3) Least. The advantage is, among other things, that it allows for comparison across product groups, e.g. comparison of cheese with mayonnaise salads. However, this on the other hand results in very detailed and complicated criteria for the categorisation of the various food products into the three groups, as illustrated in annex 1 (The Danish Ministry of Family and Consumer Affairs, 2006, annex 2).

#### **4.4 Classification of food products as a basis for economic measures**

The categorisation of food products into "healthy" and "unhealthy" is, as mentioned, already in use for regulatory purposes in the field of food and nutrition, and both the methods mentioned can be used on their own or in combination as the basis for the implementation of economic measures as part of a nutrition policy. In this connection, it is estimated that it would be expedient to use the nutrient content of the food products to categorise them into "healthy" and "unhealthy" products, i.e. according to the same principle that is used for the future nutrition label.

A simplification of the detailed criteria, which the nutrition label is based on, would however be desirable. From a health-related point of view the content of fat and sugar are the most important criteria, while the content of dietary fibres and salt is further down the list. The criteria for the categorisation could therefore, if necessary, be limited to the content of fat and sugar, and simply make use of a categorisation into "healthy" and "unhealthy" instead of using the three groups related to the nutrition label.

## **5. Should government have a say in what people eat?**

Government is already exercising considerable influence on the population's diet – both directly and indirectly. Directly through information, education, government provision of meals, marketing regulation, prohibitions etc., and indirectly through its agricultural policy, subsidies/taxes on food products, taxes etc. By far the largest part of the governmental dietary influence is not aimed directly at improving the nutrition of the Danish population, but rather serves other society-related purposes, such as providing revenue for the government, protecting the environment, or as support for specific professions or vulnerable groups etc. A characteristic feature of this is that the legitimacy of the government's use of measures to affect peoples consumption of food products is not questioned in such cases. However, had this been a case of improving diet and nutrition, it would have sparked a discussion about whether the government should be allowed to interfere with the eating habits of its citizens which are considered to be part of our private life. This is an issue which the field of nutrition shares with other types of disease prevention and health promotion.

Efforts in the field of public health are part of a long tradition. From the early 19th century the effort was directed at vaccination campaigns, sewerage work, water supply, food quality control, pollution control etc. This produced remarkable results in terms of a reduced infant mortality rate, hugely prolonged lifespans, and fewer cases of illness. The great breakthroughs in medicine following World War II meant that it was possible to cure many of the infectious diseases. Some of which have actually been eradicated. With the growth in lifestyle diseases (cardiovascular diseases, cancer, high blood pressure etc.) in the last half of the century, preventive efforts came into focus. Such diseases are in fact characterized by being difficult or impossible to cure, when they have first emerged.

Diseases are related to peoples individual lifestyles, such as their dietary

### **Examples of the use of prohibitions in food and nutrition policy**

Trans fatty acids (TFA) in the food derive either from industrial tempering (hydrogenizing) of oils or from fat from ruminants. Compared to non-hydrogenized oils, fat containing industrially produced TFA (IP-TFA) is solid at room temperature, contributes with a range of technical advantages in the production of food, and prolongs the shelf life of the products. The percentage of IP-TFA in fat can be up to 60 percent in some food products, whereas the percentage of TFA from ruminants can only be up to 6 percent. The intake of TFA contributes to an increased risk of developing obesity, type 2 diabetes, and ischaemic heart diseases (IHD). A metaanalysis of four large studies found that an intake of TFA corresponding to 2 percent of the energy intake – approx. 5 g/day for an adult – contributes to a 25 percent increase in the risk of developing IHD (Stender et al., 2006). This indicates a 4-5 times higher risk of IHD per g of TFA than per g of saturated fatty acids.

In 2001, in Denmark it was possible to consume 20-30 g of IP-TFA by eating a special "high trans menu" consisting of a portion of French fries and chicken chunks from fast food chains, a portion of certain microwave oven popcorn, and a portion of industrially produced waffles. It was estimated that although the average intake of IP-TFA for the 5 million Danish people was only approx. 1 g per day, a group of 10-50,000 people had an average intake of more than 10 g/day due to a frequent intake of the above mentioned products. This – and because of the lack of studies that were not even close to indicated a health improving effect of IP-TFA – was among other things why the Danish government – as the first in the world – introduced legislation which from the 1st of January 2004 and onwards would limit the use of IP-TFA to a maximum of 2 percent of fat in food products. Two years after the coming into force of this legislation, a study showed that IP-TFA had basically been totally eliminated from the Danish diet. The Danish initiative has inspired other authorities to similar efforts to limit the use of IP-TFA. The local government in New York has e.g. prohibited the sale of IP-TFA food products in New York restaurants and cafeterias.



habits, physical activity, and consumption of tobacco and alcohol. Such habits are a result of individual choices, but are also socially and culturally defined. They are created as part of the interaction between the individual and its environment, e.g. based on legislation, prices, availability, and cultural factors.

To illustrate the particular issues facing the individual citizen, the metaphor of a person trying to push a stone up a hill has often been used. The stone and its size represent the citizen's personal nutrition issues which depend on the hereditary predispositions, lifestyle, dietary habits, nutritional knowledge, resources etc. The hill and its inclination represent societal factors which can make it easier or more difficult to push the stone uphill. The inclination - and hence the difficulty of the task - can be reduced by making healthy food products more accessible and unhealthy ones less accessible, e.g. through the use of subsidies and taxes. Society can also make it easier for its citizens to eat healthily by requiring nutrition labelling of food products or by limiting TV commercials for unhealthy food and beverages aimed at children. In this way, society can help make "the healthy choice, the easy choice".

A similar approach has been discussed in the recently published discussion paper "Er sundhed et personligt valg? – et debatoplæg om forebyggelse i Danmark" (Is health a personal choice? – a discussion paper on preventive measures in Denmark) (Mandag Morgen, 2006). This paper does not support the general opinion that prevention is solely about informing the Danish population that they each should choose a healthier lifestyle. The current health problems concerning overweight, diabetes, smoker's lung, cancer, apoplexy, and osteoporosis are products of modern civilisations easy access to and the proliferation of temptations from nicotine and alcohol over sweet and fat food to an almost complete lack of physical activity. The trick for future prevention policy will be to develop ideas which - without limiting our freedom – are able to deal with the physical structure, prices, supply, social traditions and group pressure of society and make it easier for each of us to make healthy choices, i.e. choices which should be the "easy, alluring and attractive" ones. One of the specific

recommendations of the discussion paper is that society should use heavy armour in its prevention policy. It is stated that in some areas prohibitions, directions, and rules should be introduced. This could include anything from school cafeteria arrangement and an examination requirement in physical education to restrictions in the availability of tobacco and alcohol. And the use of taxes, quotas and other types of economic measures is even more important. This requires considerable development in the regulatory instruments, and suggestions are made to e.g. introduce energy quotas – which with the current way of looking at things seems rather futuristic – and apply such quotas to the product energy content. Similar systems exist for fishery and the emission of sulphur dioxide. If food product energy quotas are allotted for free, but in limited quantities, the prices of high energy food products, such as sweets, traditional soft drinks and crisps, will rise significantly, while low energy food products, such as vegetables and artificially sweetened products, become significantly cheaper.

The debate about government's involvement in its citizen's free choice is, however, not something particularly Danish<sup>1</sup>. In Great Britain, the Labour government has traditionally been under attack for wanting to create a "nanny state" in which government pretends to know what is best for each individual and preserves the right to interfere according to this. The present Labour government has been eager to distance itself from everything that could be attributed to a "nanny state". It views itself as a government who "empowers the citizens" rather than a government who "interferes with".

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<sup>1</sup>. In the Danish debate, the government role in food and nutrition policy has e.g. been discussed in Landbrugets Økonomi 2001 (Agricultural Economics 2001) from the former Danish State Institute for Farming and Fishery Economics (Statens Jordbrugs- og Fiskeriøkonomiske Institut). This publication contains a comprehensive presentation from an economic point of view of a number of the issues mentioned in this chapter and includes specific recommendations regarding the approach to the lack of information and the uncertainty related to issues of regulation.

This issue is discussed in the report "Nanny or Steward? The role of government in public health" (Jochelson, 2005). The report describes the role of government in connection with modern health problems such as overweight and poor dietary habits. Based on case studies of government interventions in connection with alcohol, smoking and road safety, it is concluded that these interventions can contribute with such significant health-related advantages for individuals and society that this compensates for any minor limitations in the personal freedom. The case studies indicate that higher taxes, prohibition of commercials, and regulation supported by "punishment" in the form of taxes etc. promote healthy behaviour, especially when the interventions are complemented by information and education. Taxation is an efficient measure but it can be socially lopsided. The use of such measures is relatively unproblematic when related to the protection of the individual against harm caused by actions of others (passive smoking, drunk-driving). When it comes to the protection of the individual against self-inflicted harm through smoking, drinking and unhealthy eating things are more controversial. Government cannot prohibit people from doing it, however, case studies show that government can use taxation, limitations of commercials, and information to make things easier for individuals who wish to live a healthier life.

In our part of the world, the market economy constitutes the framework for free consumer choices. Economists' basic assumption is that we, if we as individuals are left to our own devices, would choose the consumption patterns which would give us the highest degree of welfare according to our own preferences. In an ideal market economy, this would at the same time produce the largest total welfare in society. However, this is only true in an ideal world where everyone behaves rationally, can grasp all consequences of their actions, pays all their expenses themselves, and are given all rewards from their actions themselves.

Information campaigns aim at getting the consumers to act rationally and grasp the consequences of their actions. Information is however not enough to make an unregulated market economy ideal. According to the concept, the individuals are also "liable" for all consequences of their actions

themselves which is far from always the case in practice, e.g. in the field of environment and nutrition. For the market economy to function optimally, the use of subsidies and taxation should be aimed at securing that the individuals are subject to all results of their actions themselves. Car owners should therefore also pay the socio-economic costs related to the CO<sub>2</sub> emission from their cars, and a beekeeper should correspondingly, in principle, by subsidies to account for the society-related gain achieved because of his bees' pollination of wild and cultivated plants. Such society-related effects are called externalities by the economists.

As in the environmental field, there are also many externalities in the health care field. If an individual by his/her way of life undermines his/her health, the individual of course pays some of the costs in the form of a lower quality of life. But there are also a number of other society-related costs. Increased sickness absence generates problems for a person's workplace and colleagues, and there are also the public health care costs and sickness benefits to consider. If a person is incapacitated, incapacity benefit will be paid out, and there will be the issue of lost tax revenues. From an economic-theoretical point of view, a healthy life should then be subsidised and an unhealthy one should be taxed to make the market economy function expediently – otherwise, the incentives for living a healthy life will not be sufficient. As CO<sub>2</sub> emission e.g. should be taxed, and beekeeping should be subsidised, economic arguments are in favour of taxing consumption of fat and sugar, and subsidising fruit and vegetables – or put more generally, that a unhealthy way of living should be more expensive than a healthy one.

In recent years, it has in fact also regularly been suggested to improve the nutritional status of the population by making healthy food cheaper and unhealthy food more expensive. In Denmark, the Danish Nutrition Council (Ernæringsrådet) has – in its discussion paper for preventive action: "Den danske fedmeepidemi" (Richelsen et al., 2003) – indicated that "unhealthy" food products could be subjected to taxes, while "healthy" ones should be subsidised, e.g. through differentiated VAT. The Danish National Board of Health (Sundhedsstyrelsen) mentions economic measures in "Oplæg til national handlingsplan mod svær overvægt" (National Action

Plan against Obesity) (Sundhedsstyrelsen, 2003), but adds that there is need of further analysis of where it would be beneficial to introduce economic regulations. Similar contemplations and usages take place in other countries. In Great Britain, a government committee has suggested a tax on unhealthy products, called a "fat tax". Most food products are already exempt from VAT. Exceptions are "snacks" such as ice cream, confectionery and fruit drinks. In France, sweets, chocolate, margarine and vegetable fats are subject to 19.6 percent VAT, while other food products are subject to only 5.5 percent VAT.

The need for regulation is emphasized by the fact that the effects of an unhealthy way of living can only be registered with huge delay. A person can be drinking a lot for years before being diagnosed with cirrhosis of the liver, and be eating too much for decades before getting obesity-related diseases. Many studies indicate that the time horizon of consumers typically is irrationally short, from an economic-theoretical point of view. It is rational to be reducing future effects with what corresponds to the actual market interest, i.e. with 2-5 percent per year. Hence, a gain which will not be realised until next year should only be attributed a value of approx. 95 percent of the value it will have if it was realised now, and only approx. 90 percent if it is not realised until two years from now etc. Studies indicate that consumers often reduce the effect, not with 2-5 percent, but with considerably higher percentages, maybe even up to 25-40 percent, if the actions of the consumers are converted to this way of thinking. If this is correct, effects that are 15-20 years out in the future are automatically attributed much less importance, and there are therefore all reasons in the world to implement a nutrition policy which supports the long term consumer interests.

Such considerations support the advantage of using economic intervention measures to intervene in consumers' actions in the field of environment and nutrition. And this is also what has always been done. In the environmental field, a wide range of "green" taxes and subsidy schemes have e.g. been introduced for environmentally friendly energy production. And in the field of food and nutrition, almost all other countries than

Denmark have intervened with differentiated VAT rates. In Denmark, however, we have very high and hugely differentiated taxes on beverages (both on sweet beverages and alcoholic beverages). Hence, there is nothing new in using economic measures in food product and nutrition policy. Taxes on spirits were e.g. introduced in Denmark in 1917, and we have had free school milk schemes for decades. The problem is that the purpose of the rational, public nutrition policy has changed. 50 years ago the purpose was to combat malnutrition that resulted in sequela, such as tuberculosis. In such situation it was rational to introduce VAT reduction and subsidies for fat dairy products. Today, the problem consists of overweight and disease related to over-consumption. The instruments are therefore not the same. Hence, the new element is not the economic regulation of food consumption. The new element consists of deciding which way to regulate<sup>2</sup>.

Nutrition policy does, on the other hand, also influence other areas, e.g. the environment. A report from the Danish Environmental Assessment Institute (Institut for Miljøvurdering) (Saxe et al., 2006) investigates the environmental effect of the use of nutrition policy. It is concluded that a healthy diet is better for the environment than the ordinary Danish diet – and at the same time 20 percent cheaper. Our choice of food and beverages greatly affects the environment and is in several ways more damaging to the environment than the combined effect of our car and housing.

The report measures the environmental effects of the diet in eight different areas, and in all of these a healthy diet results in environmental improvement. The report shows that the choice of a healthy diet – measured in six out of eight environmental areas – protects the environment far more than a 10 percent reduction in the consumption of electricity, heating and

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<sup>2</sup> It has been a dogma in Danish thinking that differentiated VAT rates are administratively complicated, however, we do in fact have differentiated VAT rates as some products are subject to 25 percent VAT and others are subject to 0 percent VAT. VAT exempt products, such as newspapers, are sold from the same stores as products that are subject to VAT.

petrol. The report raises the question of whether the environmental considerations in this field is something that the legislators should leave to the individual or whether the politicians should take action and motivate people to choose a healthy and environmentally correct diet. It is mentioned that there e.g. are green taxes on cars and car-driving, and that something similar could be introduced in the field of food and nutrition. If taxes on food products reflected society's expenses for the health and environmental area, "unhealthy" food products would probably be more expensive and "healthy" food products would be cheaper.

A Swedish report (Naturvårdsverket, 1997) also concludes that the healthy diet is better for the environment. The report was part of the Naturvårdsverket's comprehensive future study "Sverige år 2021" (Sweden in the year 2021) (Naturvårdsverket, 1998). It shows, among other things, that food production is very energy demanding. One fifth of Sweden's total energy consumption is attributed to production, processing, transportation and preparation of food. The adjustments that are required in the Swedish diet to achieve a sustainable Swedish food production in 2021 are examined.

The conclusion is that to succeed, the Swedes should be eating a diet that is in line with the official dietary guidelines, i.e. a diet that contains more fruit, vegetables, potatoes and bread than today, and fewer animal products. The conclusions of these studies are familiar as they recommend to replace some of the dietary animal products with plant products, and that the necessary resources for the production of a given quantity of calories in the form of plants should be lower than for the production of the same quantity of calories in the form of animal products.

## 6. Measures in nutrition policy

When the authorities want to influence the dietary habits of consumers in a more healthy direction they can make use of a number of measures. The measures available to nutrition policy can be divided into two groups: Those that aim at improving the individual citizen's possibility of making prudent choices, e.g. through nutrition information and nutritional labelling. And those that aim at making it easier for the citizen to obtain good nutrition, e.g. through regulation of commercials for food products aimed at children or by making "healthy" food products cheaper than "unhealthy" ones. The measures are characterized by being relatively weak on their own compared to those of the other parties in society with a stake in the field of food and nutrition.

More specifically, there are following options:

1. Prohibition against or quotas for allowed consumption
2. Information and education
3. Product standards
4. Mandatory or recommended labelling
5. Marketing regulation
6. Public meals
7. Taxes and subsidies

*Prohibition* against or *quotas* for the consumption of certain products might be to drastic intervention measures for these to be widely used in nutrition policy.

It is hard to image a popular or political accept of more general prohibitions against unhealthy food products. Hence, prohibitions and quotas will only be applicable for the regulation of outright toxic substances and not in connection with the consumption of fat and sugar. Only in connection with a case such as trans fats where it is possible to remove it



completely from the food products without implications for the availability, taste or price is this accepted.

*Nutrition information and education* are necessary prerequisites for a nutrition policy. The individual citizen should feel responsibility for his/her own health and have knowledge of how to preserve it. Nutrition information can however not be used on its own. The problem is, firstly, that the message easily drowns in the massive flow of commercial communication concerning food matters. Secondly, experience shows that nutritional information has a hard time getting through to the informationally impaired groups who need it the most. A poor diet and nutritional status is, as mentioned in chap. 1 and 3, socially lopsided. Finally, the individual does not have complete responsibility for his/her choices, as systems like ours, with e.g. free admissions to hospitals and public incapacity benefits, are subject to derived societal costs or other externalities for which the individual is not liable.

*Product standards* have traditionally be considered an important measure in nutrition policy as they can be used to guarantee the nutritional value of each food product, e.g. by introducing maximum thresholds for the content of fat in cold cuts or sugar in preserve. The significance is however limited. The reason why the Danish diet is too fat is to a large degree due to the relative quantity that is consumed of the individual food product, rather than the fat content of the product. The quantity of salami or liver paté compared to the quantity of bread is e.g. more important for the fat content of an open sandwich than the fat percentage of the salami or liver paté. Product standards in the field of food and nutrition are furthermore being phased out globally as they are an obstacle to the free movement of products across borders and for product development.

The purpose of *nutrition labelling* is to enable consumers to make prudent choices when shopping. The problem is however that, today, nutritional labellings are so hard to understand and compare with the nutrition recommendations that they are almost impossible for the ordinary consumer to understand. Attempts have been made to introduce an easy understandable national nutrition label. So far this has failed, however, the

attempt has not been abandoned (see section 4.3).

The *marketing of food and beverages* is massive and undoubtedly affects consumption. Marketing e.g. takes on the shape of commercials in television, the radio, the written media, and on the internet, sports and culture sponsorships, product placement in the electronic media and marketing in schools. In Denmark, 85 percent of the food industry budget is used on television commercials, of which every sixth is aimed at children. Of these, 93 percent are commercials for decidedly unhealthy food products (Forbruger-rådet, 2005). Norway, Sweden and the province of Quebec in Canada have introduced a prohibition against commercials for food and beverages aimed at children, while other countries, including Denmark, have introduced some restrictions. In Denmark, television commercials for sweets, soft drinks, snacks and the like must e.g. not imply that the product could replace a regular meal. If the experiences from the three places that have introduced prohibitions are compared, it turns out that a prohibition against television commercials does have an effect, but that it can be neutralized completely or partly if the industry in question transfers the money to other forms of marketing and focuses on popular television channels that broadcast from countries where there are no prohibitions or restrictions (Hawkes, 2004).

*Public meals* are used on a large scale in Denmark. These include meals in nursing homes and hospitals, in schools, in day and 24-hour care centres, canteens etc. In total this amounts to more than 100,000 meals per day. Public meals therefore constitute a possibility of affecting the population's diet. As the individual person's consumption of food is to a very high degree based on tradition – eating habits should be taken very literally here – the influence on the population's habits is a key element to healthy nutrition, and this influence can e.g. be exercised through public meals, particularly in children's institutions. Healthy food in children's institutions and schools can be the start of good life-long habits, and public subsidy for such schemes can therefore be the source of huge positive returns for society in the long term.

*Taxes and subsidies* are traditional standard instruments for public

regulations – just think of taxes on tobacco and alcohol (often directly referred to as "poison taxes"), as well as environmental taxes, e.g. water and petrol taxes. Similarly, there are public subsidies for the consumption of culturally beneficial things such as evening school and theatres, and for housing (from the outset based on public health reasons). Taxes on unhealthy food products with a high content of fat and sugar and subsidies for physical exercise as well as healthy food products do seem to be promising and necessary instruments, and they are therefore discussed further in the following chapter.

## **7. The use and effect of taxes and subsidies**

Throughout decades taxes and subsidies have been used as instruments in nutrition policy in almost all countries. But such regulations have had entirely different purposes than solving the problems of over-consumption of a diet that is too fat and too sweet. They have, among other things, aimed at combating hunger and malnutrition to ensure that there was sufficient food for their populations and have, hence, been used for reasons of security of supply. Such measures can be found in all European countries, and are still in use today. The Common Agricultural Policy (CAP) in EU and the agricultural policy in many other countries, such as Norway and Switzerland, e.g. have an intended aim of ensuring sufficient supply of cheap food products for their consumers. To achieve this aim they use public subsidies for the production of agricultural products. The Common Agricultural Policy in EU has, however, numerous other purposes, including "reasonable" prices and income to farmers, and consists of such a number of intertwined subsidy and regulation schemes that the overall result of the policy is unclear (see e.g. Elinder, 2003 and 2004; Kærgård, 2004; Frandsen & Walter-Jørgensen, 2006).

Furthermore, basically all other countries than Denmark have lower VAT on food products than on other products, cf. table 7.1.

### **7.1 Examples of traditional use and effect of taxes and subsidies**

Subsidies for food products are often used to affect consumption. In 1978 and the following year, EU sold butter from its butter stocks at Christmas time. The "Christmas butter" was sold with a price reduction of 25 percent. On a yearly basis, this corresponded to additional sales of 2 percent of the consumption. Hence, in the long term the butter consumption was not

Table 7.1 VAT on standard products and food products in various countries, in percent.

<b>Country</b>	<b>Standard products</b>	<b>Food products</b>
Great Britain	17,5	0 and 17,5
Switzerland	7,6	2,4
Denmark	25,0	25,0
Sweden	25,0	12,0 and 25,0
Italy	20,0	4,0 and 10,0
France	19,6	5,5 and 19,6
Germany	16,0	7,0 and 16,0
Holland	19,0	6,0
Greece	18,0	8,0
Spain	16,0	4,0 and 7,0
Austria	20,0	10,0

significantly affected because of this sale, but the products in the surplus stock were replaced.

An example of the positive effect of the price mechanism on consumption is known from the situation with milk. Until 1984, milk was subsidised in such a way that milk with a high content of fat was favoured. When the scheme was discontinued, the price of whole milk rose 25 percent, while low-fat and skimmed milk rose 10 and 5 percent, respectively. The consequences for the consumption were significant as, in 1985, the sale of whole milk was 25 percent below the sale of in 1983, while the sale of low-fat and skimmed milk rose 27 and 18 percent, respectively. The total

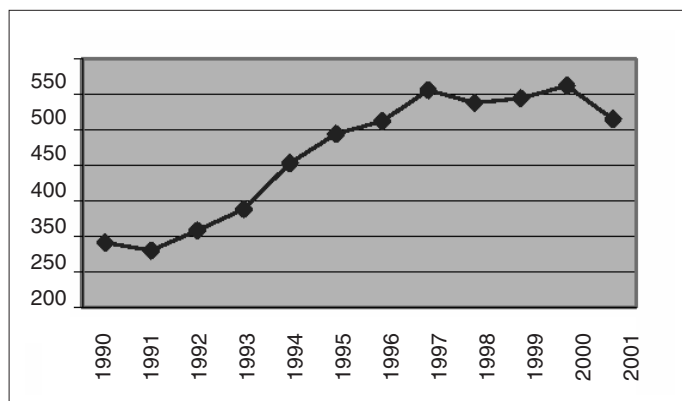
consumption of milk was only reduced a little, but the reduction in the population's intake of fat from milk was significant. In this connection, it should however be remembered that the reduction in the intake of fat from milk due to the EU Common Agricultural Policy resulted in large surplus stocks which were handed off for industrial purposes (ice cream, biscuits etc.) with price subsidies. It is therefore a bit uncertain how much the total intake of fat from butter was in fact reduced.

Hence, subsidies are an obvious and previously often used measure in nutrition policy. Something similar is the case for taxes. A classical example of this is the tax imposed on aquavit in 1917. This tax was so high that prices for a bottle of aquavit rose from 1 DKK to 11 DKK. At that time, a male worker in Copenhagen earned 50 DKK a week, so this increase was extremely high. The result was indeed a decrease in the consumption of alcohol from an average of 6 l per adult in 1916 to 1.6 l in 1918. And the consumption of alcohol actually stayed on a relatively low level until people starting getting richer in the 1960s. Since then taxes on beer, wine and spirits have increased several times, but never as drastically as in 1917.

The tax on mineral water was doubled in 1984, but this only temporarily affected consumption which has risen steadily since 1955. Figure 7.1 illustrates the sale of mineral water in Denmark during the years from 1990-2001.

The tax on mineral water was halved to 0.80 DKK/l in 1991 and raised to 1.00 DKK/l in 1998 and to 1.65 DKK/l in 2001. Then in 2003, the tax was reduced to 1.15 DKK/l, and sales have slowly risen again (Skatteministeriet, 2002). It is too early to comment on the effect of the recently adopted mineral water tax reduction, but from a nutritional point of view one could fear that consumption will continue to rise.

In October 1976, a tax on sugar was introduced for the primary reason that the Treasury needed the money, even though the positive, nutritional aspects were also highlighted. The tax was quite significant compared to the price of sugar (3 DKK per kg), but was only introduced on household sugar as a tax on industrial sugar would apparently lead to huge administrative problems, especially when it came to the sugar content of



Source: Rapport om grænsehandel 2001, Skatteministeriet, 2002.

Figure 7.1 The sale of mineral water in Denmark (mill. litres) 1990-2001.

imported products. A tax on industrial sugar would furthermore lead to increased use of alternative sweeteners. The announcement of the tax gave rise to widespread hoarding, and as a result the law did not result in any apparent government revenue. In the longer term, the tax resulted in a reduction in the total consumption of sugar of 10-15 percent which, however, to a certain degree was compensated for by an increased consumption of other types of sugar made of e.g. maize starch. The tax did however change the distribution of the total consumption of sugar between household sugar and industrial sugar. The fact was that it became relatively cheaper to e.g. buy ready-made preserve instead of making it yourself. The sugar tax was discontinued in December of 1989.

Taxes have furthermore been imposed on several food products and beverages. Below are mentioned some examples of the size of the taxes as well as the government revenue:

- Chocolate and sugary food products: 14.20 DKK/kg. In Denmark, the average price of chocolate/sweets is 80 DKK, corresponding to a tax of 19 percent and total government revenue of 1,317 million DKK. (2001).
- Mineral water: 1.65 DKK/l, in average a tax of approx. 15 percent and government revenue of 767 million DKK (2001). The tax was reduced to 1.15 DKK/l in 2003 and to 0.91 from the 1st of January 2007.
- Spirits: 150 DKK/l, corresponding to a tax of 100 percent. At a price of 42 DKK per bottle 40 percent spirits, the tax constitutes 36 percent. Total government revenue of 1,265 million DKK (2004).
- Wine: 8.80 DKK per bottle, an average tax of 20 percent and total government revenue of 1,136 million DKK (2004).
- Beer tax: 1.03 DKK per bottle, an average tax of 21 percent and revenue of 1,366 million DKK (2004).
- Ice for consumption: 0.94 DKK/l with total government revenue of 181 million DKK (2004).
- Coffee: 6.54 DKK/kg with total government revenue of 271 million DKK.
- Packaging: 0.125 DKK for a normal bottle, 0.40 DKK for a 1 litre bottle.

Hence, tax rates of 15-35 percent are not uncommon when it comes to food products and beverages.



## **7.2 Could taxes and subsidies be used in nutrition policy?**

Some of the examples of the effect of taxes and subsidies on consumption mentioned in section 7.1 are historical and not likely to be fully applicable today where the percentage of income used on food has decreased. The examples can however be used to illustrate that the use of economic measures is not uncomplicated, and that certain conditions need to be satisfied if taxes/subsidies should be able to affect the composition of the consumption in a way that will have an influence on the health status:

- The food products in question should be food products that make up a significant part of a family's nutrition – such as milk would do in families with children.
- The price difference should be as big as to be noticeable.
- The effect of the taxes is biggest if the products in question are products that can be substituted with healthier alternatives - such as whole milk that can substituted with low-fat milk without any significant loss of taste.
- Taxes should result in improvements in the food consumption for groups who need it.

In the theory of economic regulation the main principle is that intervention measures should be aimed as directly as possible at the desired effect. To reduce the greenhouse effect, taxes should be directed at CO<sub>2</sub> emission and not car-driving. If obesity is the problem, it would indicate a tax on obesity, i.e. for example a tax based on the body mass index, BMI. This has for many reasons not been seriously suggested (see Bonke, 1999), a tax based on BMI would among other things be close to constituting an ethical unwarrantable tax on diseases. However, a range of accepted pricing

measures are of a similar nature, e.g. higher life insurance premiums in cases of unhealthy lives, hospital payments etc. Traditional taxes on fats and sugar are, however, also problematic in certain contexts. It may seem unfair that a big, slim, physically hard working man should pay extra for the necessary high energy intake he needs, while a small woman with work that requires very little physical activity becomes fat on the same diet.

There are also social aspects of such taxes. There is no doubt (cf. e.g. Smed & Denver, 2004) that nutrition taxes, no matter how they are composed, will to some extent be socially imbalanced. The lowest social classes are the ones that will be affected the most. It is then possible to try to remedy this through the use of other social schemes, such as social security and child benefits, or defend the use of the intervention measure by the fact that the lower social classes are the ones with poorest health. In many countries, smoking as well as the consumption of alcohol are clearly most common among the lower social classes, cf. the example with "the poor man's aquavit" in connection with the introduction of aquavit taxes in 1917. This has, however, not prevented the Danish Parliament from introducing higher taxes on tobacco and spirits.

### **7.3 Changing dietary patterns through taxes and subsidies**

As discussed above there are good arguments in favour of using regulatory economic measures in nutrition policy, however, the question is how efficient they are and how they interact with other measures. This is hard to say as economics and demand analysis is only to a limited extent part of the experimental sciences. It is not possible to experiment with two groups of consumers where one group pays higher prices than the other. Therefore, the conclusions must be drawn from the actual price variations in the markets, i.e. based on studies of whether the demand is lower at high prices than at low prices, or whether the demand correlates with the fluctuations in prices over time. The problem with such variations is that there are a lot

of changing factors at the same time. Therefore, complicated models have to be created to account for variations in price, income as well as wealth and, based on this, make an estimation of the desired results.

Hence, in this way the typical demand elasticities, i.e. how big the change in the demand for and the consumed quantity is if the price is changed by one percent, are estimated. Hence, if the demand elasticity for sugar is -0.3 it means that the consumption of sugar decreases 0.3 percent if the price of sugar increases by one percent, e.g. due to a tax increase. Apart from the direct elasticities, it is also possible to talk about cross-price elasticities which indicate what happens to the demand for a product if the price of another product rises, i.e. what happens e.g. to the demand for pork, if the price of beef increases with one percent.

Three different types of data material have been used in recent analyses of the demand for food products in Denmark (cf. Jensen, Smed & Baltzer, 2004):

- *Statistics Denmark's* (Danmarks Statistik) national accounts figures which provide long series (1971-1996) for households and businesses with very reliable figures but with a low level of detail as these are to a very high degree macroeconomic figures concerning the Danish economy. The figures used are yearly figures. These figures can be combined with figures from Statistics Denmark's consumer study (Danmarks Statistik, 2002).
- The so-called *GfK figures* from the market analysis institute GfK Denmark. The figures are based on random samples of Danish household purchases in 1997-2000. These are based on weekly registrations of staple goods purchased in 2,000 representatively selected households that have been thoroughly specified based on family type, age, number of children, income, education, residence etc. The households have reported their purchases with a high level of detail using a diary system into where the products are entered immediately on return from shopping with statement of quantity (piece or gram), price (DKK), make (e.g.

Schulstad Bread), type (e.g. fresh or frozen), shop (e.g. the low price supermarket Netto), packet size (e.g. 10 pieces), whether the product was bought on sale or not, whether it is organic etc. These data do not comprise non-household purchases made by household members, e.g. consumption in canteens and institutions as well as purchases of sweets of soft drinks in kiosks.

- *Registration of bar code data from COOP Danmark* with description of weekly turnover for all food products sold in each of COOP's stores from 1st quarter of 2000 to 2nd quarter of 2002. This material comprises a total of 934 stores.

An overview of the empirical analyses of the demand for food products can be found in Wegge & Jensen (2002). An exhaustive study based on data from Statistics Denmark can be found in Jensen and Toftkær (2002) and based on the GfK figures can be found in Smed (2002). The normal assumption in such analyses is that consumers make stepwise choices. The analyses are therefore started by dividing the total consumption into main groups (beverages, clothing, food products etc.). In Jensen and Toftkær (2002) the food products are then characterized into three groups: Meat/fish, Dairy products and Vegetables each of which is subdivided into a range of subgroups. Meat/fish is divided into beef, pork, poultry, lamb, and fish. Dairy products into whole milk, low-fat milk, junket etc., other milk, butter, other fats, egg and cheese, and Vegetables into cereal products, sugar etc., and fruit/vegetables. The distribution of consumption among groups is among other things decided by prices but also by other variables, such as e.g. income. This kind of decision structure indicates that it might be relatively easy to shift consumption between related substitutes, e.g. from one type of meat to another, or from one type of vegetable to another, while it is more difficult to shift consumption from meat to vegetables.

The elasticities estimated in such analyses vary very much in size. High own-price elasticities are e.g. registered for whole milk (-1.14), pork (-1.20) and sugar (-1.01), and low ones for low-fat milk (0.37) and fish (-

0.30). Cross-price elasticities are typically small, however with various exceptions. The demand for beef would e.g. increase 0.61 percent if pork prices increased 1 percent, and the demand for margarine would increase 0.42 percent if the price for butter increased 1 percent. Hence, these figures are so high that consumption could be shifted significantly through the use of subsidies and taxes: To use the highest of the above elasticities, a 10 percent tax on pork would reduce the consumption of pork by 12 percent.

These analyses have been used to estimate the value of using taxes as a nutrition policy instrument (Smed and Denver, 2004; Landbrugets Økonomi, 2004). Hence, based on the GFK data, Smed and Denver carry out an analyse of whether differentiated VAT constitutes a viable road. The task provides in itself fixed boundaries for what is possible, as it is evident that it is hard to imagine VAT rates higher than the ordinary VAT rate, and that the "subsidies" can as a maximum only correspond to that of a VAT exemption, i.e. 25 percent. The calculation included in the Landbrugets Økonomi (Agricultural Economics) (2004) is only an illustration of the use of specific taxes on cholesterol, fat and saturated fat, and subsidies for fibres. The specific taxes are calculated based on bases of allocation specifying the content in the specific products. The analysis constitutes a useful description of the possibilities that in principle can be used. They are however difficult to administer in practice. It is e.g. difficult to register the content of fat in various cuttings of meat.

In practice, it seems far more tempting to consider the use of excise taxes on particularly unhealthy products, such as e.g. sweet beverages, than to consider the use of so imprecise an instrument as ordinary VAT. Excise taxes could e.g. be combined with a reduction in VAT on fruit and vegetables.

It should furthermore be considered what the effect of other instruments than taxes and subsidies would be. A large number of studies (e.g. Bjørner & Hansen, 2002) indicate that labelling has a significant effect on the consumption pattern. These find that for toilet paper, paper towels, and washing powder labelled with the Nordic swan ecolabel, this label has

an effect similar to a price reduction of 10-17 percent. Hence, if these results could be transferred to food products, the effect of a recognised label would correspond to a halving of VAT (assuming that the price elasticity is approx. one). However, no corresponding studies have been made concerning the effect of nutrition labelling regarding the consumption of food products. The reason for this is among other things that food products are part of a very complex product group compared to toilet paper, paper towels, and washing powder, and that studies of the nutritional effect of nutrition labelling are difficult to carry out.

Studies normally settle with investigating the population's knowledge of the label. In Sweden, a study has e.g. been carry out to investigate consumers' knowledge of the "Keyhole label" and what it stands for (Livsmedelsverket, 2003). This study shows that a large part of Swedish consumers know the label but the study does not give any information about how and to what extent this knowledge results in changes in the consumption of food products. Something similar is true regarding the knowledge of the effect of information campaigns concerning nutrition, e.g. the "6 pieces/portions per day" campaign. Follow-up studies examine the effect on consumer knowledge, while no calculations are made of the changes in consumption or nutritional status.

Finally, there might be reason to consider the relation between the various measures, especially between labelling/information campaigns and taxes. In other economic areas, an intense discussion of the relationship between information and price policy has taken place. Hence, exchange rate theoreticians have engaged in a long discussion of the extent to which political statements about fixed exchange rate policy controls the exchange rate development, and to what extent the exchange rate development is controlled by the actual economic policy. So far, there appears to be agreement that the two conditions are reinforcing each other (de Grauwe, 1996); a statement indicates a policy and focuses on this policy, however without actual economic intervention the statement is considered void. The market agents would, on the other hand, hardly react to the same extent to a specific policy that is not substantiate by clear statements of

intent. Similarly, it is possible to imagine that information campaigns and labelling schemes for healthy food products followed by tax reductions probably would be much more efficient than separate labelling schemes and taxes as the labelling substantiates the intent which is indicated by the taxes, and the taxes are tangible incentives to take the recommendations and labelling seriously.

## **8. Scenarios showing the effect of economic measures**

To illustrate the effect of the economic measures on the consumption of healthy and unhealthy food products in different social classes, an analysis of three studies has been carried out for use in this discussion paper (Jørgen D. Jensen, The Institute of Food and Resource Economic, Uni-versity of Copenhagen, 2006):

1. Exemption of VAT on "healthy" food products
2. Increased tax on "unhealthy" food products
3. Exemption of VAT on "healthy" food and increased tax on "unhealthy" food products

The analysis focuses on the consequences of a change in subsidies for and taxes on food products concerning the distribution of the food products purchased by the various food product groups and, hence, on a possible change in composition of the population's diet.

### **8.1 Analysis tools and parameters**

The scenarios have been calculated based on the calculation model illustrated in section 7.3. The data used as the base for the analysis are the GfK data from the market analysis institute GfK Danmark as also indicated in section 7.3.

To be able to analyse data, the underlying population must be divided into well-defined groups. The analysis has been carried out according to the GfK method and is used to examine the distributional consequences for the various social classes. The definition of the social classes used is described in the table 8.1. These social classes are as all categorisations open to discussion



Table 8.1 Description of social classes in GfK data.

<b>Social class</b>	<b>Content</b>
Soc. 1	Self-employed with 21 subordinates or more - regardless of education Self-employed with university degree - regardless of number of subordinates White-collar workers with 51 subordinates or more - regardless of education White-collar workers with university degree - regardless of number of subordinates Landed proprietors
Soc. 2	Self-employed in trade and industry etc. with 6-20 subordinates or with medium-long higher education White-collar workers with 11-50 subordinates or with medium-long higher education Landed proprietors with 4 or more subordinates
Soc. 3	Self-employed in trade and industry etc. with 0-5 subordinates White-collar workers with 1-10 subordinates or "expert-minded" work Landed proprietors with 0-3 subordinates
Soc. 4	White-collar workers without subordinates and without higher education and "expert-minded" work Skilled workers Smallholders
Soc. 5	Unskilled workers Students Other without professions

Source: Smed & Denver: "Fødevareefterspørgsel på tværs – sundhed og ernæring: Er momsdifferentiering en farbar vej?" Fødevareøkonomisk Institut, 2004.

and many other categorisations could be used. A division into income groups could e.g. have been used, and in such case many people with a humanistic educational background from social group 1 would e.g. have 2 lower lifetime income than a skilled worker in social group 4. A division

into lifestyles could also have been used, and in such case a female teacher and a male police officer would e.g. be placed differently even though they have both been placed in social group 4. Any division into a comparatively small number of groups would under all circumstances result in a simplified description of the underlying population.

In the underlying GfK data describing the food product demand behaviour in different population groups, the food products have been categorised into 23 groups: Rice and pasta, Potatoes, Fresh fruit, Frozen and canned fruit and vegetables, Fresh vegetables, Biscuits and cakes, Sugar and sugar products, Bread, Other food products, Fish products, Cold cuts, Poultry, Fish, Pork, Beef, Other meat, Margarine, Butter, Egg, Cheese, Milk, Sour milk products, Other dairy products.

To be able to carry out quantitative calculations of the economic consequences of the three scenarios and of the consequences for the consumption of food and its composition and, hence, for the health situation using the model described below, the 23 food product groups of the model have been categorised as "healthy", "unhealthy", and "mixed", respectively. In this connection, the guidelines discussed in chap. 4, cf. the official dietary guidelines, are used so that the "healthy" food products comprise the food groups: Rice and pasta, Potatoes, Fresh fruit, Frozen and canned fruit and vegetables, Fresh vegetables, Fish products and Fish, and the "unhealthy" food products comprise: Biscuits and cakes, Sugar and sugar products, Margarine, Butter and Egg. The remaining – "mixed" – groups that e.g. comprise meat and milk contains both "healthy" and "unhealthy" food products and can therefore not be attributed to neither one nor the other of the above groups. Beef can e.g. consist of products with both a very high and a very low content of fat. Furthermore, it is of course a shortcoming that the group Sugar and sugar products contains sugar, sweeteners, ice cream, chocolate spread and jam, as most of our sugar intake comes from other food products with added sugar, e.g. sweets and soft drinks. In this analysis some food product groups are therefore identified as mainly "healthy" and some as mainly "unhealthy" – even though we are well-aware that this is an approximation which has to be refined before

being used in practice. With regard to the food product nutrients which we should cut down on, namely fat and sugar, the "unhealthy" food product categories are important contributors of these two components to the Danish average diet. This is the conclusion in a dietary study carried out by the National Food Agency of Denmark (Levnedsmiddelstyrelsen) in 1995 (Andersen et al., 1996) from which the data in table 8.2 is collected.

Table 8.2 Sources of selected nutrients in the Danish diet as stated in the dietary study from 1995, in percentages.

<b>Product groups</b>	<b>Total fat</b>	<b>Saturated fat</b>	<b>Total carbo-hydrate</b>	<b>Added sugar</b>	<b>Dietary fibre</b>
Milk	13	20	8	3	1
Cheese	8	13	0	0	0
Cereal products	7	3	47	2	62
Vegetables	2	0	12	1	24
Fruit <sup>1</sup>	2	1	13	23	12
Meat	18	17	0	0	0
Fish	2	1	0	2	0
Poultry	2	1	0	0	0
Egg	3	2	0	0	0
Fats	40	36	0	0	0
Sweets and ice cream	3	6	12	55	0
Beverages	0	0	8	15	0

<sup>1</sup>. Incl. preserve, jam, and sweetened fruit juice.

Source: Andersen et al.: "Danskernes kostvaner 1995. Hovedresultater." Levnedsmiddelstyr., 1996.

As can be seen, the product groups are not corresponding exactly to the 23 food product groups in the underlying GfK data, but the figures illustrate that we – through the categorisation of the GfK data into "healthy", "unhealthy", and "mixed" food products – have in fact included the key sources of dietary fat in the category "unhealthy" food products as well as some of the key sources of dietary sugar. As can be seen in the table, fats, mainly butter and margarine which in this discussion paper are categorised as "unhealthy" product groups, account for a total of approx. 40 percent of the dietary fat. Cheese accounts for 8 percent. Milk and meat that are included as "mixed" product groups above contribute with 13 and 18 percent, respectively. With regard to sugar, a part of the added sugar in the table is included in the group of "unhealthy" products, since "Sweets and ice cream" according to the dietary study is the biggest source of added dietary sugar as it contributes with more than half of it, while a third comes from jam, preserve, and sweetened fruit juice, which belong under the "Fruit" table product group; and soft drinks, which belong under the Beverages table product group.

The calculations in this analysis are based on various assumptions about the mechanisms governing consumers' choice of food. It is assumed, as is customary in this type of study, cf. section 7.3, that consumers make stepwise choices, i.e. they firstly allocate the amount available to them for consumption to main groups (meat, dairy products, fruit etc.), and then distribute the amount they have allocated for meat on subgroups (beef, pork, poultry, lamb, and fish). Each of these allocations are governed by parameters (own-price and cross-price elasticities for the 23 mentioned food product groups for the different social groups) which have been estimated based on the data. Hence, statistical methods have been used to try and establish how consumer choices have previously been affected by price and income, and it is then assumed that consumers will act likewise on future price and income changes.

Such calculation will therefore be misleading if there are changes in the behaviour of the consumers. This can take place in two ways. Either due to fundamental structural changes in the behaviour of consumers, or due to

changes in the parameters. With regard to changes in the consumption pattern, it could e.g. be presumed that cheese has always been eaten as a second course and therefore is included in the main group with desserts and fruit. The calculation method will produce misleading results if the consumption pattern is changed so that cheese is only eaten as part of breakfast, as it is then included in a main group with yoghurt, junket, oatmeal porridge and breakfast rolls. With regard to the parameters, it could be imagined that the estimated parameters are not constant over time; it might e.g. be that the behaviour of the consumers becomes less price sensitive as they get richer, or if pricing becomes less clear. However, in practice the behaviour of consumers is relatively stable in the short and medium-long term, so it is not likely that there will be any serious problem in using figures from around the year 2000 to forecast the effects of introducing nutrition policy intervention measures today.

The available GfK data material has not allowed for an estimation of price elasticities regarding the consumption of soft drinks and fruit juice in Denmark. Based on Danish data for the total consumption of different types of beverages, Norwegian estimates (Gustavsen, 2004) for price elasticities have been used instead as the basis for an assessment of the effect of consumption changes in Denmark.

## **8.2 Three scenarios**

In *scenario 1*, the consequences of the exemption of VAT on rice, pasta, potatoes, fruit, vegetables, and fish products are examined. A such VAT exemption is estimated to have a maximum impact on consumer prices and, hence, reduce prices with 20 percent. The fall in the price of "healthy" food products may be expected to stimulate consumption of the products in question at the expense of other – both "unhealthy", "healthy" and "mixed" – food products. Various complementarities in the consumption of food products (e.g. a connection between the consumption of cornflakes and milk) may however lead to a more complex reaction.

In *scenario 2*, on the other hand, the consequences of increased taxes on food products categorised as "unhealthy" are examined. To make the effects fairly suitable for comparison with scenario 1, the increase in tax has been fixed at a level where the expected surplus revenue for the government (if consumption is unchanged) counterbalance the revenue loss in scenario 1. With the product classification used, the expectation is to reach this goal with an extra tax of approx. 30 percent on "unhealthy" food products. The tax increase is assumed to have a maximum impact on consumer prices and must be expected to provide a financial incentive to consume less "unhealthy" food products and instead consume more of the "healthy" and "mixed" food products. Once again, substitution and complementarity patterns can result in more complex reactions.

*Scenario 3* consists of a combination of the two first scenarios, i.e. exemption of VAT on "healthy" food products and a 30 percent extra tax on "unhealthy" food products. The scenario is expected to result in a decrease in the consumption of "unhealthy" food products and an increase in the consumption of "healthy" food products, while the net consequences for the consumption of "mixed" food products will be based on the quantitative analyses. The purpose of the scenario is to examine to what extent the effects of scenario 1 and 2 are additive and the consequences of using the two instruments at the same time. Although the scenario in principle is revenue neutral if the food product consumption is unchanged, adaptations in the consumption of food products towards lower taxation of food products result in moderate change in government net revenue.

Table 8.3 shows the calculated consumption changes in percent for selected food product groups. At a first evaluation of the table, attention is drawn to the fact that it shows considerable changes in the consumption in the three scenarios. Intuitively, one would expect that the own-price elasticities would be around one at the most, and that the consumption of products, where the price is reduced by 20 percent due to the VAT exemption, therefore, would increase by approx. 20 percent at the most,

Table 8.3 Change in consumption of selected food product groups (in percent) in five social classes (soc). 1-5. See table 8.1. for a definition of the social classes.

		<b>Soc. 1</b>	<b>Soc. 2</b>	<b>Soc. 3</b>	<b>Soc. 4</b>	<b>Soc. 5</b>	<b>All</b>
<b>Vegetables</b>	Scenario 1	13	16	18	22	12	17
	Scenario 2	-10	-12	-4	1	-13	-6
	Scenario 3	3	4	13	24	-1	11
<b>Fish</b>	Scenario 1	-7	8	16	30	-2	13
	Scenario 2	-10	-12	-4	1	-13	-6
	Scenario 3	-16	-4	11	31	-15	7
<b>Fruit</b>	Scenario 1	30	25	18	37	47	31
	Scenario 2	-19	-10	-12	-10	-8	-11
	Scenario 3	10	14	6	27	39	19
<b>Sugar /sugary food prod.</b>	Scenario 1	-7	-10	-10	-15	-11	-12
	Scenario 2	-61	-45	-44	-49	-2	-37
	Scenario 3	-69	-55	-54	-64	-14	-49
<b>Bisquits /cakes</b>	Scenario 1	-19	-23	-16	-16	-12	-16
	Scenario 2	-55	-42	-38	-46	4	-33
	Scenario 3	-74	-64	-54	-62	-9	-50
<b>Butter</b>	Scenario 1	20	23	12	29	-36	8
	Scenario 2	35	-39	-33	28	-10	-5
	Scenario 3	55	-16	-22	57	-46	3
<b>Margarine /other fats</b>	Scenario 1	20	23	12	29	-36	7
	Scenario 2	29	16	31	101	47	49
	Scenario 3	49	39	43	129	11	56

Source: Jørgen D. Jensen, The Institute of Food and Resource Economics, University of Copenhagen, 2006.

and that the consumption of products that are subjected to a tax of 30 percent would decrease by approx. 30 percent at the most. When the effects indicated in several places in the table are bigger, this may in part be due to the fact that the elasticities for some products are actually over 1, and partly that the cross-effects are more complicated than an intuitive consideration of one individual product would indicate. It is, however, also important to remember that the effects are calculated on the basis of weekly figures which may result in too big effects. If the prices are low one week, e.g. because the product is on sale, consumers may have hoarded the product in question which would result in an effect of the purchase which is not reflected in a similar change in consumption.

Hence, the illustrated effects must be said to be high threshold estimates, especially for durable products.

Furthermore, when interpreting the figures, it must be remembered that the effects are a combination of income effects and substitution effects. If taxes are increased, consumers become poorer, which means that they cut down on expensive products – this is what economists call the income effect. This might be the reason why the consumption of fish, fruit and vegetables decreases when taxes on fat and sugar are increased, even though the substitution effects (the fact that fish, fruit and vegetables become relatively cheaper compared with fat and sugar) are pulling in the other direction. The reduced consumption of fish, fruit and vegetables may be considered to be an income effect.

In particular many of the effects on butter and margarine are contra-intuitive. This is presumably due to the fact that nobody buys butter, margarine and other fats to use them without other ingredients. In the short term, the consumption of butter and other fats is therefore dependent on the dishes that people are considering preparing. You choose whether you want to prepare pork loin or fish, sandwiches or fondue, and then you buy the quantity of fats that is needed to prepare the dish in question. This is particularly true when no distinction is made between various types of fats, and when looking at the short term effects estimated on the basis of weekly registrations.



A reduction in e.g. the amount a butter used on sand-wiches will probably only be relevant in the long term when habits are gradually changing (however, such long-term effects can not be captured in a model based on weekly figures for a shorter period of years).

It is important to be aware that the effects are made up of a complicated pattern of substitution and complementarity effects. An increase in the tax on butter will, from an isolated point of view, result in significant reductions in the consumption of butter and an increase in the consumption of margarine due to the closely related possibilities of substitution when it comes to butter and margarine. An increase in the tax on margarine will, from an isolated point of view, result in significant reductions in the consumption of margarine, but will on the other hand not have a particularly strong effect the consumption of butter.

The combination of butter and margarine taxes results in a net reduction in the consumption of butter and an increase in the consumption of margarine (i.e. a total net reduction in the consumption of "yellow fats"), however it will at the same time generate a reduction in the consumption of fruit and vegetables (again probably an income effect which results in consumers becoming poorer due to the tax increases, which is why they cut down on expensive products as butter, fruit and fish, and use more of the cheaper products, such as margarine). The effects of a combination of increased taxes on "unhealthy" food products and lower taxes on "healthy" food products correspond roughly to the total effects of the first two scenarios.

With regard to the effect on the various social classes, the picture is quite varied for certain product groups (see e.g. the consumption of butter). Here it is important to remember that the classification in only five social classes is a very crude classification. Especially the classification of social class 5 is rather problematic – this group includes e.g. students, unskilled workers and old age pensioners, and even though they all have relatively low income, this is at the same time almost also the only thing they have in common. Therefore, the right thing to do here is to interpret the figures for especially social class 5 with care.

Although there is a significant random variation, especially the VAT

development for "healthy" food products seems to have a relatively stronger total effect on the lowest social classes.

In summary, the described tax changes give rise to some desirable effects on the consumption of food products, however, they also result in indirect consumption effects which in some cases are desirable and in some cases are not. The results indicate some differences in the consumption effects across the social classes. Hence, there seems to be a certain indication that the net increase in the consumption of "healthy" food products due to tax changes will be more significant in the households of the lower social classes than the higher social classes. The results do however not show any clear indications across social classes in terms of whether the tax changes affect the consumption of "unhealthy" food products.

### **8.3 The effects of the scenarios on the consumption of soft drinks**

The Danish consumption of sugary beverages (soft drinks and fruit juice) amounts to 3-4 billion DKK – or between 1,500 and 2,000 DKK yearly per household. As mentioned earlier, the data available have not been sufficient for estimating the price elasticities for these beverages. Therefore, an analysis of Norwegian data (Gustavsen, 2004) has been used as the basis for the estimation of a median own-price elasticity of -0.77 and a corresponding elasticity for cordial and juice of -0.41. These elasticity estimates are used in this analysis in connection with the Danish consumption data from Statistics Denmark's consumer study (2002) which includes information about the expenses for different types of beverages in households according to profession. This information has been "translated" into the five social classes.

The described extra tax of approx. 30 percent in scenario 2 results in an 18 percent reduction of the consumption of soft drinks with the above mentioned price elasticities. If it is assumed that a third of the product group "fruit juice and juice" consists of sugar-sweetened cordial (so that

the average extra tax for the product group as a whole is 10 percent), the consumption of this product group is reduced by approx. 4 percent. As mentioned, it has not been possible to examine whether the price elasticities vary across social classes, which is why the change in the consumption of beverages is assumed to be proportional for all social classes. However, the analysis carried out by Gustavsen (2004) indicates that the consumption of soft drinks is very price sensitive among the Norwegian consumers who already have the highest consumption of soft drinks. If a similar trend is present in Denmark, price sensitivity should be highest in social class 4 and lowest in social class 5. If this is the case, a tax on soft drinks would reduce the consumption most, relatively seen, in social class 4 and least in social class 5, as social class 5, as mentioned, is relatively broadly composed.

## **8.4 Economic consequences of the scenarios**

The economic consequences of the three scenarios for different types of households are illustrated in table 8.4 on the next page. The economic consequences are estimated as the compensation requirement (amount in DKK) needed for the consumers to achieve the same utility level as before the tax change. A negative compensation requirement means that the household achieves a gain through the tax change. This compensation requirement is the most appropriate indicator for measuring and comparing the welfare effect for the relevant types of households.

The compensation requirement generated by a VAT reduction is inherently negative as households will be able to reach the original utility level with a lower food budget as the "healthy" food products have become cheaper. Hence, households in all social classes achieve a net welfare gain as a consequence of the VAT reduction on "healthy" food products - also even if they for some reason have to use the saved tax amount in another way. However, please note that the gain is highest in the upper social classes and lowest in the lower social classes.

A higher taxation of "unhealthy" food products will, on the other hand, naturally result in a positive compensation requirement – the households are subject to a welfare loss due to the tax increase, as they will not be able to reach the original utility level with the original budget if the price of some of the food products rises. Social class 1 is subject to the biggest loss per household. However, for the remaining social classes there is a tendency for the loss per household to be bigger in the lower social classes than in the higher. Hence, heavy taxation of "unhealthy" food products has a regressive effect on the distribution of income.

A combination of tax increases and reductions result in economic welfare gain for all social classes – the highest for social class 2 and 3, and the lowest for social class 4 and 5.

With regard to the macro-economic effects, VAT exemption on "healthy" food products results in practically unchanged total food expenses. However, the composition of expenses regarding product purchases and tax payments changes somewhat. Hence, tax proceeds are estimated to be

Table 8.4 Economic consequences of alternative tax scenarios for households in five social classes. See table 8.1 for a definition of the social classes.

<b>Compensation requirement for reaching the initial utility level - DKK per household per year</b>						
	<b>Soc. 1</b>	<b>Soc. 2</b>	<b>Soc. 3</b>	<b>Soc. 4</b>	<b>Soc. 5</b>	<b>All</b>
Scenario 1: Reduced VAT	-2485	-2260	-2140	-2088	-1839	-2088
Scenario 2: Increased taxes	581	79	142	476	439	341
Scenario 3: Combination	-1926	-2202	-2183	-1683	-1762	-1907

Source: Jørgen D. Jensen, The Institute of Food and Resource Economics, University of Copenhagen, 2006.

reduced with 4.75 billion DKK, while net consumption is increased correspondingly – an increase of 8 percent. An increase in the tax on "unhealthy" food products results, on the other hand, in a significant reduction in food expenses, corresponding to approx. 8.7 billion DKK, but in an increase in tax proceeds of approx. 1 billion DKK. A combination of VAT exemption on "healthy" food products and higher taxes on "unhealthy" food products will also result in a significant reduction in the total consumption of food as well as a reduction in tax proceeds of around 2.9 billion DKK.

An extra tax of approx. 30 percent on soft drinks and sweetened cordial will generate tax proceeds of between a half and one billion DKK. An extra tax of approx. 30 percent on soft drinks and sugar-sweetened fruit juice will increase the average yearly expenses per household by approx. 110 DKK. There are no clear differences in the extra expenses for households in social class 1-4. The increase is however somewhat smaller in social class 5 which includes a relatively high share of one-person households. Hence, when looking at extra expenses per person, the differences between the social classes are less pronounced.

When discussing taxes on food products it is worth considering the problems of border trade, e.g. in light of the newly introduced tax reduction on soft drinks and the corresponding problems with taxes on tobacco and spirits. In this connection it should be remembered that the kilo and litre price of fat, sugar and soft drinks is considerably smaller than the price of tobacco, beer and spirits. There will therefore probably not be any considerable danger of any large scale legal border trade arising for such products. The experience with regard to soft drinks is in fact not indicating any large scale legal border trade for private consumption, but rather an illegal import with an aim of onward sale. A such illegal import implies not only a case of tax evasion but also income tax evasion as well as possible illegal production or trade situations in the producer countries, however, tax variations are hardly of any importance regarding such trade.

## 8.5 Conclusions

According to the calculations, there may be a considerable potential for affecting food consumption through tax changes, however the described tax models can be said to have intended as well as unintended effects on the dietary composition. Hence, reduced taxes on "healthy" food products result in a stimulation of the consumption of these food products but may, however, also result in increased consumption of certain unhealthy food products, as indicated by the calculations. Similarly, increased taxes on "unhealthy" food products may also result in reduced consumption of some of these food products but may, however, also result in an increase in the consumption of other of the "unhealthy" food products. The quantity effects of increased taxes on "unhealthy" food products and reduced taxes on "healthy" food products are basically additive in the analysis of this discussion paper, i.e. the effects of a combined tax scenario correspond roughly to the sum of the effects of the individual "part scenarios".

Basically, consumers in the lower social classes tend to eat less healthily than consumers in the higher social classes. The discussed tax models seem to stimulate the consumption of healthy food products (fish, fruit and vegetables) to a relatively higher extent in the lower social classes, while there appears to be no systematic social differences regarding the effect of taxes on the consumption of unhealthy products. Hence, the analysed tax models can to a certain degree contribute to the correction of social imbalances in the dietary composition.

The results show a tendency for consumers in the lower social classes to end up with the greatest financial net strain (or the smallest gain) from the tax redistributions.

As mentioned, the calculations included have been carried out to illustrate the possible scale of the effects that changes in food taxes would have and, hence, the potential for the use of financial incentives as regulatory measures to get Danes to eat more healthily. The three described scenarios can be considered as relatively simple tax model examples and show results which indicate relatively significant effects. Hence, there are all reasons in the

world to move on to more refined calculations of more specified scenarios with a view to the implementation of such taxes.

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# Annex 1

Criteria for the use of the nutrition label based on a division into product groups. Continues on the next page. See footnotes and source reference on page 106.

Product groups	Fat (g/100g)			Saturated fat (g/100 g)		
Category	1	2	3	1	2	3
Dairy products except cheese	≤ 1,5	≤ 2,5	> 2,5	≤ 1	≤ 2	> 2
Cheese	≤ 15	≤ 20	> 20	≤ 10	≤ 13	> 13
Meat, poultry, pork products etc.	≤ 10	≤ 20	> 20	≤ 4	≤ 7	> 7
Fish and fish products <sup>4</sup>	≤ 10 or natural content from fish	≤ 20	> 20	≤ 4	≤ 7	> 7
Pastry (bread, biscuits, cakes), flour, oats, cereal products	≤ 5 or natural content from cereal products and seeds	≤ 10	> 10	≤ 1,5 or natural content from cereal products and seeds	≤ 4	> 4
- Flour and oats						
- Breakfast products						
Fruit and vegetables, potatoes and potato products <sup>5</sup>	Natural content fruit/ vegetables	≤ 5	> 5	Natural content fruit/ vegetables	≤ 4	> 4
- Pre-cooked potatoes						
Ready-made meals <sup>6</sup>	≤ 5	≤ 10	> 10	< 1,5	≤ 4	> 4
Fats <sup>7</sup>	≤ 5	≤ 10	> 10	≤ 1,5	> 1,5 and ≤ 20% of total fat	> 20% of total fat
Beverages (non-alcoholic)	0	≤ 2,5	> 2,5	0	≤ 2	> 2
Desserts, snacks and sweets	≤ 5	≤ 10	> 10	≤ 1,5	≤ 4	> 4

Criteria for the use of the nutrition label based on a division into product groups, continued.  
 See footnotes and source reference on page 106.

Product groups	Sugar (g/100 g)			Fibres <sup>2</sup> (g/100 g)			Sodium
Category	1	2	3	1	2	3	1
Dairy products except cheese	0 <sup>1</sup>	≤ 5	> 5 <sup>1</sup>				Sodium not added
Cheese							≤ 700 mg
Meat, poultry, pork products etc.							No threshold <sup>3</sup>
Fish and fish products <sup>4</sup>							No threshold
Pastry (bread, biscuits, cakes), flour, oats, cereal products	≤ 5	≤ 10	> 10	≥ 6	≥ 3	< 3	≤ 600 mg
- Flour and oats							Sodium not added
- Breakfast products							≤ 400 mg
Fruit and vegetables, potatoes and potato products <sup>5</sup>	0 <sup>1</sup>	≤ 10	> 10				Sodium not added
- Pre-cooked potatoes							≤ 100 mg
Ready-made meals <sup>6</sup>	≤ 5	≤ 10	> 10				≤ 500 mg
Fats <sup>7</sup>							≤ 500 mg
Beverages (non-alcoholic)	0	≤ 5	> 5				Sodium not added
Desserts, snacks and sweets	≤ 5	≤ 10	> 10				No threshold

Source: Catalogue draft for "Bekendtgørelse om Ernæringsmærket" (The departmental order concerning a nutrition label) of 8.8.2006, Annex 2. The Danish Veterinary and Food Administration, The Danish Ministry of Family and Consumer Affairs, 2006.

#### Notes for Annex 1:

1. Added sugar, i.e. naturally occurring lactose in dairy products or naturally occurring sugar in fruit and vegetables not included. Added sugar also includes fruit concentrates, honey etc.
2. Fibre content only relevant for the pastry/cereal group.
3. Under Departmental Order no. 392 of 16th of August 1985 concerning quality standards etc. for meat products, some meat products are subject to salt content standards.
4. Processed fish products must as a minimum contain 70 percent fish to be labelled as category 1.
5. Unprocessed products (can be gutted, cut, refrigerated or frozen) are labelled as category 1. Dried fruit and nuts are labelled as category 2.
6. Fruit and vegetables must make up at least 1/3 of the entire dish (w/w).
7. Pure fats (oil, plant margarine, butter, spreadable mixed products etc.) are not included under the threshold for total fat.

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