# Soft drinks, sweets, and sugar - tracking and lifestyle:

## The Oslo Youth Study

**Master Thesis in Public Health Nutrition**

**Lena Lie Nymoen**

**University of Oslo**

**2008**

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Lena Lie Nymoen

Oslo, May 2008

# Summary

**Background:** Sugar intake has increased substantially in most parts of the world over the past 50 years. Soft drinks seem to be the largest contributor to this increase. A high intake of sugar is correlated with tooth decay, and has been linked to the risk of becoming overweight, developing diabetes type 2 and other lifestyle diseases. One part of the prevention strategy for these diseases may therefore be to promote a reduced intake of foods and beverages high in sugar. To be able to design and implement an efficient prevention strategy, we need to know how intake of sugary foods and beverages develops from childhood into adulthood. Very few studies have looked at the stability of soft drink and sweet intake over this time period. The aim of this thesis is to assess the change in and tracking of soft drink and sweet intake from age 15 years (1981/1979) to age 40 years (2006), and total sugar intake from age 33 years (1999) to 40 years. The association of long-term intake of soft drinks, sweets, and sugar with BMI is assessed. In addition, cross-sectional analyses on the association of demographic and health-related behaviours with soft drink, sweet, and sugar intake at age 40 years is assessed.

**Design:** Longitudinal cohort study over 27 years, from 1981/1979 to 2006.

**Subjects:** A total of 1086 subjects from six primary- and secondary schools in Oslo, Norway, were invited to participate at baseline, mean age 15 years (1981/1979). These subjects have been followed up at age 25 years (1991), age 33 years (1999), and at age 40 years (2006), with varying participation rates at the different time points.

**Method:** Self-administered questionnaires were used in all surveys. Self-reported height and weight were obtained in 1999 and 2006.

**Results:** The level of tracking of soft drink intake at a group level was moderate to high from age 15 to age 40 years, and high during adult years. Sweet intake did not show a significant level of tracking from age 15 to 40 years. However, from age 25 to

40, as well as from age 33 to 40 years, the level of tracking of sweet intake was high. At the individual level, the level of tracking of soft drink, sweet, and sugar intake was moderate from age 33 to 40 years. Sugar and soft drink intake decreased substantially between age 33 and 40 years. Long-term intake of soft drinks, sweets, and sugar were not associated with BMI. Intake of soft drinks and sugar at age 40 years were, however, associated with other unhealthy lifestyle variables like smoking and a low level of leisure time physical activity.

**Conclusion:** At group level, relative intake frequency of soft drinks seems to be stable from adolescence into adulthood, while for sweet intake it seems to be relatively unstable. From age 25 years, both the relative intake frequency of soft drinks and sweets seem to be stable at group level. Long-term intake of these foods and beverages, and intake of sugar in general, were not found to be associated with BMI in this study. Soft drinks and sugar seem to be markers of an unhealthy lifestyle in general.

# Norsk sammendrag

**Bakgrunn:** Sukkerinntaket har over de siste 50 år økt betraktelig over store deler av verden. Brus ser ut til å bidra mest til denne økningen. Et høyt inntak av sukker er korrelert med karies, og har blitt koblet til en økt risiko for å utvikle overvekt, diabetes type 2 og andre livsstilssykdommer. Ett ledd i forebyggingen av disse sykdommene kan derfor være å promotere et redusert inntake av mat- og drikkevarer med et høyt sukkerinnhold. For å kunne designe og implementere en effektiv forebyggingsstrategi, trenger vi kunnskap om hvordan inntaket av sukkerholdige mat- og drikkevarer utvikler seg fra barndom til voksen alder. Svært få studier har sett på stabiliteten i brus- og godteriinntak over dette tidsrommet. Målet med denne masteroppgaven er å belyse endring i og stabiliteten ('tracking') av brus- og godteriinntak fra 15 år til 40 år, og totalt sukkerinntak fra 33 år til 40 år. Forholdet mellom langtidsinntak av brus, godteri og sukker, og kroppsmasseindeks blir studert. I tillegg blir assosiasjonen mellom demografiske og helserelaterte variabler, og inntaket av brus, godteri og sukker ved 40 år studert.

**Design:** Longitudinell kohortstudie over 27 år, fra 1981/1979 til 2006.

**Studieobjekter/deltakere:** 1086 personer med gjennomsnittsalder 15 år ble invitert til å delta ved baseline i 1981/1979. Disse personene er siden blitt fulgt opp ved 25 år (1991), 33 år (1999) og ved 40 år (2006), med varierende responsrater på de forskjellige tidspunktene.

**Metode:** Selvrapporterte data om mat- og drikkevaner, samt andre helserelaterte variabler har blitt samlet inn ved alle studietidspunktene. Egenrapportert høyde og vekt ble samlet inn i 1999 og 2006.

**Resultater:** Den relative stabiliteten i brusinntak på gruppenivå var moderat til høy mellom 15 og 40 år, og høy i voksen alder. For godteriinntak var den relative stabiliteten på gruppenivå lav fra 15 til 40 år, men høy fra 25 til 40 år, og fra 33 til 40 år. På individnivå ble det funnet en moderat stabilitet i brus-, godteri- og sukkerinntak

fra 33 til 40 år. Brus- og sukkerinntaket sank vesentlig fra 33 til 40 år. Langtidsinntak av brus, godteri og sukker var ikke assosiert med kroppsmasseindeks. Inntaket av brus og sukker ved 40 år var imidlertid assosiert med andre usunne livsstilsfaktorer som røyking og et lavt nivå av fysisk aktivitet på fritiden.

**Konklusjon:** På gruppenivå synes den relative inntaksfrekvensen av brus å være stabil fra ungdom til voksen alder, men for godteri synes den å være relativt ustabil. Fra 25 års alder synes den relative inntaksfrekvensen av både brus og godteri å være stabil på gruppenivå. Langtidsinntaket av brus, godteri og sukker, ble i denne studien funnet å ikke være forbundet med kroppsmasseindeks. Brus- og sukkerinntak virker å være markører for en usunn livsstil generelt.

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# Abbreviations and definitions

### Abbreviations

| | |
|---|---|
| ANOVA | Analysis Of Variance |
| ANCOVA | Analysis Of Covariance |
| BMI | Body Mass Index |
| BMR | Basal Metabolic Rate |
| CVD | Cardiovascular Disease |
| E% | Per cent of total energy intake |
| EI | Energy Intake |
| FFQ | Food Frequency Questionnaire |
| GP | General Practitioner |
| LTPA | Leisure Time Physical Activity |

### Definitions

Body Mass Index (BMI) is defined as weight in kilograms divided by the square of height in meters, $kg/m^2$.

Overweight and obesity is defined as BMI $\geq 25$ $kg/m^2$ and BMI $\geq 30$ $kg/m^2$, respectively.

Soft drinks = Sugar-sweetened, carbonated beverages, not including squash and other sugar-sweetened beverages like ice tea and sports drinks.

Sweets = chocolate, candy, and confectionary (1999)/"smågodt" (2006)[*]

[*] "Smågodt" ('Sweets, pay per kilo') is a common way to buy sweets in Norway. It includes all sorts of sweets, like chocolate, candy and wine gum. Consumers can pick the sweets they like from large shelves, normally containing 30 to 40 different types of sweets.

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# 1. Introduction

This master thesis is part of the fifth follow-up of the Oslo Youth Study, carried out during autumn 2006. The Oslo Youth Study is one of the longest running nutrition surveys in Norway, and therefore makes an important contribution to the knowledge on longitudinal eating patterns and other health-related behaviours in a Norwegian population.

The knowledge base on tracking of sweet foods and beverages, as well as sugar in general, is meagre. There is also little research done on intake of soft drinks, sweets, and sugar in the Norwegian population, and on the association of demographic and health-related factors with these intakes. The findings in this thesis may therefore be an important contribution to this scarcely explored field.

# 2. Background

## 2.1 The Oslo Youth Study

The Oslo Youth Study was initiated in Oslo, Norway, in 1979 as part of the International Know Your Body Risk Factor Assessment Programme (1). Students in 5th, 6th, and 7th grade (mean age 13 years) at six combined primary and secondary schools were invited to participate. The initial purpose of the study was to obtain epidemiological data about cancer and cardiovascular disease (CVD) risk factors and related behaviours in an adolescent population (2). At the first screening in 1979, students from Oslo had a higher cholesterol level than students from the 14 other participating countries. It was therefore decided to implement and evaluate a school-based health education programme designed to improve students' eating patterns, increase their physical activity level, and reduce their rate of cigarette smoking. This programme, implemented in three of the six schools, was part of the World Health Organization Collaborative Study on Health Promotion in Youth (3). In 1981 the intervention was evaluated to see if the health education programme had been effective (4). After this initial survey, four follow-ups have been carried out, in 1989, 1991, 1999, and in 2006.

## 2.2 Sugar and health

During the last 40 to 50 years, intake of sugar and other caloric sweeteners has increased considerably around the world (5). Today, consumption of added sugars, notably in the form of sugary drinks, accounts for a substantial proportion of energy intake in both western and less developed countries (5;6).

Sugar derived from cane is the most profitable edible cash crop in the world, and sugars and syrups made from cane, beet, and now also corn, are used to sweeten and preserve breakfast cereals, baked foods, desserts, soft drinks, and a vast array of other

manufactured products (7;8). Nutritionally, sugars supply energy and nothing else. A high intake of sugar-rich foods and beverages may therefore contribute to an excess energy intake and also to a dilution of the micronutrient content of the diet (9). In addition, sugar intake is a well known cause of tooth decay (10).

The Nordic Nutrition Recommendations (11) state that the amount of energy from refined sugars[†] should not exceed 10 % of total energy intake. This is in accordance with the conclusions in the WHO Technical Report "Diet, Nutrition and the Prevention of Chronic Diseases" (10).

### 2.2.1 Tooth decay

Both the frequency and the amount of sugar eaten is correlated with tooth decay; in countries with a relatively low intake of sugar, the incidence of caries is low (10). Dental caries occur because of demineralisation of enamel and dentine by organic acids formed by bacteria in dental plaque, through the anaerobe metabolism of sugars derived from the diet (12). Dental erosion is a relatively new problem in many countries throughout the world, and is also related to diet. Dental erosion is the progressive irreversible loss of dental hard tissue that is chemically etched away from the tooth surface by extrinsic and/or intrinsic acids by a process that does not involve bacteria. In order to minimize the occurrence of dental erosion and caries, the amount and frequency of intake of soft drinks and fruit juices which both have a low pH and often a high level of sugars, should be limited (10). The intake frequency of sugary foods and sweets should also be limited to reduce the caries risk (11).

### 2.2.2 Displacement of other nutrients

It has been suggested that a high intake of sugar-rich foods and beverages may dilute the micronutrient content of the diet and compromise the micronutrient status in the

[†] The term 'refined sugars' here refers to sucrose, fructose, glucose, starch hydrolysates, i.e. glucose syrupe, high-fructose syrupe, etc., as food ingredients or added to foods by the manufacturer, cook or consumer.

population, especially among children and elderly (13). Trends in beverage consumption among children and adolescents imply that soft drinks replace other more nutritious drinks, like milk and fruit juices (14-16). There is also reason to believe that a high intake of sugar-rich foods displaces micronutrient- and fibre-rich foods and thereby decrease the overall quality of the diet (17). Øverby et al (17) found that children who had a high intake of added sugar ate 30 to 40% less fruit and vegetables than children with a low sugar intake. On the other hand, if foods and beverages with high sugar content are consumed in addition to other foods and beverages, they may contribute to excess calorie intake and consequent weight gain.

There is, however, large diversity in methodologies and definitions used to assess sugar intake, which impacts on associations with micronutrient intake level, so a firm conclusion can not be drawn (9).

### 2.2.3 Overweight

The increase in intake of sugar and other caloric sweeteners has been suggested to be one out of several risk factors for weight gain and consequently overweight and obesity (18-23). Overweight and obesity are important risk factors for development of non-communicable diseases like cardiovascular diseases (CVDs), cancer, and diabetes mellitus type 2 (6;10;19;21;24). It may also be that sugar contributes directly to some of these diseases (6;21;25). In the European Prospective Investigation into Cancer and Nutrition (EPIC)-Potsdam Cohort, Schulz et al (18) found that for male adults, intake of high energy, high sugar foods, like sweets, was significantly predictive of a large weight gain. Ludwig et al (26) suggest that consumption of high levels of sugar, particularly in soft drinks, could affect food intake and increase the chances of developing obesity among children. Other studies have not found this relationship (27-31). There have recently been conducted two large reviews which both conclude that there are clear associations of soft drink intake with increased body weight (21;22).

Most of the discussions on plausible mechanisms linking soft drink intake to weight gain has been concerned with liquids' effect on satiety. It is being argued that calories from liquids satiate less than calories from solid foods, and thereby provide extra calories that are not compensated for by reduced food consumption (32). Therefore, beverages with high sugar content may lead to a surplus of calories and subsequent weight increase. Several experimental studies have been carried out on this issue (33-37). Many biological mechanisms have been suggested to be involved. A weaker stimulation of the satiation signals by beverages compared to the effects of solid foods due to faster passage through the gastro-intestinal tract, reduced expansion of the ventricle, and no chewing are some of them. Some researchers argue that the issue of sugar and body weight should not purely be framed in physiological or metabolic terms, but also encompass psychological aspects like human dietary behaviour, context, availability, and the economics of food selection (38).

In this thesis, the relationship of soft drink, sweet, and sugar intake with BMI is studied. In the 1999-follow-up of the Oslo Youth Study, Kvaavik et al (39) assessed the association between long-term intake of soft drinks between age 25 and 33 years and BMI at age 33 years, but found no relationship. Since there seem to occur large changes in body weight in the transition from early adulthood into later adulthood, and since the mean BMI in Norway is increasing (40), it is interesting to assess this relationship again, seven years later. The possible relationship of long-term intake of sweets and sugar, with BMI has previously not been assessed in the Oslo Youth Study.

## 2.3 Sugar intake in Norway

The consumption of sugar in Norway has, like in most other countries, increased during the past decades (41-44). Even though there is observed a small decrease since 2000, the intake is still too high, especially among children and adolescents (41). According to the latest national representative nutrition surveys, sugar contributes to the total energy intake by approximately 11 to 19 % in children and adolescents (43)

and 8 to 10 % in adults (42). In the Norwegian Action Plan on Nutrition (2007-2011) (45) one of the general goals for dietary changes in the population is to reduce consumption of sugars.

The main sources of sugar in the Norwegian diet have also changed over the past years. Like in many other industrialised countries, sugars are now mostly consumed as ingredients of processed foods. The traditional use of sugar in the form of castor sugar and syrups is almost halved in Norway, while the consumption of soft drinks and sweets has increased considerably (41-43). Sugars are not only added to obviously sweet foods like chocolate. Also many canned products and savoury processed foods, such as soups and sauces often contain significant amounts of sugars.

However, there are sales and wholesale data which indicate that the intake of sugar has been reduced somewhat over the last six years (41), and the Norwegian Brewers and Soft Drink Producers report a change in the beverage consumption pattern with a reduction in sugar-sweetened soft drinks (46). There has not been conducted a national representative dietary survey in Norway during recent years that can confirm these numbers. The results in this thesis, even though not nationally representative, may be an indicator of how sugar intake has changed over the past seven years in the Norwegian adult population.

### 2.3.1 Soft drink intake in Norway

The consumption of sugar-sweetened soft drinks in Norway is among the highest in the world (46). Children start drinking such beverages at a young age, and consumption increases through young adulthood (42;43;47). The average intake of soft drinks increased by 30% per person during the ten year period from 1992 to 2001 (46;48). The largest increase was seen among the high consumer groups (48). The consumption of sugar-sweetened soft drinks peaked in 1997 with 93 litres per inhabitant, and in 2004 sugar-sweetened soft drinks contributed to 8 kg of sugar per person (41). The same year approximately 71% of the soft drinks consumed were

sugar sweetened (46). However, data indicate that the consumption pattern of carbonated soft drinks has changed after 2002. According to sales figures from the Norwegian Brewers and Soft Drink Producers (46), Norwegians have increased their purchase of soft drinks with intense sweeteners and bottled water, while the sales of sugar-sweetened soft drinks has decreased. However, according to the Health Interview Survey in 2005 (49), the percentage of people who reported to drink soft drinks with sugar every day or several times per day, was still high. One in two young men (age 16 to 24 years), and one in four men (age 25 to 44 years) reported to drink soft drinks or squash daily or more often.

As a reaction to this high intake, the Norwegian government states that the consumption of sugary soft drinks and other sweet drinks should be reduced in order to obtain a better public health (45). As for sugar intake, the results in this thesis may give some indication on how soft drink intake has changed among Norwegian adults between 1999 and 2006.

### 2.3.2 Sweet intake in Norway

Data on intake of sweets in the Norwegian population is scarce. From sales data we know that sales of chocolate and other sweets increased from approximately four to 13 kg per person per year between 1960 and 1996, and has more or less stabilised at this level during the past ten years (41). In the Norkost-study in 1997 (42), men and women both reported to eat 11 grams of sweets per day. The reported intake among young participants was significantly higher than among older participants. According to Statistics Norway (49), almost 10% of both men and women report to eat sweets every day, and there is no difference between educational levels, but as in the Norkost-study, young people report a considerably higher sweet intake than older people. As for soft drinks and sugar in general, the Norwegian government have set a goal to reduce the intake of sweets in the Norwegian population (45).

This thesis adds some data to the scarce knowledge that exists on sweet intake in Norway.

## 2.4 Longitudinal development and tracking

Longitudinal, prospective (cohort) studies are observational studies in which subjects are followed over time. Exposure (e.g. intake of foods and beverages) and outcome (e.g. lifestyle diseases) are normally monitored at regular intervals.

This study type enables comparison of e.g. subjects who have a long-term high intake of a certain food item or nutrient to subjects who have a lower intake, and to determine if there is a difference in health outcome between the two groups. Since exposure data is collected before the subjects have the health outcome of interest, longitudinal studies can provide a relatively good picture of the relationship between cause and effect. However, results should be interpreted with caution since longitudinal studies may be biased by the phenomenon of reverse causation, which is a common problem in cross-sectional studies. Longitudinal studies often compare change in an outcome variable with changes in one or several other variables, but it may be difficult to interpret the results of such analyses. For example overweight subjects may adopt a healthier lifestyle to reduce their body weight without succeeding, and for instance a healthy diet may then be linked to overweight.

To study stability or tracking of a variable over time, a longitudinal design is a requisite. In epidemiological literature, tracking is used to describe the relative stability of the longitudinal development of a certain outcome variable (50). Tracking of dietary behaviour is assessed in many different ways. This is partly due to the fact that there is no single definition of tracking. The use of different definitions may result in different choices of methods which in turn will lead to somewhat different results. The choice of method also depends on the number of measurements included in the analyses, and which aspects of the tracking variable that is desirable to illuminate. Twisk et al (50) have summarised some common key concepts to the definitions of tracking: 1) the relation/correlation between early measurements and measurements later in life or the maintenance of a relative position within a distribution of values in the observed population through time or, in other words, the longitudinal stability of a certain variable, and 2) the predictability of future values by

early measurements. A measurement "tracks" if there is a positive relation over subjects between two or more time points. High tracking indicates that people maintain their relative position across time, e.g., a woman with a relatively high soft drink consumption at one time point remains her high consumption at a subsequent time point, relative to other women. Low tracking indicates no systematic pattern in relative frequency of a behaviour across time.

Tracking can be assessed at both group and individual level. When dividing a group of subjects into two subgroups, e.g. high and low consumers of a nutrient, one can assess whether these groups maintain relative positions to the each other over time by comparing the mean values in the groups at different time points. This can be an efficient way to identify high-risk groups at an early stage. At the individual level, whether a person maintains his/her position relative to the other subjects in a group over time, can be assessed. From such analyses it is for instance possible to deduce whether high-consumers are more likely to change their habits over time than are low-consumers. In this thesis, both tracking at group and individual levels are studied.

### 2.4.1 Tracking of diet from adolescence into adulthood

It is well known that transition from early adolescence into adulthood consists of great behavioural and physiological changes (51). For example, during childhood and early adolescence eating patterns are greatly influenced by parental control of foods and beverages served at home. This control decreases as the child ages and becomes more autonomous. Two contrasting hypotheses have been proposed by Demory-Luce et al (52): 1) with the transition from early adolescence into adulthood, eating behaviour may change, resulting in a low tracking coefficient across this age period, or 2) because food preferences are formed early in life and food preferences predict food consumption, the tracking coefficient may be high. A third hypothesis have been proposed by Devine (53): Food choices evolve from infancy to adulthood, and even though they are rooted in past experiences, food choices are susceptible to change

trough exposure to new circumstances and life transitions. If this is true, one may expect that some nutrients or foods have a high degree of tracking while others have a moderate or low degree of tracking.

The degree of stability in dietary behaviour from adolescence into adulthood has strong implications on disease prevention. If dietary intake appears to be stable from adolescence into adulthood, measures to change dietary habits in relation to disease prevention should be taken before early adolescence, as alleged by Kelder et al (54). If, however, dietary intake is relatively unstable, it may be changeable after adolescence so that disease prevention measures would need to be taken at an older age.

Results from previous studies on the stability of dietary intake from adolescence into adulthood are not consistent. Some studies have found a relatively stable intake (16;54;55), while others have found contrasting results (52;56;57). One of the main problems when comparing these studies, is the lack of coherence in the nutritional aspects assessed. Some studies assess stability at a nutrient level (58;59), while others assess stability at food or food group level (16;39;52;55-57;60). In this thesis, stability at both nutrient and food, as well as food group level, is examined. Soft drink and sweet intake is assessed from age 15, 25, and 33 years to age 40 years, while sugar intake is assessed from age 33 to 40 years.

Another challenge, when comparing studies on tracking, is the difference in the age groups studied. The Oslo Youth Study with its extensive follow-up period, cover a wide age range which may make it possible to compare its results to tracking studies done on both adolescent and adult populations.

Last, but not least, tracking of soft drink, sweet, and sugar intake during adulthood is a scarcely explored field. In light of the absence of research on this topic, this thesis may contribute with important new knowledge.

## 2.5 Association of demographic and health-related variables with soft drink, sweet, and sugar intake

The association of demographic and health-related variables with intake of sugary foods and beverages, as well as sugar in general, is a scarcely explored field.

In the 1999-follow-up of the Oslo Youth Study, Kvaavik et al (39) assessed the intake of soft drinks between age 25 and 33 years in relation to several health-related behaviours, including smoking status and level of physical activity, at age 33 years. They found that a long-term high intake of soft drinks was associated with, among other things, a low level of leisure time physical activity among women, and a higher smoking prevalence among both men and women.

It is becoming more and more recognised that lifestyle behaviours, including eating behaviour, are interrelated, and that healthy or unhealthy behaviours occur together to characterise groups of individuals (61-65). This is commonly referred to as the clustering phenomenon. It has also been realised that many unhealthy behaviours are inversely associated with socio-economic status (66-69). That is, individuals with a low socio-economic status tend to have less healthy habits than individuals with a higher socio-economic status.

In this thesis, education level and several health-related variables are assessed in relation to the intake of soft drinks, sweets, and sugar at age 40 years. These data may be an important contribution to the scarce amount of knowledge available on this topic.

# 3. Aims and research questions

First, the tracking of soft drink and sweet intake from adolescence into adulthood, and the tracking of total sugar intake over seven adult years is studied. Secondly, the association of long-term intake of soft drinks, sweets, and sugar with BMI is assessed, and the association between demographic and health-related variables at age 40 years and intake of soft drinks, sweets, and sugar at the same age is studied. The specific aims and research questions were:

- To assess the tracking of soft drink intake from adolescence into adulthood, and during adult years.
    - To what degree does the consumption of soft drinks track from age 15 years (1981/1979) to age 25 (1991), 33 (1999), and 40 years (2006)?
    - To what degree does the consumption of soft drinks track from age 25 years (1991) to age 33 (1999) and 40 years (2006)?
    - To what degree does the consumption of soft drinks track from age 33 (1999) to age 40 years (2006)?
    - To what degree does the consumption of soft drinks change from age 33 (1999) to age 40 years (2006)?
- To assess the tracking of sweet intake from adolescence into adulthood, and during adult years.
    - To what degree does the consumption of sweets track from age 15 years (1981/1979) to age 25 (1991), 33 (1999), and 40 years (2006)?
    - To what degree does the consumption of sweets track from age 25 years (1991) to age 33 (1999) and 40 years (2006)?

  - To what degree does the consumption of sweets track from age 33 (1999) to age 40 years (2006)?
  - To what degree does the consumption of sweets change from age 33 (1999) to age 40 years (2006)?

- To what degree does sugar intake (grams per day and E%) track from age 33 (1999) to 40 years (2006)?
- To what degree does sugar intake (grams per day and E%) change from age 33 (1999) to age 40 (2006) years?
- To assess the association of intake of soft drinks, sweets, and sugar with BMI.
  - Is there an association of long-term intake of soft drinks, sweets (from age 25 to 40 years), and sugar (from age 33 to 40 years) with BMI at age 40 years?
  - Is there an association of change in intake of soft drinks, sweets, and sugar with change in BMI between age 33 and 40 years?
- To assess the association of demographic and health-related variables with soft drink, sweet, and sugar intake.
  - Is gender and level of education associated with intake of soft drinks (grams per day), sweets (grams per day), and sugar (E%) at age 40 years (2006)?
  - Is smoking, leisure time physical activity, dieting, and level of health concern associated with intake of soft drinks (grams per day), sweets (grams per day), and sugar (E%) at age 40 years (2006)?

# 4. Methods

## 4.1 Study design

The Oslo Youth Study is a longitudinal cohort study, initiated in 1979. All students in 5th, 6th and 7th grade, mean age 13 years (range 11 to 15 years), at six combined primary and secondary schools in Oslo were invited to participate.

The initial survey included a questionnaire and a medical examination to assess the students' eating patterns, physical activity level, and physiological measures like height and weight. The schools were matched into three pairs based on their location and the socio-economic status of their neighbourhood (2). One school from each pair was offered the chance to participate in the health education programme, with the remaining three schools serving as a comparison condition. The intervention was implemented during autumn of 1979 and winter and spring of 1980. In 1981 a data collection similar to the one in 1979 was carried out, and the intervention was evaluated.

After this initial part of the study, there have been four follow-ups, in 1989, 1991, 1999, and in 2006. In this thesis, data from 1979 (mean age 13 years), 1981 (mean age 15 years), 1991 (mean age 25 years), 1999 (mean age 33 years), and 2006 (mean age 40 years) are used.

Even though the Oslo Youth Study was originally an intervention study, the sample is treated as one cohort in this thesis.

## 4.2 Subjects

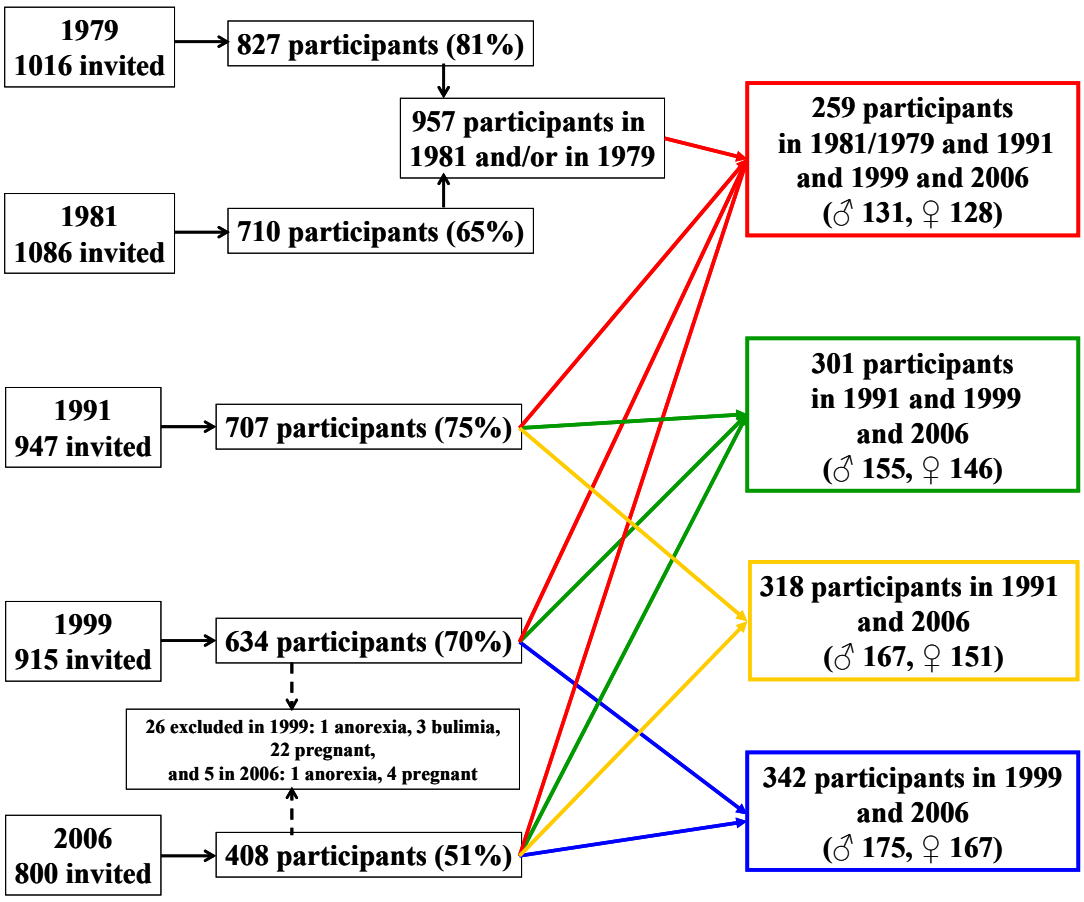
A flow chart for participation is shown in **Figure 1**. In 1979, 1016 boys and girls, including their parents, were invited to participate in the study. A total of 827 students completed the questionnaires. In 1981, 70 new students attended the schools,

so 1086 students and their parents were invited. Of these 710 students participated. Data from both parents were collected in 1979 and 1981, but is not included in this thesis. Due to unknown addresses at follow-up, refusal to participate, emigration, and deaths among former participants, the numbers invited in 1991 and 1999 were reduced to 947 and 915 respectively. Of these 707 and 634 completed the questionnaires. In 2006, 800 previously invited subjects once more received an invitation to participate, and 408 of them participated.

Since health-related habits were regarded as more established at age 15 than at age 13 years (70;71), 1981 was chosen as the baseline in this thesis. To increase the sample size, participants who participated in 1979, but not in 1981, were also included in the study.

A total of 276 subjects participated at all four surveys; the remainders had at least one missing time point. Of these 276 responders, 17 were excluded, resulting in 259 consistent participants. The numbers of consistent responders between 1991, 1999 and 2006, 1991 and 2006, and between 1999 and 2006 are shown in **Figure 1**. Due to missing values on singular items, N may vary somewhat in the analyses.

***Figure 1*** *Flow-chart for participation at all five time points in the Oslo Youth Study. (Numbers in the combined year groups are without subjects excluded in 1999 and 2006.)*




## 4.3 Data collection and research instruments

### 4.3.1 1979 and 1981

The baseline survey (1981/1979) included a questionnaire for the students (Appendix 1), and a medical examination including measurements of height and weight. The students completed the questionnaires in school. The questionnaire covered a range of topics, including information on frequency of leisure time physical activity, smoking habits, and eating patterns.

The questionnaire included two questions on intake of soft drinks: “Did you drink carbonated soft drinks yesterday?” with response alternatives “yes, at home”, “yes, at school” and “yes, at both places”, and “Did you drink carbonated soft drinks with

added sugar last week?" with response alternatives "yes" and "no". Because there was no suitable response alternative for those students who did not drink soft drinks yesterday, we presumed that students who did not answer this question, did not drink soft drinks the previous day, as long as they had answered 50% or more of the other questions on foods and beverages. If they had not reported to drink soft drinks the previous day and answered less than 50% of the questions on foods and beverages, they were excluded from the analyses. By combining these two questions, three levels of soft drink intake were made: (1) "Previous day" – including those students who reported intake of soft drinks both the previous day and during the past week, (2) "Past week" – those students who had soft drinks the previous day, but not the past week, or the past week, but not the previous day, and (3) "Never/seldom" – including those who did not have soft drinks the previous day, nor the past week. For the analyses, "Past week" and "Never/seldom" were combined.

Sweet intake was assessed by three questions: "Did you eat chocolate during the past week?" and "Did you eat other sweets during the past week?" with the response alternatives "yes" and "no", and "How often do you eat chocolate, sweets, crisps or similar foods?" with the response alternatives "almost every day", "1-2 times per week", "not that often", and ""never". By combining these questions, two consumption groups were made: (1) "Almost every day" – those students who reported to have had both chocolate and sweets during the past week and to have such foods one to two times per week or more often, and (2) "Seldom/not that often" – including a) those students who reported not to have had chocolate or other sweets during the past week and never to eat such foods, b) those students who reported to have had either chocolate or other sweets during the past week, but never to eat such foods, and c) those students who reported to have had both chocolate and sweets last week, but that they seldom ate such foods.

### 4.3.2 1991

In 1991, all eligible subjects were invited to participate in a screening similar to those conducted in 1979 and 1981. A screening centre in Oslo was established for measurement of height, weight, and several other physical parameters. At the centre the participants also completed a written questionnaire (Appendix 2). Those not attending the screening centre received the same questionnaire via the post.

The questionnaire included information on dietary intake, physical activity and psychosocial factors related to health. The question assessing intake of soft drinks and sweets was: "How often have you consumed these foods or beverages the past three months?" Foods listed included "soft drinks with sugar", "soft drinks with intense sweeteners", and "chocolate/sweets", with the response alternatives "several times daily", "once daily", "3-6 times per week", "1-2 times per week", and "more seldom/never". For analyses, these categories were combined to yield two consumption groups: (1) "≥ 3 times per week", and (2) "< 3 times per week".

### 4.3.3 1999

A validated semi-quantitative food frequency questionnaire (FFQ) and a shorter questionnaire were mailed to all subjects who had been invited to participate in any of the former waves of the Oslo Youth Study.

The FFQ has been used in several large scale studies and is thoroughly evaluated (72-78). It included questions on 180 food items grouped together according to the Norwegian meal pattern. Both questions about frequency of consumption and amounts eaten (portion sizes given in units like glasses, spoons and decilitres) were included to get information about the habitual food intake during the last year, including intake of sugary foods and beverages. For the analyses in this thesis, the intake of chocolate, candy, and confectionary were combined to create a food group labelled "sweets". The questions regarding sweet intake are found in Appendix 3.

The daily intake of energy and nutrients were computed using a food data base and software systems developed at the Department of Nutrition, University of Oslo. The food data base is primarily based on the Norwegian Food Table (79) which is continuously supplemented with new data. In addition to give information on the participants' complete diet, the FFQ also included questions about the participants' weight and height.

The short questionnaire included questions on, among other things, leisure time physical activity, smoking, and level of education. (The questions were identical to the ones in 2006, so the questionnaire is therefore not appended. See Appendix 4 for the 2006 version.)

### 4.3.4 2006

In 2006, two questionnaires were sent to all previously invited subjects via the post. One of the questionnaires included questions about, among other things, physical activity, smoking habits, education, height and weight (Appendix 4). The participants were also asked to fill in the name and contact information on their general practitioner (GP).

The other questionnaire was a scanner-readable semi-quantitative FFQ similar to the one used in 1999 (Appendix 5). The questionnaires were to be returned by mail in postage paid envelopes within three weeks.

Like in 1999, a food group labelled "sweets" was constructed by combining the intake of individual sweet foods. There was, however, one change in the FFQ between 1999 and 2006. Confectionary was replaced by "smågodt". The foods chocolate and candy remained the same between 1999 and 2006.

The participants were called on to contact their GP to carry out a health examination within two weeks after the questionnaires had been returned. This examination included measurement of height, weight, and waist circumference. Because only 290

participants completed the medical examination, self-reported weight and height (n=400) were used to calculate BMI in this thesis.

## 4.4 Statistics

For analyses, intake of soft drinks and sweets were expressed as frequencies of consumption at age 15 (1981/1979), 25 (1991), 33 (1999), and 40 years (2006). In addition, total sugar intake, soft drinks, and sweets were expressed in grams per day at age 33 and 40 years. Total sugar intake was also expressed as percentage of total energy intake (E%) at age 33 and 40 years.

Scaled response alternatives for questions on leisure time physical activity (LTPA), health concern, and education were dichotomised. A high level of LTPA was defined as being physically active for 30 minutes or more on two or more days per week. For the question about level of health concern: "Are you concerned about questions regarding your own health?", the response alternatives "Not very much", "Not especially", and "No" were combined, while the response alternative "A lot" was kept as it was. A high level of education was defined as having more than 12 years of schooling.

The Kolmogorov-Smirnof-test-of-Normality and histograms were used to assess whether the variables were normally distributed. When the assumption of normal distribution was violated, non-parametric tests were performed.

### 4.4.1 Difference between women and men at age 40 years

Student t-test for unpaired samples, Mann-Whitney U-Test, and chi-square test for independence were used to analyse the differences between genders at age 40 years (2006). Male participants were coded as 1 and female as 2.

Basal metabolic rate (BMR) was calculated from WHO formulas, based on age, weight and gender (80). The ratio between energy intake (EI) and BMR was

calculated to reveal subjects who may have underreported their energy intake. An EI:BMR ratio less than 1.35 may indicate underreporting (80-82).

### 4.4.2 Tracking analyses

Tracking analyses on soft drink and sweet intake from adolescence into adulthood and from young adulthood into later adulthood were done on a group level. The consumption frequencies of both soft drinks and sweets were divided into two consumption groups at age 15 years (1981/1979) (Soft drinks: "Seldom/past week" and "Previous day"; Sweets: "Never/not that often" and "Almost every day") and at age 25 years (1991) ("< 3 times per week" and "≥ 3 times per week"). These groups are referred to as low and high consumption groups. Analysis of Covariance (ANCOVA) was used to study the differences in mean frequency and amount of intake between these groups at the follow-ups while adjusting for the effect of gender. Because a borderline significant interaction with gender was found for grams of soft drinks consumed at age 33 and 40 years for the 15-year consumption groups, these analyses were done on men and women separately, using Mann-Whitney U-Test. Since the ANCOVA and Mann-Whitney U-Tests revealed different results, only the p-values from the Mann-Whitney U-Tests are reported. There was also a significant interaction with gender for soft drink intake at age 33 years for the 25-year consumption groups, but when analysing on men and women separately with Mann-Whitney U-Tests, the results were the same as for genders combined (data not shown).

For tracking of intake of soft drinks and sweets (frequency and grams per day) at a group level between age 33 years (1999) and 40 years (2006), subjects were divided into two consumption groups based on their consumption frequencies at age 33 years. To be able to compare the results to the tracking analyses between age 25 and 40 years, and with Kvaaviks' work from the follow-up in 1999 (39), a low level of consumption was defined as three times per week or less. Because a significant interaction with gender was found for soft drink intake, analyses on tracking of soft

drinks were done on men and women separately. For these analyses Mann-Whitney U-Test was used to study the differences in frequency and amount of soft drink intake between the two consumption groups at follow-up. Regarding sweets, there was no interaction with gender, so the analyses were done on men and women combined using ANCOVA with adjustment for the effect of gender.

In addition, soft drink, sweet, and sugar (E%) intake were assessed at the individual level by studying movement between quartiles, and by use of Spearman's correlation analysis. For sugar intake, the per cent of subjects who remained a total sugar intake above the recommended 10 E% between age 33 and 40 years was assessed by chi-square test for independence.

### 4.4.3 Change in soft drink, sweet, and sugar intake between age 33 and 40 years

Change in soft drink, sweet, and sugar intake between age 33 and 40 years were assessed by Student t-test for paired samples or Wilcoxon's matched pairs signed rank test whenever the assumption of normal distribution was violated. The analyses were done on men and women separately.

### 4.4.4 Association of long-term intake of soft drinks and sweets with BMI at age 40 years

For analyses on association between long-term intake of soft drinks and sweets, and self-reported BMI at age 40 years, 318 subjects participating both at age 25 years (1991) and at age 40 years (2006) were categorised as low or high consumers at both time points by their frequencies of soft drink and sweet intake.

The threshold values for a low and high intake at both 25 and 40 years were set at the 5 % trimmed means for the frequencies of soft drink and sweet intake at age 25 years. These values were approximately halfway between the medians and the means. Because men consumed soft drinks significantly more often than women, the threshold value for low and high intake of soft drinks was set for men and women

separately. For men, a high intake was defined as reporting to drink soft drinks 2.7 times per week or more at age 25 years. For women the corresponding value was 1.8 times per week or more.

The frequencies of sweet consumption were similar for men and women at age 25 years, so the threshold value was set combined at 2.5 times per week.

Subjects were then categorised into four groups based on their relative stability in frequencies of soft drink and sweet intake between age 25 and 40 years. Those who maintained a low intake at both age 25 and 40 years were categorised as long-term low consumers, correspondingly, long-term high consumers had a high intake at both time points. Subjects who reported a low intake at age 25, but a high intake at age 40, were labelled increasing consumers, while those who went from a high intake to a low intake during the same time period were labelled decreasing consumers.

Interaction with gender was not found using univariate analysis of variance (ANOVA), so the analyses were done on men and women combined. Analysis of covariance (ANCOVA) with adjustment for the effect of gender was used to study the difference in self-reported BMI and the per cent of overweight at age 40 years between the long-term consumption groups for soft drinks and sweets.

### 4.4.5 Association of long-term intake of sugar with BMI at age 40 years

For analyses on association between long-term intake of sugar and self-reported BMI at age 40 years, subjects participating both at age 33 years (1999) and at age 40 years (2006) were categorised as low or high consumers at both time points according to their reported sugar intake (E%). Based on the recommendations for sugar intake (11), a low intake was defined as consuming 10 E% or less from sugar, and a high intake was defined as consuming more than 10 E% from sugar.

Subjects were then categorised into four consumption groups. Those who remained above or below 10 E% from sugar between age 33 and 40 years, were categorised as

long-term high and long-term low consumers, respectively. Those who went from below to above 10 E% were categorised as increasing, and those who went from above to below 10 E% were categorised as decreasing. Because only 9 subjects reported to have increased their intake of sugar during this period, they were excluded from the analyses.

Interaction with gender was not found using ANOVA, so the analyses were done on men and women combined. ANCOVA with adjustment for the effect of gender was used to study the change in sugar intake between age 33 and 40 years and differences in self-reported BMI at age 40 years.

### 4.4.6 Association of change in soft drink, sweet, and sugar intake with change in BMI between age 33 and 40 years

For analyses on the association between change in soft drink, sweet, and sugar intake between age 33 and 40 years, and the parallel change in self-reported BMI, subjects who reported their height and weight at both age 33 and 40 years were included (n=326). No interactions with gender were found using ANOVA, so analyses were done on men and women combined.

Linear regression analyses were performed with change in BMI as the dependent variable. Independent variables assessed were differences in frequencies and grams per day of soft drink and sweet intake, and differences in E% from and grams per day of sugar. No significant relationships were found (data not shown).

In addition, change in BMI was divided into groups based on whether subjects reported a decline, stability or increase in BMI from age 33 to 40 years. Stability was defined as +/- 0.5 BMI units. Differences in mean change in soft drink, sweet, and sugar intake from age 33 to 40 years between these groups, were assessed with ANCOVA with adjustment for the effect of gender. No significant differences were found (data not shown).

### 4.4.7 Association of demografic and health-related variables with soft drink, sweet, and sugar intake at age 40 years

Hierarchical multiple linear regression was used to study the association of demographic and health-related variables with intake of soft drinks (grams per day), sweets (grams per day), and sugar (E%) at age 40 years. Each dependent variable (soft drink, sweet, and sugar intake) was assessed separately, but the independent variables included in the models were the same for all three analyses. The independent variables were chosen on the basis of knowledge about clustering of demographic and health-related behaviours.

The first model included the demographic variables gender and level of education. The second model added the health-related variables smoking status, leisure time physical activity, level of health concern, and dieting behaviour over the past three months.

### 4.4.8 General comments

Interaction with intervention status at age 15 years (1981/1979) was not found for any of the included variables, so intervention and control groups were combined in the analyses.

For each analysis, only the subjects who participated at all follow-ups of interest are included. This causes somewhat different results for the same variables in different analyses.

The data are expressed as mean, standard deviation (SD) and/or 95 % confidence interval, or as percentage of subjects with a given characteristic. When the assumption of normal distribution was violated, median and $25^{th}$ and $75^{th}$ percentiles are also reported. Results were considered to be statistically significant at $p<0.05$. The programme package Statistical Product and Service Solutions 14.0 for Windows was used in all analysis (SPSS Inc, Chicago, Ill).

### 4.4.9 Exclusion criterias

Subjects reporting to have anorexia and/or bulimia nervosa and/or being pregnant at either age 33 years (1999; 1 anorexia, 3 bulimia nervosa, and 22 pregnant) or at age 40 years (2006; 1 anorexia and 4 pregnant) were excluded from the analyses.

### 4.4.10 Attrition analyses

Attrition analyses were performed to compare the subjects who participated at baseline, age 15 years, but not at any of the subsequent time points. To assess differences between the consistent responders and the inconsistent responders in continuous variables, Student t-test for unpaired samples was used. For categorical variables chi-square test for independence was used.

## 4.5 Ethics

All former participants received an information letter about this fifth follow-up where the voluntary aspect of the survey was emphasised (Appendix 6). A written consent was obtained from everyone who agreed to participate. Research permissions were obtained from the National Committees for Research Ethics in Norway, the Norwegian Data Inspectorate, and the Norwegian Tax Administration.

# 5. Results

## 5.1 Sample characteristics

A total of 276 out of 957 who participated at age 15 years (1981/1979) also participated at age 25 (1991), 33 (1999), and 40 years (2006). Comparing the 276 participants to the remaining 681, the consistent responders were older (14.7 (1.1) vs. 14.4 (1.2), $p<0.001$) and were less likely to smoke (9.8% vs. 17.6%, $p=0.004$) at age 15 years than were those with subsequent missing data. No differences were found between inconsistent and consistent reporters with regard to intervention status, soft drink or sweet intake at age 15 years.

The differences between women and men in included variables at age 40 years (2006) are shown in **Table 1**. Women reported a significantly lower intake of energy, grams per day of added sugar, and soft drinks than did men ($p<0.001$). The frequency of soft drink intake also differed between genders, with male participants as the most frequent consumers ($p<0.001$). The grams of sweets reported to be consumed per day also differed between the genders ($p=0.017$). A higher percentage of women than men had higher education ($p=0.002$), and more women reported to have tried to lose weight over the past three months ($p=0.003$) than did men. Men had a significantly higher BMI than women ($p<0.001$), and also a higher percentage of overweight ($p<0.001$) and a non-significantly higher percentage of obese ($p=0.067$) than did women. An extended table with medians, $25^{th}$ to $75^{th}$ percentiles, and 95% confidence intervals are presented in Appendix 7.

***Table 1*** *Difference between women and men in included variables at age 40 years (2006) (mean (SD) or % with given characteristic).*

| | **Women (n = 198)** | **Men (n = 205)** | p-value* |
|---|---|---|---|
| **Health-related and demographic variables** | | | |
| Age, years [1] | 39.9 (0.9) | 40.1 (0.9) | 0.092 |
| BMI, kg/m$^2$ [1 †] | 24.0 (4.2) | 26.5 (4.0) | < 0.001 |
| Overweight, BMI ≥ 25 [3 †] | 29.0 | 58.4 | < 0.001 |
| Obesity, BMI ≥ 30 [3 †] | 8.8 | 15.3 | 0.067 |
| LTPA at least twice weekly [3] | 50.0 | 43.3 | 0.217 |
| Smoking, % daily smokers [3] | 25.0 | 26.5 | 0.824 |
| Very health conscious [3] | 69.7 | 41.3 | < 0.001 |
| Tried to lose weight last 3 months? (% yes)[3] | 27.3 | 14.8 | 0.003 |
| Education, more than high school [3] | 63.1 | 47.5 | 0.002 |
| **Dietary variables** | | | |
| Soft drinks, grams/day [2] | 53.4 (133.5) | 166.9 (392.4) | < 0.001 |
| Soft drinks, times/week [2] | 0.9 (2.1) | 2.0 (3.4) | < 0.001 |
| Sweets, grams/day [2] | 16.5 (21.8) | 23.2 (30.3) | 0.017 |
| Sweets, times/week [2] | 2.8 (3.2) | 3.1 (3.8) | 0.606 |
| Added sugar, grams/day [2] | 33.8 (28.5) | 53.9 (51.3) | < 0.001 |
| Sugar, E% [2] | 6.9 (5.1) | 7.9 (6.1) | 0.083 |
| Energy, KJ/day [1] | 8065 (2525) | 11037 (3279) | < 0.001 |
| EI:BMR <1.35 [3] | 56.1 | 52.7 | 0.339 |

*Difference between genders were analysed with: [1] Student t-test for unpaired samples, [2] Mann-Whitney U-Test, [3] Chi-square test for independence. † BMI calculated from self-reported height and weight.

## 5.2 Soft drinks

### 5.2.1 Tracking of soft drink intake from age 15 to 40 years

As seen in **Table 2a**, subjects who reported a low intake of soft drinks at age 15 years (1981/1979) reported to drink soft drinks significantly less often at age 25 (1991), 33 (1999), and 40 years (2006) than subjects who reported a higher intake at age 15. A visualisation of this tracking is shown in **Figure 2**. The lines for the two consumption groups remain generally parallel, which indicates a relative stability of intake between the groups. The total amount of soft drinks consumed (grams per day) at age

33 years was significantly lower for female participants who reported a low level of consumption at age 15 years, than female high-consumers at this age (**Table 2b**). For men this difference was not significant (**Table 2c**). Grams per day of soft drinks consumed at age 40 years did not differ significantly between the two groups for neither women nor men.

***Table 2a*** *Soft drink intake (times/week) at age 25 (1991), 33 (1999), and 40 years (2006) by frequency of soft drink intake at age 15 years (1981/1979),women and men. (Mean (SD), median (25th-75th percentile)).*

| | Soft drink frequency at age 15 years | | | | |
|---|---|---|---|---|---|
| | Low | | High | | |
| **Soft drinks at** | (n=127) | | (n=110) | | p-value* |
| **follow-up** | Mean (SD) | Median (25th-75th) | Mean (SD) | Median (25th-75th) | |
| Times/week, 25 y | 2.0 (2.6) | 1.5 (0.0 – 4.5) | 3.1 (3.4) | 1.5 (0.0 – 5.1) | 0.004 |
| Times/week, 33 y | 2.4 (3.3) | 1.0 (0.1 – 2.5) | 3.6 (4.1) | 2.5 (0.8 – 4.5) | 0.017 |
| Times/week, 40 y | 1.2 (2.4) | 0.3 (0.0 – 1.0) | 2.2 (4.0) | 0.8 (0.0 – 2.5) | 0.025 |

*ANCOVA with adjustment for the effect of gender for difference between consumption groups.

***Table2b*** *Soft drink intake (grams/day) at 33 (1999) and 40 years (2006) by frequency of soft drink intake at age 15 years (1981/1979), women. (Mean (SD), median (25th-75th percentile)).*

| | Soft drink frequency at age 15 years, women | | | | |
|---|---|---|---|---|---|
| | Low | | High | | |
| **Soft drinks at** | (n=66) | | (n=54) | | p-value* |
| **follow-up** | Mean (SD) | Median (25th-75th) | Mean (SD) | Median (25th-75th) | |
| Grams/day, 33 y | 108.1 (177.3) | 35.7 (0.0 – 165.0) | 147.4 (149.8) | 91.2 (9.2 – 286.7) | 0.046 |
| Grams/day, 40 y | 49.0 (139.5) | 0.0 (0.0 – 35.0) | 75.1 (175.9) | 4.5 (0.0 – 54.3) | 0.151 |

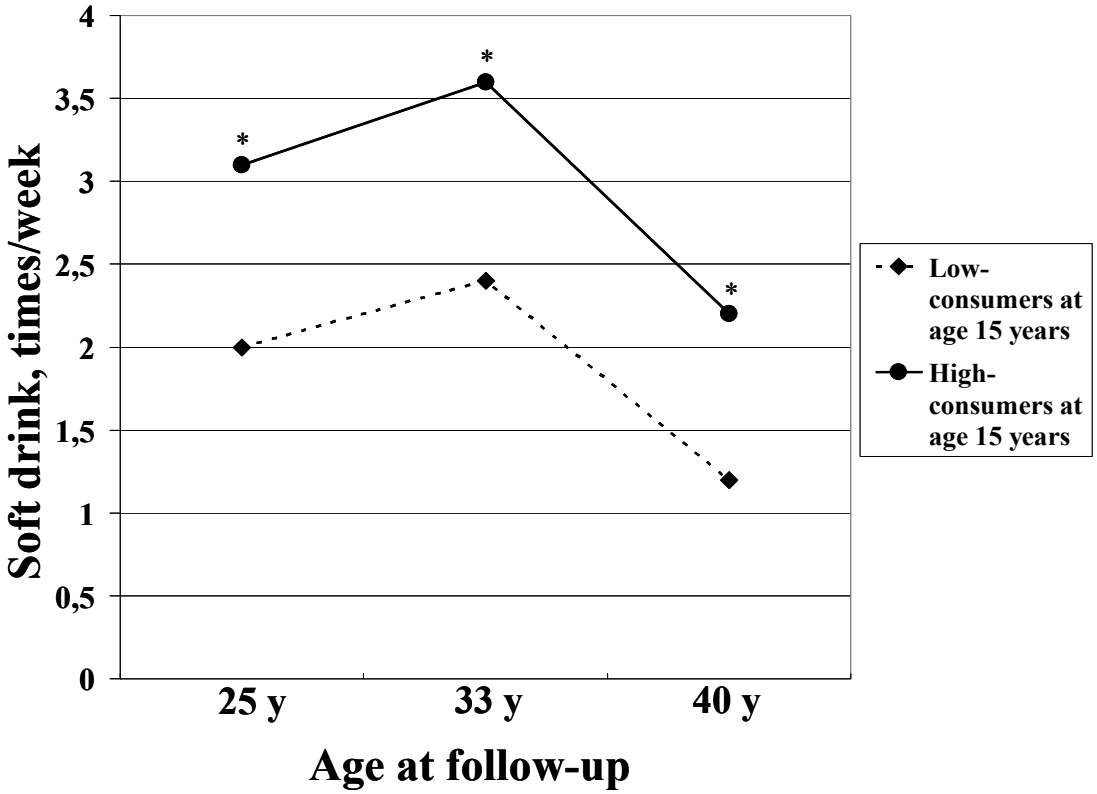
*Mann-Whitney U-Test for difference between consumption groups.

***Table 2c*** *Soft drink intake (grams/day) at 33 (1999) and 40 years (2006) by frequency of soft drink intake at age 15 years (1981/1979), men. (Mean (SD), median (25th-75th percentile)).*

| | Soft drink frequency at age 15 years, men | | | | |
|---|---|---|---|---|---|
| | Low | | High | | |
| **Soft drinks at** | (n=61) | | (n=56) | | p-value* |
| **follow-up** | Mean (SD) | Median (25th-75th) | Mean (SD) | Median (25th-75th) | |
| Grams/day, 33 y | 235.9 (347.9) | 180.0 (35.7 – 272.3) | 505.8 (839.1) | 180.0 (70.0 – 465.0) | 0.064 |
| Grams/day, 40 y | 112.3 (268.6) | 39.0 (0.0 – 133.0) | 310.3 (622.0) | 55.0 (8.3 – 245.0) | 0.119 |

*Mann-Whitney U-Test for difference between consumption groups.

***Figure 2*** *Mean frequency (times/week) of soft drink consumption at age 25 (1991), 33 (1999), and 40 years (2006) by groups of soft drink intake at age 15 years (1981/1979), women and men. †*




Difference between consumption groups assessed by ANCOVA, adjusting for gender. * $p < 0.05$.

†Low consumption group n=127; high consumption group n=110.

### 5.2.2 Tracking of soft drink intake from age 25 to 40 years

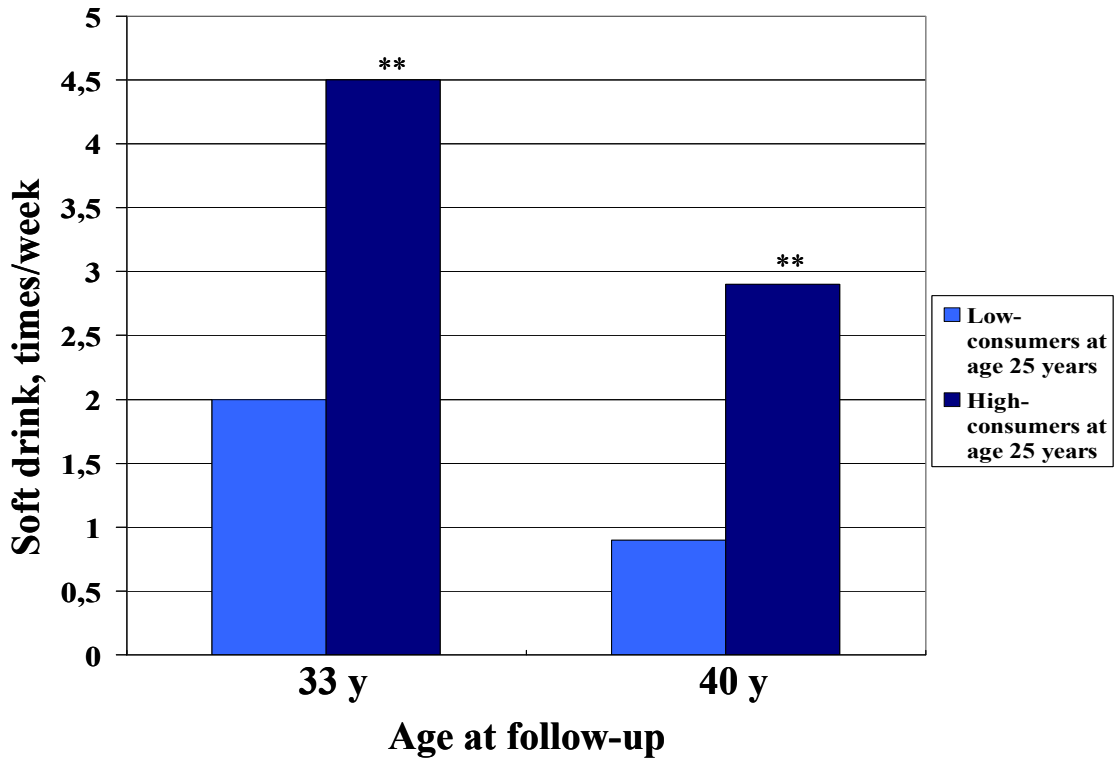
When dividing the subjects into consumption groups based on frequency of soft drink consumption at age 25 years (1991) (**Table 3**), subjects who reported to drink soft drinks less than three times per week at this age had a lower frequency of soft drink consumption at age 33 (1999) and 40 years (2006) than those reporting a higher at age 25. A visualisation of the difference between the two tracking groups is shown in **Figure 3**. There was also a significant difference between the groups for grams of soft drinks consumed per day at age 33 and 40 years. The results are summarised in **Table 3**.

***Table 3*** *Soft drink intake at age 33 (1999) and 40 years (2006) by frequency of soft drink intake at age 25 years (1991), women and men. (Mean (SD), median (25th-75th percentile)).*

| | Soft drink frequency at 25 years | | | | |
|---|---|---|---|---|---|
| | Low | | High | | |
| **Soft drinks at follow-up** | (n=183) | | (n=89) | | p-value* |
| | Mean (SD) | Median (25th-75th) | Mean (SD) | Median (25th-75th) | |
| Times/week, 33 y | 2.0 (2.8) | 1.0 (0.1-2.5) | 4.5 (4.3) | 2.5 (1.0-6.5) | <0.001 |
| Times/week, 40 y | 0.9 (2.0) | 0.1 (0.0-1.0) | 2.9 (4.2) | 1.0 (0.2-2.5) | <0.001 |
| Grams/day, 33 y | 138.4 (234.5) | 70.0 (2.5-180.0) | 433.7 (700.8) | 180.0 (72.6-443.7) | <0.001 |
| Grams/day, 40 y | 62.9 (192.5) | 4.0 (0.0-49.0) | 246.6 (506.5) | 55.0 (12.0-238.0) | <0.001 |

*ANCOVA with adjustment for gender for difference between consumption groups.

***Figure 3*** *Mean frequency (times/week) of soft drink consumption at age 33 (1999) and 40 years (2006) by groups of soft drink intake at age 25 years (1991), women and men. †*




Difference between low and high consumption groups at each time point assessed by ANCOVA with adjustment for the effect of gender. ** $p < 0.001$.

†Low consumption group n=183; high consumption group n=89.

### 5.2.3 Tracking of soft drink intake from age 33 to 40 years

Tracking of soft drink intake at group level between age 33 and 40 years was assessed for men and women separately. As seen in **Table 4a**, women who reported to have a relatively low intake of soft drinks at age 33 years, still reported a significantly lower intake at age 40 years than women who reported a high intake at age 33. The same results were found for male participants (**Table 4b**).

***Table 4a*** *Soft drink intake at 40 years (2006) by frequency of soft drink intake at age 33 years (1999),women. (Mean (SD), median ($25^{th}$-$75^{th}$ percentile)).*

| | **Soft drink frequency at age 33 years, women** | | | | |
|---|---|---|---|---|---|
| | **Low** | | **High** | | |
| **Soft drinks at** | (n=102) | | (n=58) | | p-value* |
| **follow-up** | Mean (SD) | Median ($25^{th}$-$75^{th}$) | Mean (SD) | Median ($25^{th}$-$75^{th}$) | |
| Times/week, 40 y | 0.3 (0.9) | 0.0 (0.0-0.3) | 1.9 (3.2) | 1.0 (0.1-2.5) | <0.001 |
| Grams/day, 40 y | 24.8 (100.3) | 0.0 (0.0-11.0) | 110.4 (180.6) | 49.0 (2.3-165.0) | <0.001 |

*Mann-Whitney U-Test for difference between consumption groups.

***Table 4b*** *Soft drink intake at age 40 years (2006) by frequency of soft drink intake at age 33 years (1999), men. (Mean (SD), median ($25^{th}$-$75^{th}$ percentile)).*

| | **Soft drink frequency at age 33 years, men** | | | | |
|---|---|---|---|---|---|
| | **Low** | | **High** | | |
| **Soft drinks at** | (n=115) | | (n=51) | | p-value* |
| **follow-up** | Mean (SD) | Median ($25^{th}$-$75^{th}$) | Mean (SD) | Median ($25^{th}$-$75^{th}$) | |
| Times/week, 40 y | 0.9 (1.6) | 0.5 (0.0-1.0) | 4.7 (5.3) | 2.5 (0.8-6.5) | <0.001 |
| Grams/day, 40 y | 54.8 (93.8) | 28.0 (0.0-70.0) | 450.6 (685.8) | 160.0 (49.0-500.0) | <0.001 |

*Mann-Whitney U-Test for difference between consumption groups.

For studying tracking at the individual level from age 33 to 40 years, movement between quartiles was assessed and correlation coefficients calculated.

The percentage of subjects who remained in the same quartile of frequency of soft drink consumption between age 33 and 40 years was 38.8% among women and 39.7% among men. A total of 73.5% of men who were in the fourth quartile of frequency of soft drink consumption at age 33 years, were still categorised in the fourth quartile at age 40 years. For women the corresponding proportion was 60%. It

was also found that a similarly large proportion of people, who were categorised to the first quartile at age 33 years, remained in this quartile at age 40 years.

For grams of soft drinks per day, the percentages were similar, except from the per cent of women who remained in the fourth quartile between age 33 and 40 years (26.9%).

Correlation coefficients for soft drink intake between age 33 and 40 years is shown in **Table 5**.

***Table 5*** *Spearman's correlation coefficient for soft drink intake between age 33 years (1999) and 40 years (2006), women and men.*

| | **Women** (n=154) | **Men** (n=160) |
|---|---|---|
| **Soft drinks, t/w** | 0.53* | 0.55* |
| **Soft drinks, g/d** | 0.54* | 0.55* |

* p<0.001

### 5.2.4 Change in soft drink intake between age 33 and 40 years

Grams of soft drinks consumed per day at age 40 years (2006) were significantly lower than at age 33 years (1999) for both genders. Women reported a mean decrease of 64.8 grams per day (SD 161.0, 95% CI [-90.5, -39.2], p<0.001), while men reported to drink 165.0 grams less per day at age 40 than at age 33 years (SD 578.5, 95% CI [-255.3, -74.7], p=<0.001).

Also the frequency of soft drink intake declined significantly from age 33 to 40 years for both men (mean difference -1.5 times/week, SD 3.7, 95% CI [-2.1, -0.9], p<0.001) and women (mean difference -1.1 times/week, SD 2.7, 95% CI [-1.5, -0.7], p<0.001).

## 5.3 Sweets

### 5.3.1 Tracking of sweet intake from age 15 to 40 years

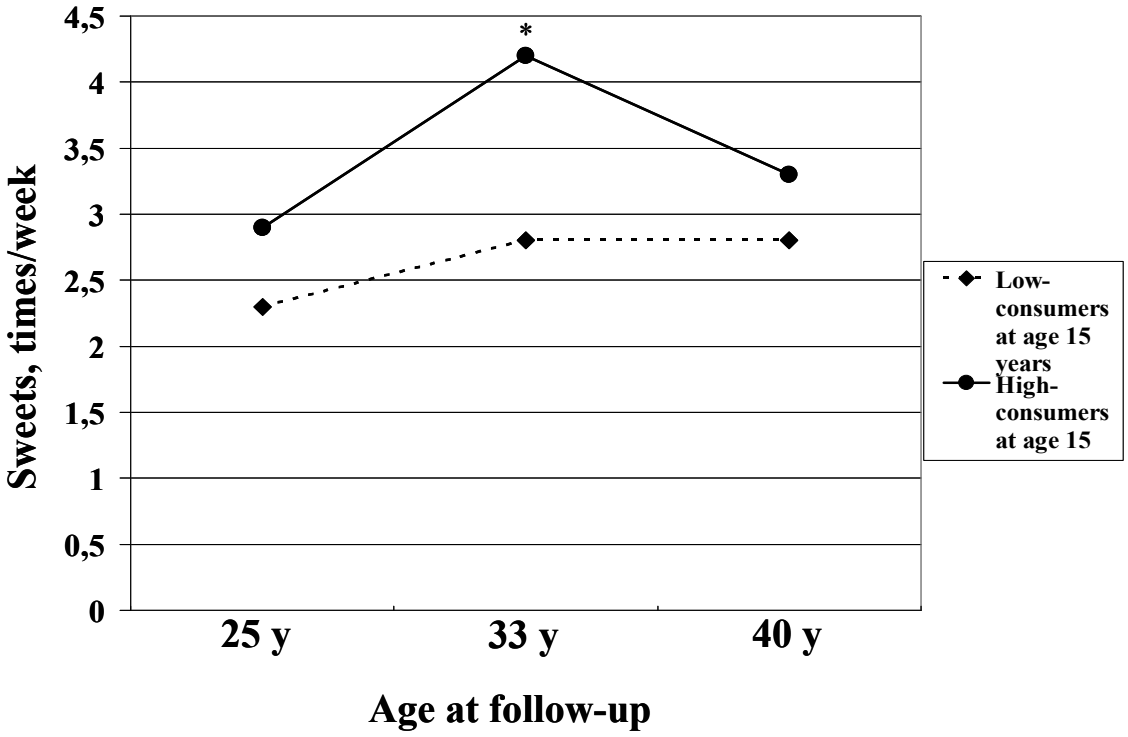
The subjects were categorised by frequency of sweet intake at age 15 years (1981/1979) (**Table 6**). At age 25 years (1991) there was only a borderline significant difference between the low and high consumption groups, while at age 33 years (1999) a significant difference was evident for frequency of sweet consumption (**Table 6**). A visualisation of these results is shown in **Figure 4**.

***Table 6*** *Sweet intake at age 25 (1991), 33 (1999), and 40 years (2006) by frequency of sweet intake at age 15 years (1981/1979), women and men. (Mean (SD), median (25$^{th}$-75$^{th}$ percentile)).*

| | **Sweet intake frequency at 15 years** | | | | |
|---|---|---|---|---|---|
| | **Low** | | **High** | | |
| **Sweets at** | (n=137) | | (n=88) | | p-value* |
| **follow-up** | Mean (SD) | Median (25$^{th}$-75$^{th}$) | Mean (SD) | Median (25$^{th}$-75$^{th}$) | |
| Times/week, 25 y | 2.3 (2.1) | 1.5 (1.5 – 4.5) | 2.9 (2.4) | 1.5 (1.5 – 4.5) | 0.056 |
| Times/week, 33 y | 2.8 (3.3) | 1.6 (0.9 – 3.5) | 4.2 (3.9) | 3.2 (1.8 – 5.2) | 0.006 |
| Times/week, 40 y | 2.8 (3.3) | 1.8 (1.0 – 3.5) | 3.3 (3.2) | 2.5 (1.3 – 4.4) | 0.179 |
| Grams/day, 33 y | 18.1 (30.5) | 8.4 (4.0 – 21.7) | 25.8 (35.9) | 14.2 (9.2 – 27.8) | 0.107 |
| Grams/day, 40 y | 20.4 (31.1) | 11.0 (5.0 – 23.0) | 21.4 (23.3) | 13.5 (8.0 – 29.0) | 0.647 |

* ANCOVA with adjustment for gender for difference between consumption groups.

***Figure 4*** *Mean frequency (times/week) of sweet consumption at age 25 (1991), 33 (1999), and 40 years (2006) by groups of sweet intake at age 15 years (1981/1979), women and men.†*




Difference between groups assessed with ANCOVA with adjustment for gender. * $p < 0.05$.

†Low consumption group n=137; high consumption group n=88.

### 5.3.2 Tracking of sweet intake from age 25 to 40 years

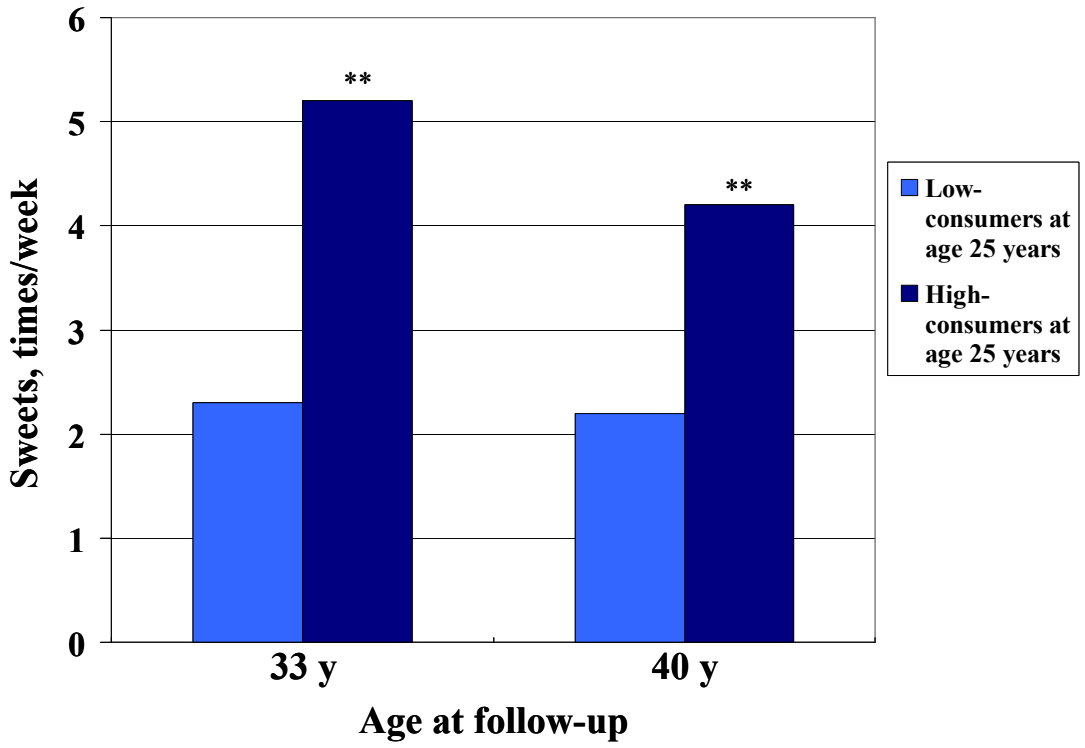
Based on intake frequency at age 25 years (1991), the high-consumption groups had a significantly higher intake of sweets at age 33 (1999) and at age 40 years (2006), both for consumption frequency and grams per day of sweets, than did the low-consumption group. The results are summarised in **Table 7**. A visualisation of this tracking is shown in **Figure 5**.

***Table 7*** *Sweet intake at age 33 (1999) and 40 years (2006) by frequency of sweet intake at age 25 years (1991), women and men. (Mean (SD), median (25th-75th percentile)).*

| | Sweet intake frequency at 25 years | | | | |
|---|---|---|---|---|---|
| | Low | | High | | |
| **Sweets at follow-up** | (n=172) | | (n=88) | | p-value* |
| | Mean (SD) | Median (25th-75th) | Mean (SD) | Median (25th-75th) | |
| Times/week, 33 y | 2.3 (2.3) | 1.6 (0.8 – 3.0) | 5.2 (4.8) | 3.5 (1.7 – 6.0) | <0.001 |
| Times/week, 40 y | 2.2 (1.9) | 1.8 (1.0 – 3.0) | 4.2 (4.5) | 2.6 (1.3 – 6.0) | <0.001 |
| Grams/day, 33 y | 12.0 (12.3) | 8.5 (3.4 – 16.6) | 36.4 (47.9) | 21.7 (8.1 – 40.7) | <0.001 |
| Grams/day, 40 y | 14.7 (14.0) | 11.0 (4.0 – 20.0) | 30.5 (40.0) | 17.0 (7.0 – 38.5) | <0.001 |

* ANCOVA with adjustment for gender for difference between consumption groups.

***Figure 5*** *Mean frequency (times/week) of sweet consumption at age 33 (1999) and 40 years (2006) by groups of sweet intake at age 25 years (1991), women and men. †*




Difference between low and high consumption groups at each time point assessed with ANCOVA with adjustment for the effect of gender. ** $p < 0.001$.

†Low consumption group n=172; high consumption group n=88.

### 5.3.3 Tracking of sweet intake from age 33 to 40 years

At a group level (**Table 8**), participants who reported a low intake of sweets at age 33 years, still reported this low intake at age 40 years, relative to high consumers at age 33 years.

***Table 8*** *Sweet intake at age 40 years (2006) by frequency of sweet intake at age 33 years (1999), women and men. (Mean (SD), median ($25^{th}$-$75^{th}$ percentile)).*

| | **Sweet intake frequency at age 33 years** | | | | |
|---|---|---|---|---|---|
| | **Low** | | **High** | | |
| **Sweets at** | (n=208) | | (n=128) | | p-value* |
| **follow-up** | Mean (SD) | Median ($25^{th}$-$75^{th}$) | Mean (SD) | Median ($25^{th}$-$75^{th}$) | |
| Times/week, 40 y | 2.2 (2.2) | 1.5 (0.8-2.7) | 4.2 (4.4) | 2.9 (1.5-5.4) | <0.001 |
| Grams/day, 40 y | 14.1 (14.2) | 10.5 (4.0-19.8) | 29.3 (39.4) | 17.5 (9.3-31.0) | <0.001 |

*ANCOVA with adjustment for gender for difference between consumption groups.

Tracking analyses at the individual level revealed that a total of 44.4% of women and 41.2% of men remained in the same quartile of intake frequency of sweets at age 40 years as at age 33 years. Among women, 40.5% of the subjects who were categorised into the fourth quartile at age 33 years, still remained in this quartile at age 40 years. For men, the corresponding number was 60%. The percentage remaining in the first quartile of consumption frequency was 71.4% for women and 51.3% for men.

When looking at grams of sweets per day, 39.6% of women remained in the same quartile between age 33 and 40 years. A total of 31.7% of women remained in the fourth quartile and 56.3% in the first quartile over the same time period. Among men, 37.5% remained in the same quartile, while 54.3% remained in the fourth quartile and 56.1% remained in the first quartile of sweet intake.

Correlation coefficients for sweet intake at age 33 and 40 years is presented in **Table 9**.

***Table 9*** *Spearman's correlation coefficients for sweet intake between age 33 years (1999) and 40 years (2006), women and men.*

| | **Women** (n=149) | **Men** (n=152) |
|---|---|---|
| **Sweets, t/w** | 0.48* | 0.44* |
| **Sweets, g/d** | 0.46* | 0.44* |

*p<0.001

### 5.3.4 Change in sweet intake between age 33 and 40 years

For change in sweet intake between age 33 and age 40 years, men reported a significant increase in median ($25^{th}$-$75^{th}$) grams of sweets per day from 9 (4.2 – 22.4) grams per day at age 33 years to 13 (6.0 – 30.0) grams per day at age 40 years (mean difference 6.0, SD 27, 95% CI [1.5, 10.3], p=0.004), but not in frequency of consumption (p=0.984). Neither frequency of consumption nor grams per day of chocolate consumed differed over the same time period (p=0.805 and p=0.258, respectively), for candy, however, both frequency and grams per day was significantly reduced (p=0.041 and p=0.025, respectively). Men reported a median ($25^{th}$-$75^{th}$) consumption of confectionary 0.1 (0.0 – 0.3) times per week (0.1 (0.0 – 0.4) grams per day) at age 33 years, and "smågodt" 0.3 (0.0 – 0.8) times per week (3.5 (0.0 – 10.5) grams per day) at age 40 years.

For the same period, women reported a non-significant decline in the total amount (median ($25^{th}$-$75^{th}$)) of sweets eaten per day, from 10.3 (5.2 – 24.2) grams per day at age 33 years to 11 (5.0 – 21.0) grams per day at age 40 (mean difference -6, SD 35, 95% CI [-12.1, -0.8], p=0.485). However, reported amounts of chocolate and candy consumed (grams per day) were significantly reduced (both p<0.001). Women's frequency of sweet consumption was significantly reduced during the same time period (mean difference -1.0 times per week, SD 4, 95 % CI [-1.5, -0.4], p=0.009). When frequency of sweet intake was divided into frequencies of chocolate and candy consumption, both were significantly reduced (both p<0.001). Women reported a median ($25^{th}$-$75^{th}$) consumption of confectionary 0.1 (0.0 – 0.1) times per week (0.1

(0.0 – 0.2) grams per day) at age 33 years, and "smågodt" 0.3 (0.0 – 0.8) times per week (2.0 (0.0 – 7.0) grams per day) at age 40 years.

## 5.4 Total sugar intake

### 5.4.1 Tracking of sugar intake from age 33 to 40 years

When studying movement between quartiles of energy per cent (E%) from sugar between age 33 and 40 years, 43.6% of men and 47.8% of women remained in the same quartile. Among men who reported to get more than 10 E% from sugar at age 33 years, 43.1 % still reported this high intake at age 40 years. For women the corresponding proportion was 27.0 %.

Correlation coefficients for sugar intake at age 33 and 40 years is presented in **Table 10**.

***Table 10*** *Spearman's correlation coefficients for sugar intake (E% and grams per day) between age 33 years (1999) and 40 years (2006), women and men.*

| | **Women** (n=167) | **Men** (n=172) |
|---|---|---|
| **Sugar, E%** | 0.62* | 0.57* |
| **Sugar, g/d** | 0.66* | 0.62* |

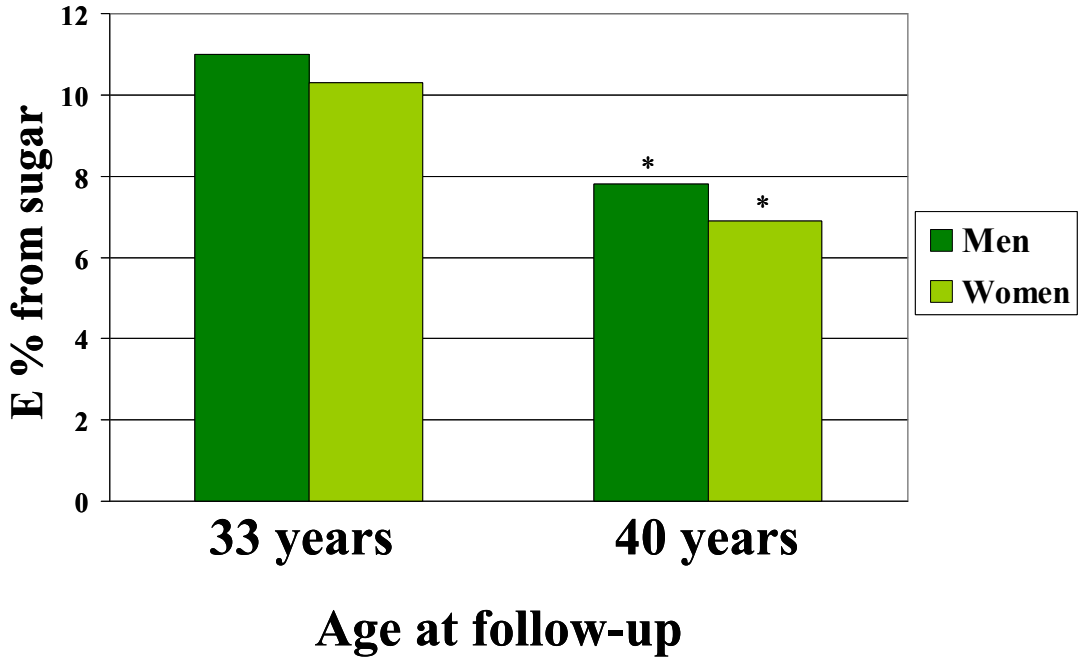
*p<0.001

### 5.4.2 Change in sugar intake between age 33 and 40 years

Both men and women reported a significantly lower intake of sugar at age 40 years compared to age 33 years (**Table 11 and Figure 6**). Among women, mean (SD) intake in grams of sugar per day decreased from 56 (46) grams per day in 1999 to 33 (28) grams per day in 2006. The mean difference was -22 grams per day (SD 42, p<0.001). Among men, mean (SD) intake decreased from 75 (66) to 55 (54) grams per day over the same period. The mean difference was -20 grams per day (SD 57, p<0.001).

Over the same period, mean (SD) energy per cent from sugar decreased from 10.3 (5.8) % to 6.9 (5.1) % among women, and from 10.9 (7.4) % to 7.8 (6.2) % among men, constituting a mean differences of -3.4% (SD 5.3, p<0.001) and -3.1% (SD 6.7, p<0.001) respectively.

***Figure 6*** *Change in mean sugar intake (E%) from age 33 years (1999) to age 40 years (2006), men (n=172) and women (n=167).*




*Difference between age 33 and age 40 years tested by paired samples t-test, p<0.001.

***Table 11*** *Difference in sugar intake from age 33 years (1999) to age 40 years (2006) (mean (SD) [95 % CI]).*

| | **33 years (1999)** | **40 years (2006)** | Difference, mean (SD) [95 % CI] | p-value* |
|---|---|---|---|---|
| **Women (n=167)** | | | | |
| Sugar, grams/day | 55.7 (46.4) | 34.0 (28.4) | -21.8 (41.9) [-28.2, -15.4] | <0.001 |
| Sugar, E% | 10.3 (5.8) | 6.9 (5.1) | -3.4 (5.3) [-4.2, -2.6] | <0.001 |
| Energy, kJ | 8506 (2921) | 8053 (2531) | -453 (2868) [-892, -15] | 0.043 |
| **Men (n=172)** | | | | |
| Sugar, gram/day | 74.7 (66.3) | 55.1 (54.0) | -19.6 (57.1) [-28.2, -11.0] | <0.001 |
| Sugar, E% | 10.9 (7.4) | 7.8 (6.2) | -3.1 (6.7) [-4.1, -2.1] | <0.001 |
| Energy, kJ | 10823 (3450) | 11226 (3303) | 403 (3718) [-157, 963] | 0.157 |

*Paired-samples t-test for difference between age 33 and 40 years.

## 5.5 Association of long-term intake of soft drinks, sweets, and sugar with BMI

### 5.5.1 Association of long-term intake of soft drinks with BMI at age 40 years

As seen in **Table 12**, there were no associations between long-term intake frequency of soft drinks and BMI, nor the percentage of overweight in each of the long-term consumption groups.

***Table 12*** *Association of long-term intake frequency of soft drinks (from age 25 years to 40 years, 1991-2006) with self-reported BMI at age 40 years, women and men combined (mean or %, (95% CI), partial eta squared ($R^2$)).*

| | **Long-term low consumers** (n=189) | **Decreasing consumers** (n=31) | **Increasing consumers** (n=20) | **Long-term high consumers** (n=75) | p-value* | $R^2$ |
|---|---|---|---|---|---|---|
| **Women, %** | 51 | 42 | 36 | 48 | ns | |
| **BMI kg/m$^2$** | 25.2 (24.6,25.7) | 25.4 (24.6,26.3) | 24.6 (22.9,26.4) | 24.9 (23.5,26.3) | 0.826 | 0.3% |
| **Overweight, %** | 42 (35, 49) | 47 (36, 58) | 36 (15, 56) | 43 (28, 60) | 0.784 | 0.3% |

* Difference between consumption groups assessed by ANCOVA with adjustment for the effect of gender.

### 5.5.2 Association of long-term intake of sweets with BMI at age 40 years

As seen in **Table 13**, no associations were found between long-term intake frequency of sweets and BMI, nor the proportion of overweight in each of the consumption groups.

***Table 13*** *Association of long-term intake frequency of sweets (from age 25 years to 40 years, 1991-2006) with self-reported BMI at age 40 years, women and men combined (mean or %, (95% CI), partial eta squared ($R^2$)).*

| | **Long-term low consumers** (n=128) | **Decreasing consumers** (n=49) | **Increasing consumers** (n=79) | **Long-term high consumers** (n=62) | p- | $R^2$ |
|---|---|---|---|---|---|---|
| **Women, %** | 48 | 42 | 55 | 48 | ns | ns |
| **BMI kg/m$^2$** | 25.1 (24.4,25.8) | 25.4 (24.3,26.6) | 25.0 (24.2,25.9) | 25.4 (24.4,26.4) | 0.927 | 0.1% |
| **Overweight, %** | 29 (31, 47) | 54 (41, 67) | 44 (33, 54) | 41 (29, 52) | 0.303 | 1.2% |

* Difference between consumption groups assessed by ANCOVA with adjustment for the effect of gender.

### 5.5.3 Association of long-term sugar intake with BMI at age 40 years

As seen in **Table 14**, there were no associations between long-term sugar intake (from age 33 to 40 years) and BMI, nor the percentage of overweight between the three consumption groups.

***Table 14*** *Association of long-term intake of E% from sugar (from age 33 years to 40 years, 1999-2006) with self-reported BMI at age 40 years, women and men combined (mean or %, (95% CI), partial eta squared ($R^2$)).*

| | **Long-term low consumers** (n=167) | **Decreasing consumers** (n=94) | **Long-term high consumers** (n=55) | p-value* | $R^2$ |
|---|---|---|---|---|---|
| **Women, %** | 48 | 44 | 50 | ns | |
| **BMI kg/m$^2$** | 25.3 (24.7, 25.9) | 24.9 (24.1, 25.7) | 24.6 (23.6, 25.7) | 0.488 | 0.5% |
| **Overweight, %** | 41 (34, 48) | 42 (32, 51) | 38 (26, 51) | 0.903 | 0.1% |

* Difference between consumption groups assessed by ANCOVA with adjustment for the effect of gender.

## 5.6 Association of demographic and health-related variables with soft drink, sweet, and sugar intake

### 5.6.1 Association of demographic and health-related variables with soft drink intake at age 40 years

As seen in **Table 15**, both gender and level of education were significantly associated with soft drink intake (grams per day) at age 40 years, and together they explained 5.6% of the variance in soft drink intake. When adding health-related variables to the model, these relationships were still significant. In addition, smoking status and leisure time physical activity were found to be significantly associated with soft drink intake. The change in $R^2$ was 4.6% which was a significant increase in variance explained from model 1 (Sig. F change = 0.001). Participants who were male, less educated, less physically active, and/or smokers had a higher soft drink intake than female, higher educated, more physically active, and/or non-smoking participants. The covariates in model 2 explained 9.3% of the variation in soft drink intake.

***Table 15*** *Multiple regression models assessing the association of demographic and health-related variables with soft drink intake (grams/day) at age 40 years. Bivariate correlations between soft drink intake and covariates. Women and men (n=380).*

| | Bivariate correlation | | Multivariate model | | |
|---|---|---|---|---|---|
| **Covariates** | r | p | b (SD) | β | p |
| ***Model 1*** | | | | | |
| Gender (1=male, 2=female) | -0.19 | <0.001 | -102.00 (31.03) | -0.17 | 0.001 |
| Education | -0.18 | <0.001 | -98.62 (31.21) | -0.16 | 0.002 |
| | | | $R^2$ = 6.1% | | |
| | | | ($R^2_{adj}$= 5.6%) | | |
| ***Model 2*** | | | | | |
| Gender (1=male, 2=female) | -0.19 | <0.001 | -82.47 (31.90) | -0.13 | 0.010 |
| Education | -0.18 | <0.001 | -74.02 (31.68) | -0.12 | 0.020 |
| Smoking | 0.19 | <0.001 | 83.00 (36.47) | 0.12 | 0.023 |
| LTPA | -0.17 | <0.001 | -68.00 (32.18) | -0.11 | 0.035 |
| Health concern (0=no, 1=yes) | -0.20 | <0.001 | -52.87 (33.42) | -0.09 | 0.114 |
| Dieting (0=yes, 1=no) | 0.08 | 0.073 | 19.93 (38.29) | 0.03 | 0.603 |
| | | | $R^2$ = 10.7% | | |
| | | | ($R^2_{adj}$= 9.3%) | | |
| | | | $R^2$ change = 4.6% | | |

r = Pearsons' correlation coefficient; b = unstadardised regression coefficient (standard deviation); β = standardised regression coefficient.

### 5.6.2 Association of demographic and health-related variables with sweet intake at age 40 years

**Table 16** shows the association of demographic and health-related variables with sweet intake at age 40 years. The significant association between gender and sweet intake in model 1 disappeared when health-related variables were added in model 2. The only significant association was seen for dieting behaviour. The increase in explained variance between model 1 and 2 of 2.5% was significant (Sig. F change = 0.049). Participants who had tried to lose weight over the past three months had a lower intake of sweets than non-dieting participants. As little as 2.7% of the variance in sweet intake is accounted for by the covariates listed.

***Table 16*** *Multiple regression models assessing the association of demographic and health-related variables with sweet intake (grams/day) at age 40 years. Bivariate correlations between sweet intake and covariates. Women and men (n=380).*

| | Bivariate correlation | | Multivariate model | | |
|---|---|---|---|---|---|
| **Covariates** | r | p | b | β | p |
| ***Model 1*** | | | | | |
| Gender (1=male, 2=female) | -0.13 | 0.008 | -6.35 (2.80) | -0.12 | 0.024 |
| Education | -0.07 | 0.094 | -2.75 (2.81) | -0.05 | 0.330 |
| | | | | $R^2$ = 1.8% | |
| | | | | ($R^2_{adj}$= 1.3%) | |
| ***Model 2*** | | | | | |
| Gender (1=male, 2=female) | -0.13 | 0.008 | -5.36 (2.91) | -0.10 | 0.066 |
| Education | -0.07 | 0.094 | -2.87 (2.89) | -0.05 | 0.321 |
| Smoking | 0.03 | 0.267 | -0.18 (3.33) | 0.00 | 0.957 |
| LTPA | -0.12 | 0.011 | -5.23 (2.94) | -0.10 | 0.076 |
| Health concern (0=no, 1=yes) | -0.07 | 0.081 | 0.42 (3.05) | 0.00 | 0.890 |
| Dieting (0=yes, 1=no) | 0.14 | 0.003 | 7.70 (3.50) | 0.11 | 0.028 |
| | | | | $R^2$ = 4.3% | |
| | | | | ($R^2_{adj}$= 2.7%) | |
| | | | | $R^2$ change = 2.5% | |

r = Pearsons' correlation coefficient; b = unstadardised regression coefficient (standard deviation); β = standardised regression coefficient.

### 5.6.3 Association of demographic and health-related variables with sugar intake at age 40 years

For sugar intake, gender was not a significant explanatory variable (**Table 17**), but level of education was. However, the association between education and sugar intake disappeared when other covariates were added to the model. $R^2$ change was 8.3% between model 1 and 2, and a significant increase in variance explained (Sig. F change <0.001). Smokers, less physically active, and/or dieting participants had a higher intake of sugar (E%) than non-smoking, more physically active, and/or non-dieting participants. Only 9.3% of the variance in soft drink intake is accounted for by the covariates listed.

***Table 17*** *Multiple regression models assessing the association of demographic and health-related variables with sugar intake (grams/day) at age 40 years. Bivariate correlations between sugar intake and covariates. Women and men (n=380).*

| | **Bivariate correlation** | | **Multivariate model** | | |
|---|---|---|---|---|---|
| **Covariates** | r | p | b (SD) | β | p |
| ***Model 1*** | | | | | |
| Gender (1=male, 2=female) | -0.09 | 0.043 | -0.79 (0.58) | -0.07 | 0.179 |
| Education | -0.14 | 0.003 | -1.47 (0.59) | -0.13 | 0.013 |
| | | | | $R^2$ = 2.4% | |
| | | | | ($R^2_{adj}$ = 1.9%) | |
| ***Model 2*** | | | | | |
| Gender (1=male, 2=female) | -0.09 | 0.043 | -0.31 (0.59) | -0.03 | 0.601 |
| Education | -0.14 | 0.003 | -1.03 (0.58) | -0.09 | 0.080 |
| Smoking | -0.22 | <0.001 | 1.73 (0.67) | 0.13 | 0.010 |
| LTPA | -0.17 | <0.001 | -1.67 (0.59) | -0.15 | 0.005 |
| Health concern (0=no, 1=yes) | 0.20 | 0.001 | -0.68 (0.62) | -0.06 | 0.273 |
| Dieting (0=yes, 1=no) | 0.18 | <0.001 | 1.98 (0.71) | 0.14 | 0.005 |
| | | | | $R^2$ = 10.7% | |
| | | | | ($R^2_{adj}$ = 9.3%) | |
| | | | | $R^2$ change = 8.3% | |

r = Pearsons' correlation coefficient; b = unstadardised regression coefficient (standard deviation); β = standardised regression coefficient.

# 6. Discussion

## 6.1 Tracking

### 6.1.1 Choice of statistical methods

Various statistical methods have been used to study tracking of dietary intake and other lifestyle factors (16;39;50;54;59). Most frequently tracking is estimated by a correlation coefficient between subsequent measurements or by the proportion of people staying in the same group at baseline and at follow-up (tertiles, quartiles, a specific 'risk' group, etc.). But also odds ratio, Cohen's κ, Kendall's coefficient of concordance, regression modelling, and other methods are used to estimate the magnitude of tracking (83).

The choice of method relies on several factors, among them the number of measurements included (T=2 or T≥2), the nature of the variables studied (distribution, division into subgroups, etc.), and whether it is tracking at individual or group level that is desired to illuminate. A major drawback of most of the traditional tracking methods is that they can only include two time points. Twisk et al (50;83;84) have developed a method which calculates a tracking coefficient using all longitudinal data available (T≥2). This generalized estimating equation analysis is comparable to linear regression analyses, but it takes into account that repeated observations within one subject are correlated. The method also gives the opportunity to adjust for time-dependent and time-independent covariates. However, this method requires a great degree of coherence between the data collection tools used and variables included at each time point. Due to the changes in the questionnaires used in the Oslo Youth Study, this method can not be applied to our data.

In this thesis, several methodologies are used to assess tracking. Subjects were divided into groups based on their frequency of consumption at age 15, 25, and 33

years, and the subsequent mean values for subjects originally in those categories were computed. If a mean value within any 15-, 25- or 33-year consumption group maintained a relative position in rank compared with the mean value in the other consumption group, it was interpreted as evidence of tracking. This method gives, however, only an estimation of tracking at a group level. To study tracking within individuals, the per cent of subjects remaining in the same quartile of sugar, soft drink, and sweet intake between age 33 and 40 years was assessed, and Spearman's correlation analysis was also used.

### 6.1.2 Interpretation of tracking results

Conclusions about the level of tracking are often based on the significance of the tracking coefficient, or whether there are significant differences between different consumption groups at follow-ups. This statistical significance is again based on the hypothesis that the tracking coefficient or the difference between groups equals zero. However, a significant difference from zero does not provide any information about the magnitude of the tracking. Furthermore, it is necessary to have in mind that p-values are strongly tied to sample size, and also that the magnitude of the tracking coefficient must be interpreted in relation to the length of the study. A study looking at dietary change over a relatively short time period may find a high tracking coefficient, while a study covering a longer time period may calculate a relatively low tracking coefficient. This does, however, not imply that a significant tracking coefficient calculated over a short time period gives any stronger implications for tracking than a non-significant coefficient calculated over a much longer time period.

The determination of cut-off points between high, moderate, and low levels of tracking also complicates the interpretation of tracking results. Some researchers argue that correlation coefficients analogous to test-retest reliability coefficients should be used (85). This may be a too stringent definition, as most tracking studies extend over a longer time period than test-retest studies, and a greater degree of change should be allowed for.

When studying the proportion of subjects who remain in a certain group (e.g. quartile or high 'risk' group), one should be aware of that the proportion of subjects who remain in extreme groups is somewhat higher than the proportion in the middle groups. This is simply caused by a statistical phenomenon, and one should not automatically conclude that there is a higher level of tracking in extreme groups than in the middle groups.

Last, but not least, it must be taken into account that tracking results are influenced by chance and by measurement errors. For tracking on group level this may not have a great influence, but at the individual level chance and measurement errors can result in incorrectly low tracking coefficients. Lifestyle factors are normally difficult to measure accurately, in contrast to, for instance, some biological factors, like blood cholesterol levels. Consequently, variables for physical activity and dietary factors not just show lower reproducibility, but also lower levels of tracking than biological variables (86-88). This is, however, not just caused by the difficulty in measuring lifestyle factors, it may also partly be due to an actual lower level of tracking in lifestyle variables, compared to biological variables.

## 6.2 Interpretations of results

### 6.2.1 Intake of soft drinks

#### *Tracking of soft drink intake*

The level of tracking of soft drink intake frequency at a group level between age 15 (1981/1979) and age 25 (1991), 33 (1999), and 40 years (2006) was found to be moderate to high in this thesis. An even higher level of tracking was observed from age 25 to 33 and 40 years, and from age 33 to 40 years, both for frequency of soft drink intake and grams of soft drinks consumed per day.

The finding that intake frequency of soft drinks tracked over the 25-year time span from age 15 to 40 years was not only statistically significant ($p=0.025$). The mean

difference in frequency of soft drink consumption between the two 15-year consumption groups at age 40 years was 1.0 time per week. With a median intake frequency of 2.0 and 2.2 times per week at age 40 for women and men, respectively, this is a large difference. When dividing the group by gender for analyses on grams of soft drink per day at age 33 and 40 years, differences between the consumption groups were found, but the results did not reach significancy. This may be due to the low number of subjects in each consumption group.

At the individual level, there was a moderate level of tracking from age 33 to 40 years for both frequency of intake and grams of soft drinks consumed per day. Correlation coefficients were all close to r=0.55, and the per cent of subjects who remained in the same quartile of intake was close to 40% for both genders. Note that only 25% of subjects would remain in the same quartile over time if one assumes that they could move randomly into any of the quartiles at follow-up. The proportion remaining in the first or fourth quartile of soft drink consumption between age 33 and 40 years was higher than the proportion remaining in the middle groups. As discussed previously, this does not automatically imply that there was a higher level of tracking in these groups. An interesting finding was that only 26.9% of women originally in the fourth quartile of grams per day of soft drink intake remained in this quartile at age 40 years. This implies that women who drank large amounts of soft drinks at age 33 years reduced their intake more than the rest of the group during the next seven years. For frequency of intake, the same change was not found. A total of 60% of women in the fourth quartile of soft drink consumption at age 33 years were still in this quartile at age 40. It can not be deduced from these findings whether it is the same women who report a stable intake frequency, but a reduced amount consumed at each time of consumption, or whether the groups are made up of different women.

Very few studies have assessed tracking of soft drink intake. In Norway both Lien et al (16) and Åstrøm (89) have analysed the level of tracking of soft drink intake among adolescents participating in the Norwegian Longitudinal Health Behaviour (NLHB) study. The participants were followed from age 13 to age 23 years (1990 to

2000). Because Lien et al focus their article on public health nutrition and Åstrøm focus on oral health, only Liens findings are discussed here. They observed a relatively high stability of soft drink intake over the age span 14 to 21 years (16). On the group level, those reporting the most frequent intake at age 14, still reported the most frequent intake at age 21 years. This finding was largely confirmed by analyses at the individual level.

In an American study, Li et al (56) followed a population of urban low-income African-American adolescents over a period of one year (mean age at baseline in 2003 was 11.8 years). They found that the level of tracking of per cent of energy from soft drinks at the individual level was low. The per cent of subjects who remained in the same quartile of soft drink intake after one year was 34.3%, and the Spearman correlation coefficient for the percentage of energy from soft drinks was r=0.28, although somewhat higher for boys (r=0.36) than for girls (r=0.19). Even though Li et al used a validated FFQ designed for an adolescent population, their results may be quite vulnerable to the effect of measurement errors and chance.

The results in this thesis are more in line with the results found by Lien et al than by Li et al. Since the subjects in this thesis have a mean age of 15 years at baseline, it is difficult to compare them to Li et al's population. It may be that the stability of soft drink intake over early adolescence is weaker than from later adolescence and onwards. Cultural differences between this American population and the Norwegian populations studied by Lien et al and in this thesis may also have influenced the results. In the Health Behaviour in School-aged Children 2001/2002 report (71), over 40% of American, but only about 20% of Norwegian 13-year-olds reported to drink soft drinks daily. In addition, baselines for the three tracking studies differ. The food choice environment for the current generation of adolescents is quite different from when the Oslo Youth Study was initiated, so time trends in soft drink availability and consumption should be taken into consideration when comparing these studies.

In the 1999-follow-up of the Oslo Youth Study (39) there was observed a low degree of tracking of soft drink intake on group level from age 15 to 33 years, but a high

degree of tracking between age 25 and 33 years. The correlation coefficients indicated a low to moderate level of tracking at the individual level from age 25 to 33 years (r=0.33 for women and r=0.44 for men). These tracking analyses were done on women and men separately, which may have hindered the finding of more significant results because of small consumption groups and thereby low statistical power. When assessing tracking of soft drink intake frequency for genders combined in this thesis, there was observed a moderate to high level of tracking from age 15, through age 25 and 33, to age 40 years. The correlation analyses between age 33 and 40 years, done on men and women separately, were also higher than in Kvaavik's study (all close to r=0.55).

The quality of the questionnaire used at age 25 years was not optimal, and only rough measures on the frequency of soft drink consumption could be obtained. This may explain the lower correlation coefficients between age 25 and 33 years reported by Kvaavik et al, than between age 33 and 40 years reported in this thesis. The sample of subjects in this thesis does, however, differ somewhat from the sample in the tracking analyses from the follow-up in 1999, because only those responding in 2006 as well as on the previous time points are included. (Of the 408 responders in 2006, 342 had also responded in 1999.) Despite this, tracking of soft drink intake on a group level from 25 years and onwards show a similar pattern in both follow-ups: there is a moderate to high level of tracking of soft drink intake from early adulthood into later adulthood. This implies that the relative intake of soft drinks has more or less stabilised at a young adult age.

### *Change in soft drink intake from 33 to 40 years*

The observed decrease in soft drink intake from age 33 to 40 years among the participants in this thesis may partly be explained by the ageing of the study population. In the latest Norwegian nationally representative nutrition survey (42), both young women and men (16 to 29 years) reported to drink more than twice as much sugar-sweetened beverages as did older subjects (30 to 59 year). The decrease observed may also partly be explained by secular trends in soft drink intake in

Norway. As mentioned previously, there are sales data that indicate that over the past five years Norwegians have increased their purchase of soft drinks with intense sweeteners and bottled water, while the sales of sugar-sweetened soft drinks has decreased (46). According to a report from Synovate MMI (90), the per cent of adolescents who consume soft drinks weekly declined from 54% in 1997 to 35% in 2005.

Even though not nationally representative, the findings presented in this thesis implies that the decline in sales of soft drinks observed in Norway recent years is reflected in the adult populations' consumption patterns of these beverages.

### 6.2.2 Intake of sweets

#### *Tracking of sweet intake*

The degree of tracking of sweet intake on a group level from age 15 to age 25, 33, and 40 years was low. On the contrary, the level of tracking from age 25 years to age 33 and 40 years, as well as from age 33 to 40 years was high. At the individual level, between age 33 and 40 years, the level of tracking was moderate. It should be mentioned that the tracking results between age 33 and 40 years must be interpreted with caution, since the change in the FFQ between the two time points (the exchange of confectionary with "smågodt") may have influenced the results.

Like for soft drinks, there is scarce data on tracking of sweet intake. In Norway, adolescents have previously reported to have a relatively stable frequency of sweet intake from 14 to 23 years of age (1990 to 2000) (16;89). Lien et al (16) found that consumption of sweets/chocolate showed stability in ranking across adolescence, with the highest stability occurring from age 18 to age 21 years (1995 to 1998).

In this thesis, the level of tracking over this age period was low. There may be several reasons for the differing results, for instance the data collection instruments used and the difference in mean sweet intake in the Norwegian population during the survey years. Both the selection and the accessibility of sweets have increased substantially

over the past years. According to data from the Organisation for Norwegian Chocolate Factories (Norske Sjokoladefabrikkers Forening) (91), the total amount of chocolate and sugary foods consumed by Norwegians at the time when the Oslo Youth Study was initiated was 10.4 kg per person (1980). By the participants in our study had reached 25 years (1991), this amount had increased to 12.9 kg per person. The increase over the time span of Liens' study (1990 to 2000) was only 0.4 kg per person (from 12.1 kg to 13.3 kg per person per year). This may have had an impact on the level of tracking in Liens' study. However, if the increase in intake between 1980 and 1991 was equal for all consumers, this would not have interfered with tracking results in this thesis.

The measure for sweet intake at age 15 years was crude, and its ability to rank subjects correctly has not been assessed. In addition, the combining of questions and response alternatives to yield low and high consumption groups for the tracking analyses may have further misclassified subjects. If a large proportion of subjects were misclassified, it may explain some of the lack of tracking of sweet intake from adolescence into adult age.

In addition, it is important to consider that adolescence is a period with major life changes. The influence of parents and home environment on diet decreases and the influence of other environments and people becomes more important. The changes that occur during adolescence are likely to influence intake of foods and beverages. As Devine (53) hypothesise, food choices are rooted in past experiences, but may be susceptible to change trough exposure to new circumstances and life transitions. This may result in different levels of tracking for different foods and beverages. In this thesis, a moderate to high level of tracking of soft drink intake at group level was observed from age 15 to age 40 years. However, the level of tracking of sweets over this period was low. These findings and results from other studies on tracking of dietary intake which show different levels of tracking for different foods and beverages (52;56;59;92) support Devine's hypothesis.

The level of tracking of sweet intake during adulthood among the participants in this thesis, could, by just studying the p-values and correlation coefficients, be defined as high at a group level and moderate at the individual level. However, as touched upon previously, this may be a bit too simple. The average consumption across a group always changes more smoothly than individual measurements, because people vary their intake in different ways (e.g., increasing, decreasing, or fluctuating consumption). Consequently, average consumption can generally be estimated more accurately than any individual's particular intake pattern (74). This may explain some of the difference between tracking on group and individual level found in this thesis.

Correlation coefficients for sweet intake between age 33 and 40 years were close to r=0.45. For soft drink and sugar intake, the correlation coefficients were approximately r=0.55 and r=0.60, respectively. This may indicate that the correlation coefficients for sweet intake were influenced by the change in the FFQ. However, similar correlation coefficients were revealed for sweet intake between age 33 and 42 years (1991 to 2000) in analyses on data from the 1958 British Birth Cohort (r=0.44 and r=0.45 for men and women, respectively) (93). It can therefore not be ruled out that sweet intake in fact was less stable than soft drink and sugar intake over these seven years.

In another British study, Lake et al (60) found no significant correlations between intakes of foods containing fat and/or sugar as a proportion of total food intake between age 12 and 33 years (1980 to 2000). However, in this study the broad nature of the food groups obscured the potentially significant level of tracking of individual foods consumed, and it is therefore difficult to compare the results to those of this thesis.

### *Change in sweet intake from 33 to 40 years*

Male participants reported a significantly higher total intake of sweets at age 40 than at age 33 years, while female participants reported a non-significant decline.

In the Norkost-study (42), young, male participants (16 to 29 years) reported to eat 19 grams of sweets per day, while in the age group 30 to 59 years, the reported intake was 10 grams per day. The corresponding amounts for female young and older participants were 17 and 11 grams per day, respectively. Though the Norkost-study is cross-sectional, this implies that intake of sweets declines with increasing age.

Analyses from the 1958 British Birth Cohort showed that both men and women decreased their intake of sweets from age 33 to 42 years (1991 to 2000) (93). It may be that a similar development has occurred among the participants in the Oslo Youth Study, but that it has been concealed as a consequence of the change in the FFQ previously discussed. In the same British Birth Cohort, there were no differences between genders for frequency of sweet intake at neither age 33 nor at age 42 years. This is similar to the reported frequencies among male and female participants in the Oslo Youth Study.

The increase in reported grams of sweets consumed per day by male participants in this thesis may solely be a result of the change of food categories in the FFQ, from "confectionary" at age 33 years to "smågodt" at age 40 years. The mean difference in grams per day of confectionary and "smågodt" was identical to the mean increase from age 33 to 40 years, 6 grams per day. It may as well seem like the decrease in frequency of reported candy consumption between the two time points was neutralised by the more frequent consumption of "smågodt" at age 40 than confectionary at age 33, so that the frequency of total sweet consumption did not differ between the two time points.

For women the picture was somewhat different, and even more complex than for men. They reported a significant decline in grams of chocolate and candy consumed between age 33 and 40 years, whereas the total amount of sweets consumed was not significantly reduced. They did, however, report to consume approximately 5 grams more of "smågodt" at age 40 years than of confectionary at age 33 years. The decrease in chocolate and candy may therefore have been neutralised by the

difference in reported consumption of confectionary at age 33 years and “smågodt” at age 40 years.

“Smågodt” includes all sorts of sweets, also chocolate and candy. This makes the comparison between the two time points even more difficult. It may be that people have reduced their intake of chocolate bars, but increased their intake of chocolate from “smågodt”. This also relates to candy.

The consumption pattern of confectionary and “smågodt” differs substantially. Confectionary is most commonly consumed at special occasions, like birthdays and Christmas parties. In addition, the amount of confectionary eaten is normally limited to a few pieces at each time of consumption. “Smågodt”, on the other hand, is a common treat in weekends, when going to the movies, and on several other occasions. Since, “smågodt” were commonly consumed sweets already in 1999, it may be that the absence of this response alternative contributed to an under-reporting of sweet intake at this time point.

Due to the changes in the FFQ used and the difficulty regarding the composition of “smågodt”, the results regarding change in sweet intake between age 33 and 40 years should be interpreted with caution. Even though the change in the FFQ is the same for all participants, it can not be ruled out that low and high consumers may have responded differently to confectionary at age 33 years versus “smågodt” at age 40 years.

### 6.2.3 Intake of sugar

#### *Tracking of sugar intake*

From age 33 years to age 40 years, 43.6% of men and 47.8% of women remained in the same quartile of sugar intake (E%). In addition, the Spearman correlation coefficients for both grams per day and E% from sugar from age 33 to 40 years were close to r=0.60. Both these findings imply that the level of tracking of sugar intake at the individual level over these seven adult years is moderate.

In the Amsterdam Growth and Health Longitudinal Study (AGHLS), Post et al (59) found low to moderate tracking coefficients for mono- and disaccharides, both for grams per day (r=0.34) and for per cent of total energy intake (r=0.37) between 13 and 33 years (1977 to 1997). The differences between the AGHLS and this thesis in both age and time span, as well as the years of the study periods, make them difficult to compare. Changes in food habits are more likely to occur between age 13 and 33 years than between age 33 and 40 years, both because of the longer time span, but also because of the changes occurring during the transition from adolescence to adult age. In addition, the tracking coefficient used in AGHLS is calculated in another way than Spearman's correlation coefficient, and the basis for comparison may therefore be limited.

Cusatis et al (92) found that throughout adolescence (12 to 18 years of age, 1990 to 1996) American females failed to maintain in relative quartile rank for mean daily sugar intake, and the correlation coefficients for repeated measures of sugar consumption were generally small. For many of the same reasons as for the AGHLS, these results are not directly comparable to the results in this thesis. The age group is different, and the study was not conducted as recent as the Oslo Youth Study. Cultural differences in sugar intake between USA and Norway may also have had implications on the difference in the results.

The absence of studies on tracking of sugar intake during adulthood, makes the findings in this thesis an important contribution to the body of literature on this topic.

### *Change in sugar intake between age 33 and 40 years*

In this Norwegian adult population, sugar intake decreased significantly from age 33 years to age 40 years. This may partly be explained by both ageing of the study population and secular trends in sugar intake in Norway.

Sugar intake normally decreases with age, and this may explain a proportion of the decline in sugar intake observed. Between the age groups 30-39 years and 40-49 years in the Norkost-study (42) a difference in energy per cent from sugar for both

women (9.3 E% and 8.1 E%, respectively) and men (9.7 E% and 7.8 E%, respectively) was observed. In this thesis, the corresponding numbers were 10.3 E% at age 33 years and 6.9 E% at age 40 years among women, and 10.9 E% at age 33 years and 7.8 E% at age 40 years among men.

Secular changes in food intake are also likely to have contributed to the changes seen. According to food supply statistics and household consumption surveys, sugar intake has declined in Norway over the past eight years (41). In addition, there has over the past five to six years been an increased focus among Norwegians on the health effects of a high sugar intake, and participants may have reported their food intake in a socially desirable fashion.

### 6.2.4 Association of soft drink, sweet, and sugar intake with BMI

In this thesis, neither long-term intake of soft drinks, sweets, nor sugar were associated with BMI at age 40 years. In addition, changes in soft drink, sweet, and sugar intake from age 33 to 40 years were not associated with change in BMI over the same time period (results not shown).

The fundamental cause of obesity and overweight is an energy imbalance between calories consumed on one hand, and calories expended on the other hand (94). How this imbalance occurs, is not well understood. Diet and physical activity are central determinants, but these seem to be modified by, among other things, culture, socioeconomic status, and behavioural factors (95). In addition, some people are carriers of genes that make them more prone to gain weight (96).

A high intake of sugar, especially in the form of beverages, has been proposed to be a risk factor for increased body weight (19;21;26). Several studies have found a relationship between intake of soft drinks and BMI (19;23;26;97-101). Schulze et al (19) followed a group of American women over 8 years, and found that women who increased their intake of soft drinks had significantly larger increase in weight than did women who maintained a low or a high intake or women who substantially

decreased their intake. However, weight change in women who maintained a high intake did not differ from the weight change in women who maintained a low intake. Schulze et al also found that women who increased their intake of soft drinks had an increased risk for development of type 2 diabetes. Among children aged 12 years at baseline, Ludwig et al (26) found that for each additional serving of sugar-sweetened drink consumed over a 19 month period, both BMI and frequency of obesity increased after adjusting for anthropometric, demographic, dietary, and lifestyle variables.

Some researchers argue against this proposed relationship between soft drinks and weight (38;102). According to them, the knowledgebase is too small and too narrow, and the results are too inconsistent to draw conclusions on. When comparing the arguments from both defenders and opponents of the relationship between sugar intake and weight gain, there are large disparities in which studies they focus on, and what aspects of these studies they put importance on. For instance, defenders put more importance on large cross-sectional studies ($n > 10.000$), than do opponents, and opponents put less importance on the number of participants in longitudinal studies, than do defenders (22;38). Because this topic is of great interest to several industries, companies, and organisations, the results and conclusions in each article should be carefully considered in light of sponsorships and possible links between authors and stakeholders.

In this thesis, no associations were found between long-term intake of soft drinks, sweets, and sugar, and self-reported BMI at age 40 years. With regard to soft drink intake, this is in accordance with results from the follow-up of the Oslo Youth Study in 1999, where a long-term high intake of soft drinks between age 25 years (1991) and 33 years (1999) was not found to be significantly associated with BMI at age 33 years (39). Since the analyses were done on men and women separately at the 1999-follow-up, the consumption groups were relatively small, and this reduced the probability of finding significant relationships. In this thesis, analyses were done on genders combined, which made some of the consumption groups larger, but similar

results were revealed. However, the number of participants who increased their soft drink intake was small, and only a large difference in BMI would be detected.

One of the reasons for the lack of association in those analyses may be that only a cross-sectional measure on BMI (at age 40) was used as the dependent variable. The most comprehensive evaluation of diet and weight involves repeated measures of both diet and weight over time. This enables analyses on specific changes in diet in relation to changes in weight and BMI. Among the studies conducted on this topic, only Ludwig et al (26), Berkey et al (23), and Schulze et al (19) reported changes in both soft drink intake and BMI. All these studies found a significant relationship. In this thesis, analyses on the association of changes in soft drink, sweet, and sugar intake between age 33 and 40 years, with change in BMI over the same age span, did not yield significant results (data not shown).

Only a few experimental studies have been conducted to assess the relationship between intake of soft drinks and BMI. Major limitations to most of these studies are their short durations and relatively small sample sizes. Two relatively long experimental studies have, however, found a link between intake of soft drinks and weight change. Tordoff and Alleva (103) conducted a crossover trial where daily consumption of 1,135 grams of soft drink, sweetened with either high-fructose corn syrup or aspartame, over a three week period led to a significant weight gain among women only when consuming the caloric sweetened beverage. Similar findings were revealed in another experimental trial over a 10 week period (37).

Very few studies were found on the relationship between sweet intake and BMI. In the EPIC-Potsdam cohort, Schulz et al (18) found that among male adults, intake of high energy, high sugar foods, like sweets, was significantly predictive of a large weight gain.

Newby et al (104) analysed changes in different food patterns in relation to changes in BMI in adult women over a nine year period. Four food patterns were derived using confirmatory factor analysis, among them a sweet pattern compromising both

foods and beverages high in sugar. Among obese participants, average BMI declined somewhat over these nine years, but this decline became smaller with increasing sweet pattern score. Sweet patterns have been observed in different populations, but few studies have shown an association with BMI (105-109). Results from analyses on sweet patterns are difficult to compare with the results in this thesis. In addition, it may be that it is easier to find associations of groups of foods and beverages with BMI, than for single food items.

Regarding sugar in general, most of the *ad libitum* studies conducted have found no difference in weight change between adults eating a diet high in solid sugar compared to a diet high in fat or starch (110-112). A large experimental study assessing two hypo-energetic diets, one with high carbohydrate content and one with high fat content, found no difference in weight loss over a 10 week period (113). Studies with energy restriction can, however, not give information on how sugar influence appetite and weight.

Comparing research evaluating the relationship of intake of sugary foods and beverages with body weight is complicated by, among other things, the difference in study designs and data collection instruments used. In addition, researchers operationalise body weight in a number of different ways (e.g. BMI, body fat percentage, body weight, and ponderal index). Small sample sizes, short durations of follow-ups, as well as confounding by other diet and lifestyle factors, further complicate the interpretation of results. In addition, age groups studied are of great importance. Most cross-sectional and longitudinal studies conducted are on children and adolescence, groups in whom dietary assessment and weight measurement are difficult.

Body weight is a result of the stability of several health behaviours over time, including dietary intake. Other explanatory factors, like physical activity level and smoking status were not adjusted for in the analyses. The fact that smoking was associated with a high soft drink and sugar intake at age 40 years, may have precluded a possible association between these intakes and BMI (114).

Another possible explanation for the lack of association is that the level of intake of soft drinks, sweets, and sugar is too low among the study participants to have an impact on BMI. Regarding soft drinks, it may be that subjects who did not report to drink such beverages, had a relatively higher intake of other caloric beverages, like orange juice, squash, or alcoholic beverages. In addition, weight gain may lead to changes in soft drink, sweet, and sugar consumption. Many individuals who experience weight gain may reduce or eliminate foods and beverages high in sugar from their diet. However, among the participants in this thesis, soft drink intake was not associated with recent dieting behaviour, whereas sweet and sugar intake were. Because so many factors are involved, it is difficult to find linkages between single food items and changes in weight or BMI.

### 6.2.5 Association of demografic and health-related variabels, with soft drink, sweet, and sugar intake at age 40 years

Soft drink intake (grams per day) at age 40 years was significantly associated with smoking, a low level of leisure time physical activity, a low level of education, and being male.

Practically identical results were revealed in a cross-sectional study on adult New York City citizens (115). They found that individuals aged 18-24 years, male participants, and those with less than college education were more likely to be frequent soft drink consumers than older, female, and better educated participants. In addition, those living in a household with low income were more likely to be frequent soft drink consumers than those from higher income households. Among behavioural variables, both more hours spent watching television and a low level of physical activity was associated with frequent soft drink consumption.

In another US cross-sectional study (116), data from the National Health and Nutrition Examination Survey (NHANES) 1999 to 2002 was organised into six beverage and six food clusters. The six beverage clusters differed with respect to many socio-economic and demographic characteristics. In the ‘Soda’ cluster, there

were higher proportions of younger persons, persons with a low level of education, and also a higher proportion of lower income persons than older, better educated, and persons of higher income.

In the Health Interview Survey, carried out by Statistics Norway in 2005, the percentage of people who reported to drink soft drinks daily was higher among those with a low level of education (49). There was less soft drink consumption among young females, compared to young males. A comparison of intake of soft drinks among high and low educated people over 25 years, showed that the percentage of people who reported to drink soft drinks daily was higher among those with a low level of education (49). In addition, in the Norkost-study (42) men with higher education reported to drink less soft drinks than did men with lower education. And both male and female manual labourers drank more soft drinks than did clerks.

All of these findings support the results in this thesis, and altogether they may give an implication of that particular population groups tend to consume more soft drinks than other groups. Why individuals with low socio-economic status are more likely to drink soft drinks than individuals with higher socio-economic status, is not clear. There is some evidence that social class differences in attitudes to food and health exists (69;117), and that these may contribute to socio-economic differences in health (118). The relatively low cost of soft drinks, as well as targeted marketing strategies may also be feasible explanatory factors. In addition, a conceivable higher social pressure to have healthy dietary habits among higher socio-economic groups may play a role in lowering their intake relative to lower socio-economic groups (119). It may also be that such a social pressure makes some individuals more likely to underreport their soft drink consumption.

The finding that male participants are more likely to drink more soft drinks than female participants was not unexpected. There is a strong association between food choice and gender (120). This is also evident in soft drink consumption, as seen in the Norkost-study (42). In addition, a “macho” orientation has been found to impact negatively on health attitudes, which again may lead to unhealthy food choices (121).

For sweet intake (grams per day), the only significant association was for dieting behaviour. Reporting to have tried to lose weight over the past three months, was significantly associated with a lower sweet intake. As a contrast to this, Paradis et al (122) found that subjects who had deliberately lost weight, bought more sweet snacks than their controls. In this study they did, however, not measure foods eaten, only foods bought. The basis for comparison with the results in this thesis is therefore limited.

The fact that sweet intake was not associated with gender, level of education or any other health-related variable than dieting behaviour among the participants in this thesis, is interesting. In the Norkost-study, sweet intake was found to be associated with education level and the importance put on having a healthy diet (42). And in an Australian study, Wang et al (121) found that people aged between 40 and 55 years, who valued the importance of health behaviours, reported less consumption of sweets than people who did not put importance on health behaviours.

Intake of dark chocolate has over the past years been promoted as a part of a healthy diet (123;124). This may explain some of the lack of association between intake of sweets and level of health concern at age 40 years. However, chocolate intake was significantly reduced among female participants between age 33 and 40 years.

Regarding intake of sugar (E%), a high intake was associated with an overall less health conscious lifestyle. Like for soft drink intake, smokers and less physically active participants had a higher intake of sugar in general. A low sugar intake was associated with dieting behaviour. Participants who had tried to lose weight over the past three months reported a lower sugar intake, than non-dieting participants.

The findings that several other health-related variables are linked to soft drink and sugar intake, are not very surprising, as several studies have found that unhealthy lifestyle factors tend to cluster (66;125-129). The associations of soft drink and sugar intake, with demographic and health-related variables have, however, only recently received attention.

In this thesis, education was chosen as a measure for socio-economic status. This could also have been expressed by level of income or occupation (69). There are several limitations to all three measures. Education has the weakness that it reflects social status more than the economic dimension. But education level does not only influence the opportunities for work and income, it also says something about the general level of knowledge. Higher educated persons may have a greater ability to obtain, understand, and make use of health information to their own benefit than people with less education. A Norwegian study that looked at both occupational status and level of education in relation to health behaviours, found no difference when comparing non-manual with manual workers (130). The authors suggest that academic achievement, more than other aspects of social position, accounts for most of its association with health behaviours.

It should be noted that the multiple regression models in this thesis (Table 15 to 17) only explained a small proportion of the variance in the outcome variables (soft drink, sweet, and sugar intake). Obviously, food choice is influenced by multifaceted and interrelated determinants, and only a few possibly associated variables were investigated in this study.

The findings in this thesis imply that soft drink and sugar intake may be markers of an unhealthier lifestyle, while sweet intake seems not to have the same function. As there is no clear explanation for why sweet intake does not follow the same pattern of relationship to other health-related variables as well as demographic factors as soft drinks do, this difference should be more closely scrutinized in future research.

## 6.3 Study limitations

### 6.3.1 Reporting of energy and nutrient intake

Bias in self-reported energy and nutrient intake is a common problem in nutrition surveys (73;74;131). When comparing energy intake (EI) with estimated basal metabolic rate (BMR), it was found that as many as 56% of the women and 53% of the men in this thesis underreported their energy intake at age 40 years (underreporters were defined as having EI:BMR<1.35 (82)). In the Norkost-study, where the same FFQ was used, the corresponding numbers were 45% and 38%, and the percentage of subjects with EI:BMR<1.35 was lowest in the age groups below 40 years (76). When validating the energy intake measured by the FFQ using the doubly labelled water technique as reference method, it was found that even though there was a wide variability in the accuracy of the FFQ at the individual level, it could provide a good measure of the mean energy intake of the group (74).

Selective underreporting of perceived unhealthy foods and beverages may also occur. Poppitt et al (132) found that reported added sugar intake was significantly lower than measured, and that the major cause of under-reporting was the failure to report between snack foods such as soft drinks and sweets. They found no difference in underreporting between obese and non-obese subjects with regard to snack foods.

In Norway, like in many other western countries, nutritionists and other health workers have for many years emphasised the importance of a healthy diet for wellbeing and disease prevention, and as a part of that, urged a reduced intake of sugar. Media has also over the past years put an increased focus on this health message, and the social pressure to eat healthy is high in many layers of society. In 2005, 52% of the Norwegian population reported to be very or quite interested in having a healthy diet, and 77% and 80% were sceptical to soft drinks and sugar, respectively (90). Women are more influenced by social pressure to eat healthy than are men (133). This is particularly true for sweet snacks (134). A perceived social pressure to eat healthier may have influenced the Oslo Youth Study participants to

report a lower intake of unhealthy foods and beverages than actually consumed. A potential greater underreporting of unhealthy foods and beverages at age 40 years compared to at age 33 years, may explain some of the decreases in sugar, soft drink, and sweet intake found in this thesis.

### 6.3.2 Reporting of body weight and height

At age 33 and 40 years all participants reported their height and weight through the short questionnaire, and at age 40 years 290 subjects were also measured by their GP. Only self-reported weight and height is included in this thesis. When comparing the objective measures to the self-reported at age 40 years, both men and women underreported their weight (both $p<0.001$, data not shown). Self-reported height did not differ significantly from the height measured by their GP. This resulted in an underestimation of self-reported BMI ($p<0.001$ for both genders, data not shown). Overweight subjects underreported their weight slightly more than normal weight subjects. If overweight subjects in this thesis reported a high intake of soft drinks, sweets, or sugar, but underreported their weight, this may have obscured the possible association of intake of soft drinks, sweets, and sugar with BMI in this thesis.

Underestimation of body weight when self-reported, is common (135;136). In the EPIC-Oxford study, Spencer et al (135) found that even though self-reported and objectively measured height, weight, and BMI were highly correlated (all $r > 0.9$), self-reported height and weight led to an incorrect classification of about 20% of both women and men when using standard categories of BMI. This may have implications for the percentage of overweight subjects in each of the long-term consumption groups in this thesis.

### 6.3.3 Change in data collection instruments

The data collection instruments used in the Oslo Youth Study have changed over the years as a result of ageing of the study population, increased knowledge about nutrition surveys, and development of new computerised systems for dietary

research. Questions about some of the factors studied, like smoking habits and physical activity, have been kept unchanged over the study period. Dietary intake was assessed by different questionnaires at age 15 and 25 years, before the FFQ was introduced at age 33 years. This makes it challenging to compare the results. Only the reported intake at age 33 and 40 years are directly comparable since almost similar FFQs were used at these two time points. Intake reported at age 15 and 25 years had to be transformed or grouped prior to analyses. At age 15 years the students were asked to recall their frequency of soft drink and sweet intake during the previous day and past week. From these questions only constructed frequency groups could be deduced. When the participants were 25 years, a more advanced questionnaire was used, but only rough intake frequencies of selected foods and beverages were measured. Some older studies suggest that most of the variation in food intake is explained by consumption frequency rather than portion size (137). However, with the large increase seen in portion sizes over the past years, this may not be the case today (138).

### 6.3.4 Loss to follow-up

Even though no difference was found between inconsistent and consistent responders with regard to soft drink or sweet intake at age 15 years, there was some evidence of attrition bias towards a more health conscious sample. Those subjects who responded at all time points were older and less likely to smoke than those who did not participate at one or more surveys. That health conscious persons are more likely to respond than less health conscious persons, is a well known problem in voluntary nutrition surveys (139-141), and in this thesis it may have influenced the reported mean intake of sugary foods and beverages.

The proportion of participants in this fifth follow-up of the Oslo Youth Study with more than twelve years of education was 63.1% among women and 47.5% among men. In the general Norwegian population, the corresponding proportions are 59% and 54% for women and men, respectively. The relatively low proportion of male

participants with a high level of education is surprising, as there normally is a bias towards a higher level of education among participants in nutrition surveys (42;142). As discussed previously, people with a higher level of education tend to have more healthy behaviours than less educated people. If this is true for the sample in this thesis, one may expect that female participants are more health conscious, while male participants are less health conscious than the general population.

A total of 51% of the invited subjects in this fifth follow-up of the Oslo Youth Study, participated. This response rate is similar to other recent nutrition surveys (143-145), but resulted in a study sample of only 408 subjects prior to exclusions. This relatively small sample size, led to small consumption groups in the tracking analyses, which weaken their statistical power. The decision to include only the subjects who responded at all time points in the analyses may have been too stringent. Another possibility was to include all subjects from whom we had data at baseline and at any one of the subsequent follow-ups. However, with differing selections and numbers of subjects in the tracking groups at different follow-ups it would be challenging to compare the results at one follow-up to the results at the next follow-up. By only including consistent responders, absolute comparability across time was ensured. Even though the consumption groups were relatively small, most of the tracking results were highly significant.

### 6.3.5 Statistical analyses and data adaptation

For some of the analyses performed in this thesis, a non-parametric alternative was used. Non-parametric tests make less stringent assumptions about the probability distribution that the data follow, but they have less statistical power as well. Non-parametric tests tend to be less sensitive in detecting a relationship or difference between groups (146).

It should also be mentioned that the common practice of dichotomising health behaviour variables may have implications for the findings (147). By dichotomising the scaled response alternatives for level of education, leisure time physical activity,

and health concern, some of the variation in these variables was lost. Loss of variation leads to less statistical power. Both level of education and leisure time physical activity was, however, found to be associated with soft drink intake, and physical activity was also associated with sugar intake.

The question assessing level of health concern was unfortunately not very well designed. To the question “Are you concerned about questions regarding your own health?”, four response alternatives were listed: “A lot”, “Not very much”, “Not especially”, and “No”. Because of the similar nature of the two mid alternatives, these were combined with “No” to form a group that was regarded as not very concerned about questions regarding own health. This grouping may have misclassified some subjects to the least health concerned group. All in all, both the indistinct response alternatives and the constructed classification of not very health concerned subjects may explain why level of health concern was not significantly associated with neither soft drink, sweet, nor sugar intake among the participants in this thesis.

The grouping of subjects into tracking and long-term consumption groups in this thesis may have introduced a bias in the analyses. Only crude measures of soft drink and sweet intake were used at age 15 years, and their capability of ranking subjects the correct way has not been evaluated. The consumption groups defined for the tracking analyses were first used by Kvaavik et al (39) on data from the follow-up of the Oslo Youth Study in 1999. By using the same groups in this thesis, it was possible to compare the results.

The definitions of long-term intake groups have previously not been used. They could have been grouped differently, but the results were the same for all alternatives tested. As with the tracking analyses, the statistical strength of the analyses on association of long-term intake with BMI at age 40 years is weakened by the relative low number of subjects in some of the consumption groups.

Another limitation to the results in this thesis is the cross-sectional nature of the analyses on association of demographic and health-related variables with soft drink,

sweet, and sugar intake at age 40 years. This precludes a strong conclusion about causal links between intake and other lifestyle variables.

## 6.4 Implications for further research

There will always be problems tied to longitudinal studies, like improvement in methodology and nutritional knowledge over time, which has implications for both research questions assessed and the design of the data collection instruments. When the studies are initiated during childhood or adolescence and progress into adulthood, these problems are even more pronounced. The research questions of interest may not be the same for a child population as for an adult population, and maturation and ageing of the study population will necessarily have implications for the design of the data collection instruments. It is, however, important that future longitudinal studies that span over these age groups use more consistent questionnaires, while allowing for small alterations due to maturation and ageing, new food products, and improved knowledge on methodology and nutrition in general.

Even though an important foundation for health behaviours, and through them risk factors for lifestyle diseases, is put down at an early age, it is beyond doubt that changes in behaviour can occur in adult age as well. This is implied in the trends in sugar and soft drink intake from age 33 to 40 years observed in this study, combined with the sales data available. Further research and synthesising of results from previously conducted studies should be combined with knowledge about effective interventions strategies, in order to increasing the nutrition quality of the population's overall diet.

It is necessary to illuminate possible differences in tracking of dietary behaviour between different socio-economic groups. If soft drink intake track from adolescence into adulthood, and a high level of soft drink in adult age is associated with low socio-economic status and several unhealthy behaviours, a holistic intervention initiated at an early age is warranted. Because socio-economic determinants are

difficult to modify, health promotion should target psycho-sociological determinants that are more amenable to change. A high-risk strategy targeting low socio-economic groups may be the most effective option.

Regarding tracking of dietary intake, it would be interesting to assess if there are factors that differentiate those individuals who track eating behaviour from those who do not. In addition, on the basis of the assumptions that high level of soft drink and sugar intake are associated with several other lifestyle variables, it would be interesting in future research to study tracking of clusters of demographic and health-related variables, such as educational attainment, physical activity, dietary intake, and smoking.

# 7. Conclusion

The level of tracking of frequency of soft drink intake at a group level from age 15 (1981/1979) to age 40 years (2006) in this Norwegian population was moderate to high, while the tracking from age 25 (1991) to 40 years as well as from age 33 (1999) to 40 years was even higher. These findings were largely confirmed at the individual level.

For frequency of sweet intake, the level of tracking at group level from age 15 to 40 years was low, but from age 25 to 40 years, as well as from age 33 to 40 years, it was high. At the individual level, tracking during adult age was moderate.

The level of tracking of sugar from age 33 to 40 years was moderate at the individual level.

Total soft drink and sugar intake reported decreased significantly from age 33 to 40 years. This is most likely due to both ageing and secular trends in the awareness of the importance of a healthy diet among Norwegians. Reported total sweet intake increased among men and remained stable among women over the same age period.

A long-term high intake of soft drinks, sweets, and sugar was not associated with self-reported BMI at age 40 years. In addition, changes in soft drink, sweet, and sugar intake between age 33 and 40 years were not associated with the parallel change in BMI.

A high intake of soft drinks and sugar, but not intake of sweets, seem to cluster with other unhealthy behaviours. In addition, soft drink intake is more prevalent among low socio-economic groups.

These results imply that the relative intake of soft drinks is more stable than the relative intake of sweets at a group level from adolescence into adulthood. They also indicate that individuals are likely to reduce their intake of soft drinks and sugar during adult years. If this also relates to sweets is more unclear. Interventions aimed

at reducing the intake of foods and beverages high in sugar should therefore be implemented at an early age and be sustained throughout adult years. To target these interventions at lower socio-economic groups would be justifiable and could contribute to reduce the social differences in health behaviours and health between high and low socio-economic groups.

Even though it was not found associations of soft drink, sweet, and sugar intake with BMI, a high intake of soft drinks and sugar at adult age seem to be associated with a less healthy lifestyle in general. This may indicate that a holistic intervention, targeting several lifestyle variables, is warranted.

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# Appendix 1

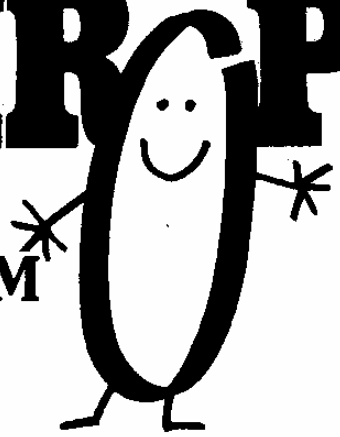
*Relevant questions from participants questionnaire in 1979 and 1981, translated into English.*

**E-SKJEMA**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | |

Dato for utfylling...../.....19..... Veileder .....

# KJENN DIN KROPP



## ET HELSEPROGRAM FOR BARN OG UNGDOM

KJENN DIN KROPP · PROGRAMMET ·

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## SPØRRESKJEMA FOR ELEVER

Ingen opplysninger kommer videre til foreldre eller lærere.

Skole .....

Klasse .....

Elevens etternavn .....

Elevens fornavn .....

Født ...../.....196....

**Question 71.**

Did you drink any of the following beverages yesterday?

| | at home | at school |
|---|---|---|
| milk | 1 | 2 |
| cocoa | 1 | 2 |
| coffee | 1 | 2 |
| tea | 1 | 2 |
| juice | 1 | 2 |
| syrup/squash | 1 | 2 |
| carbonated soft drink, cola | 1 | 2 |
| nothing | 1 | 2 |

**Question 72.**

Did you eat or drink any of the following items last week?

| | at home | at school |
|---|---|---|
| Danish pastry or cakes | 1 | 2 |
| carbonated soft drinks or cola (with sugar) | 1 | 2 |
| chocolate | 1 | 2 |
| other sweets | 1 | 2 |
| potato crisps etc. | 1 | 2 |

**Question 76.**

How often do you eat chocolate, sweets, potato crisps etc.?

| | |
|---|---|
| 1 | Almost every day |
| 2 | 1-2 times per week |
| 3 | Not **that** often |
| 4 | Never |

# Appendix 2

*Relevant questions from questionnaire used in 1991, translated into English.*

UNIVERSITETET I BERGEN

*Nasjonalforeningens senter for forskning om helsefremmende arbeid, miljø og livsstil*

# KJENN DIN KROPP-UNDERSØKELSEN 1991

**Dette spørreskjemaet er en direkte oppfølging av Kjenn din kropp-undersøkelsene som ble gjennomført i Oslo i 1979 og 1981.**

**Hensikten med denne undersøkelsen er å studere *kostvaner* og endring i livsstil, fra barne- og ungdomsårene og inn i voksen alder.**
**Spørsmålene er laget slik at du setter en ring rundt det tallet som passer best for deg. Vennligst les hvert spørsmål nøye før du svarer.**

**Svarene behandles strengt *konfidensielt*. Skriv *ikke* navn på skjemaet. Vi bruker identifikasjonskode fra 1981 til å koble svarene til eksisterende data fra Kjenn din kropp. Dataene lagres slik at de ikke kan person-identifiseres.**

***Tusen takk for hjelpen!***

F.o.m - t.o.m
KdK: 91 V97 - V172 inn i ny fil: psy .sav
+ id1

Øisteins gt. 3 - 5007 Bergen - Tel.: 05-21 28 08 - Telefax: 05-90 16 99

*Samarbeids-senter for Verdens helseorganisasjon (WHO)*

T.l.f nr. 9199SFSnsuisos.sav

**How often did you eat or drink the following foods and beverages during the past 3 months?**

| Questio | Food item | Several times daily | Once daily | 3-6 times per week | 1-2 times per week | Seldom/ never |
|---|---|---|---|---|---|---|
| 15 | Carbonated soft drinks with sugar | 1 | 2 | 3 | 4 | 5 |
| 16 | Carbonated soft drinks, artificially sweetened | 1 | 2 | 3 | 4 | 5 |
| 18 | Chocolate/ sweets | 1 | 2 | 3 | 4 | 5 |

# Appendix 3

*Questions regarding sweet intake in the Food Frequency Questionnaire used in 1999*

# HVA SPISER DU?

I dette skjemaet spør vi om dine spisevaner, slik de **vanligvis** er. Vi er klar over at kostholdet varierer fra dag til dag. Prøv derfor så godt du kan å gi et **"gjennomsnitt"** av dine spisevaner. Ha det siste året i tankene når du fyller ut. Der du er usikker, anslå svaret.

Alle opplysningene vil bli behandlet fortrolig

Skjemaet skal leses av en maskin, og derfor er det viktig at du:

- bruker **blyant**
- markerer bare innenfor avmerket område med **en strek**

Riktig markering er slik: 

Hvis du gjør feil, bruk viskelær:

Av hensyn til den maskinelle lesingen, bruk **ikke** kulepenn eller tusjpenn, og unngå å få flekker på arket. Pass på at arket ikke blir brettet.

**Takk for at du tar deg tid til å fylle ut skjemaet!**

## 14. FRUKT, DESSERT, KAKER, GODTERI

< 1 betyr sjeldnere enn 1 gang.

| | 0 | Gang pr. måned: <1 | 1 | 2 | 3 | ELLER Gang pr. uke: 1 | 2-3 | 4-5 | 6-7 | 8+ | | Mengde pr. gang: 1/2 | 1 | 2 | 3+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Eple | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | ☐ | ☐ | ☐ | ☐ |
| Appelsin, mandarin, grapefrukt | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | ☐ | ☐ | ☐ | ☐ |
| Banan | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | ☐ | ☐ | ☐ | ☐ |
| Annen frukt (fersken, pære, drueklase o.l.) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | ☐ | ☐ | ☐ | ☐ |
| Bær (friske, frosne) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | ☐ | ☐ | ☐ | ☐ |
| Hermetisk frukt, fruktgrøt | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | ☐ | ☐ | ☐ | ☐ |
| Puddinger (sjokolade-, karamell- o.l.) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | ☐ | ☐ | ☐ | ☐ |
| Riskrem, fromasj | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | ☐ | ☐ | ☐ | ☐ |
| Is (1 dl = 1 pinne = 1 kremmerhus) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | ☐ | ☐ | ☐ | ☐ |
| Fløte krem på dessert | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | ☐ | ☐ | ☐ | ☐ |
| Boller, julekake, kringle | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | ☐ | ☐ | ☐ | ☐ |
| Skolebrød, skillingsbolle | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | ☐ | ☐ | ☐ | ☐ |
| Wienerbrød, -kringle o.l. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | ☐ | ☐ | ☐ | ☐ |
| Smultring, formkake | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | ☐ | ☐ | ☐ | ☐ |
| Vafler | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (plate) | ☐ | ☐ | ☐ | ☐ |
| Syltetøy til vafler | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (ts pr. hjerte) | ☐ | ☐ | ☐ | ☐ |
| Rømme til vafler | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (ts pr. hjerte) | ☐ | ☐ | ☐ | ☐ |
| Sjokoladekake, bløtkake, annen fylt kake | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | ☐ | ☐ | ☐ | ☐ |
| Fyrstekake, nøttekake | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | ☐ | ☐ | ☐ | ☐ |
| Småkaker, søt kjeks, kakekjeks | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | ☐ 1-2 | ☐ 3-4 | ☐ 5-6 | ☐ 7+ |
| Sjokolade (60 g) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (plate) | ☐ | ☐ | ☐ | ☐ |
| Konfekt | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | ☐ 1-2 | ☐ 3-4 | ☐ 5-6 | ☐ 7+ |
| Drops, lakris, seigmenn o.l. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | ☐ 1-2 | ☐ 3-4 | ☐ 5-6 | ☐ 7+ |
| Potetgull (1 pose 100 g = 7 dl) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | ☐ 1-2 | ☐ 3-4 | ☐ 5-6 | ☐ 7+ |
| Annen snacks (skruer, crisp, saltstenger, lettsnacks o.l.) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | ☐ 1-2 | ☐ 3-4 | ☐ 5-6 | ☐ 7+ |
| Peanøtter, andre nøtter (1 pose 100 g = 4 never) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (neve) | ☐ | ☐ | ☐ | ☐ |

# Appendix 4

*Short questionnaire used in 2006.*

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**UNIVERSITETET I OSLO**
**Avdeling for ernæringsvitenskap**

## "Kjenn din kropp"-undersøkelsen 2006

Vi håper du tar deg tid til å besvare spørsmålene i spørreskjemaene. Hvis du vil delta, fyller du ut dette skjemaet og det som heter "Hva spiser du?". Returner skjemaene i den frankerte svarkonvolutten sammen med samtykkeskjemaet.

Vennligst les instruksjonene nøye. Bruk helst blyant ved utfylling av spørreskjemaene, feil kan da rettes med viskelær. Svart kulepenn og tusjpenn kan også brukes. Av hensyn til at spørreskjemaene skal leses maskinelt, må du ikke skrive utenfor oppmerkede felt og skjemaene må ikke brettes. I dette korte spørreskjemaet finner du noen bakgrunns- og helsevanespørsmål som er brukt i tidligere "Kjenn din kropp"-undersøkelser. Sett kun et kryss for det alternativet som passer best for deg.

Svarene behandles strengt konfidensielt. Det er frivillig å delta. Dersom du ikke ønsker å delta, ber vi om at du likevel returnerer de ikke utfylte skjemaene i svarkonvolutten (dermed unngår du unødige påminnelser fra oss).

**Tusen takk for din deltakelse i "Kjenn din kropp"-undersøkelsen!**

Vennlig hilsen

Elisabeth Kvaavik, PhD, prosjektleder

**1. Er du:**

☐ Gift
☐ Ugift
☐ Skilt/separert
☐ Enke/enkemann

**2. Hvor mange barn har du?**

☐ Ingen barn
☐ 1 barn
☐ 2 barn
☐ 3 eller flere barn

**3. Hvor mange års utdannelse har du?**

☐ Ni-årig grunnskole
☐ 1-2 års videregående
☐ 3 årig videregående
☐ 1-4 år ved universitet/høgskole
☐ Mer enn 4 år ved universitet/høgskole

**4. Hvilket yrke har du nå? Prøv å beskrive så nøyaktig som mulig.**
Er du f. eks. student, industriarbeider, hjemmeværende, lærer osv.

**5. I hvilken av disse kategoriene vil du plassere deg selv?**

☐ Selvstendig næringsdrivende
☐ Høyere funksjonær
☐ Lavere funksjonær
☐ Faglært arbeider
☐ Ufaglært arbeider
☐ Arbeidsledig
☐ Student
☐ Hjemmeværende
☐ Annet

**6. Er du i full- eller deltidsjobb utenfor hjemmet?**

☐ Fulltid (minst 35 t/uke)
☐ Deltid (mindre enn 35 t/uke)
☐ Er student på fulltid
☐ Har ikke lønnet arbeid utenfor hjemmet

**7. Arbeider du i offentlig eller privat sektor?**

☐ Offentlig
☐ Privat
☐ Begge deler
☐ Ingen av delene

**8. Hva var din husstands årsinntekt i 2005?** (brutto)

☐ Mindre enn 300 000
☐ 300 000-399 000
☐ 400 000-499 000
☐ 500 000-599 000
☐ 600 000-699 000
☐ 700 000 eller mer

**9. Hva var din personlige årsinntekt i 2005?** (brutto)

☐ Mindre enn 200 000
☐ 200 000-299 000
☐ 300 000-399 000
☐ 400 000-499 000
☐ 500 000-599 000
☐ 600 000 eller mer

**10. Hvor mange års utdannelse har din ektefelle/samboer?**

☐ Ni-årig grunnskole
☐ 1-2 års videregående
☐ 3 årig videregående
☐ 1-4 år ved universitet/høgskole
☐ Mer enn 4 år ved universitet/høgskole
☐ Har ingen ektefelle/samboer

**11. Dersom du er gift/samboende, hvilket yrke har han/hun? Prøv å beskrive så nøyaktig som mulig.**
Er han/hun f. eks. student, industriarbeider, hjemmeværende, lærer osv.

**12. Er du opptatt av spørsmål som angår helsa di?**

- ☐ Mye
- ☐ Ikke særlig mye
- ☐ Ikke noe spesielt
- ☐ Ikke noe

**13. Synes du helsetilstanden din for tiden er:**

- ☐ Meget god
- ☐ Ganske god
- ☐ Middels
- ☐ Ganske dårlig
- ☐ Meget dårlig

**14. Hvor ofte trener du (minst 1/2 time per gang), slik at du blir andpusten og svett?**

- ☐ Hver dag
- ☐ 4-6 ganger per uke
- ☐ 2-3 ganger per uke
- ☐ 1 gang per uke
- ☐ 2-3 ganger per måned
- ☐ Sjeldnere

**15. Hvor ofte har du drukket alkohol (øl, vin, brennevin) de siste 3 månedene?**

- ☐ Hver dag
- ☐ 4-5 ganger per uke
- ☐ 2-3 ganger per uke
- ☐ 1 gang per uke
- ☐ 2-3 ganger per måned
- ☐ 1 gang per måned
- ☐ 1-2 ganger siste 3 måneder
- ☐ Har ikke drukket alkohol siste 3 mndr.

**16. Hvis du tenker spesielt på de 6 siste månedene - hvor mange ganger har du i løpet av denne tiden drukket deg beruset?**

- ☐ Ingen ganger
- ☐ 1-4 ganger
- ☐ 5-10 ganger
- ☐ 11-25 ganger
- ☐ 26-50 ganger
- ☐ Mer enn 50 ganger

**17. Røyker du?**

- ☐ Nei
- ☐ Ja

**18. Hvis ja, hvor mange sigaretter/piper røyker du per dag?**

- ☐ Mindre enn 1
- ☐ 1-5
- ☐ 6-10
- ☐ 11-20
- ☐ 20+

**19. Hvor mye veier du?**
Skriv null i første rute hvis du veier mindre enn 100 kg

☐☐☐ kg

**20. Hvor høy er du?**

☐☐☐ cm

**21. Hva synes du om vekten din?**

- ☐ Veier altfor mye
- ☐ Veier litt for
- ☐ Passelig
- ☐ Veier litt for lite
- ☐ Veier altfor lite

**22. Har du noen gang forsøkt å slanke deg?**

- ☐ Ja, mange ganger
- ☐ Ja, noen ganger
- ☐ Ja, en gang
- ☐ Nei

**23. Har du forsøkt å slanke deg i løpet av de 3 siste månedene?**

- ☐ Ja
- ☐ Nei

**24. Passer noe av dette for deg?**

- ☐ Er gravid
- ☐ Ammer
- ☐ Er vegetarianer/veganer
- ☐ Har diabetes/sukkersyke
- ☐ Har matvareallergi
- ☐ Har høyt blodkolesterol
- ☐ Har høyt blodtrykk
- ☐ Har anoreksi
- ☐ Har bulimi

**Kontaktinformasjon til fastlegen din:**
*Det er særlig viktig å fylle ut linjene merket med stjerne

Legens navn*:_____

Legesenter*:_____

Adresse*: _____

Postnummer*:_____

Poststed*: _____

Telefon: _____

E-post: _____

Har du kommentarer til "Kjenn din kropp"-undersøkelsen kan du skrive dem her:

**Tusen takk for hjelpen!**

# Appendix 5

*Food Frequency Questionnaire used in 2006.*

# HVA SPISER DU?

I dette skjemaet spør vi om dine spisevaner slik de **vanligvis** er. Vi er klar over at kostholdet varierer fra dag til dag. Prøv derfor så godt du kan å gi et **"gjennomsnitt"** av dine spisevaner. Ha det siste året i tankene når du fyller ut skjemaet. Der du er usikker, anslå svaret.

Skjemaet skal leses av en maskin, og derfor er det viktig at du setter et tydelig kryss i avmerket rute.

Riktig markering er slik: ☒

Bruk helst bløt blyant. Feil kan da rettes med viskelær.
Kulepenn og svart tusjpenn kan også brukes.

Av hensyn til den maskinelle lesingen pass på at arkene ikke blir brettet.

*Alle svar vil bli behandlet strengt fortrolig.*

## EKSEMPEL PÅ UTFYLLING AV SPØRSMÅL 1.

Kari Nordmann spiser daglig 5 skiver brød og ett knekkebrød. Hun spiser vanligvis kneippbrød, men i helgene blir det en del loff. I tillegg spiser hun ett knekkebrød hver dag. Hun fyller ut første spørsmål slik:

## 1. HVOR MYE BRØD PLEIER DU Å SPISE?

Legg sammen det du bruker til alle måltider i løpet av en dag.

(1/2 rundstykke = 1 skive, 1 baguett = 5 skiver, 1 ciabatta = 4 skiver)

| | Antall skiver pr. dag | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1/2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12+ |
| Fint brød<br>(loff, baguetter, fine rundstykker o.l.) | ☐ | ☐ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Mellomgrovt brød<br>(lys helkorn, lys kneipp, lyst hj.bakt o.l.) | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Grovt brød<br>(fiberkneipp, mørk kneipp, mørkt hj.bakt o.l.) | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Knekkebrød<br>(kavring, grov skonrok o.l.) | ☐ | ☐ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

Sum skiver pr. dag = 6

Antall skiver pr. uke: 6 x 7 = 42 Tallet brukes i spørsmål 5.

# 1. HVOR MYE BRØD PLEIER DU Å SPISE?

Legg sammen det du bruker til alle måltider i løpet av en dag.

(1/2 rundstykke = 1 skive, 1 baguett = 5 skiver, 1 ciabatta = 4 skiver)

| | Antall skiver pr. dag | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1/2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12+ |
| **Fint brød** (loff, baguetter, fine rundstykker o.l.) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| **Mellomgrovt brød** (lys helkorn, lys kneipp, lyst hj.bakt o.l.) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| **Grovt brød** (fiberkneipp, mørk kneipp, mørkt hj.bakt o.l.) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| **Knekkebrød** (kavring, grov skonrok o.l.) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

Sum skiver pr. dag = ____

Antall skiver pr. uke: ____ x 7 = ____. Tallet brukes i spørsmål 5.

# 2. HVA PLEIER DU Å SMØRE PÅ BRØDET?

Merk av både for hverdag og helg, selv om du bruker det samme.

| Hverdager | | Lørdager, søndager |
|---|---|---|
| ☐ | Bruker ikke | ☐ |
| ☐ | Smør (meierismør) | ☐ |
| ☐ | Bremykt, Smøregod | ☐ |
| ☐ | Brelett | ☐ |
| ☐ | Soft, soyamargarin (pakke, beger) | ☐ |
| ☐ | Solsikke | ☐ |
| ☐ | Oliven | ☐ |
| ☐ | Vita | ☐ |
| ☐ | Olivero | ☐ |
| ☐ | Omega | ☐ |
| ☐ | Soft light | ☐ |
| ☐ | Vita lett | ☐ |
| ☐ | Annen margarin | ☐ |

# 3. OM DU BRUKER FETT PÅ BRØD, HVOR MYE BRUKER DU?

En porsjonspakning på 12 g rekker til antall skiver

1 ☐

2 ☐

3 ☐

4 ☐

5 ☐

# 4. MELK SOM DRIKK

(1 glass = 1,5 dl)

| | Drikker sjelden/ ikke | Antall glass pr. dag | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1/2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8+ |
| Helmelk, søt, sur | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Lettmelk, søt, sur | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Lettmelk, ekstra lett | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Skummet melk, søt, sur | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

## 5. PÅLEGGSSORTER

Bruk sum skiver pr. uke fra spørsmål 1.

| | Til antall skiver pr. uke | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1/2 | 1 | 2-3 | 4-5 | 6-7 | 8-14 | 15-21 | 22-28 | 29-35 | 36+ |
| Brun ost, prim | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Hvit ost, helfet, 27% fett (Jarlsberg, Norvegia o.l., smøreost; eske, tube) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Hvit ost, halvfet, 16% fett (Jarlsberg, Norvegia o.l., smøreost; eske, tube) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Ost med mer enn 27% fett (kremoster, Normanna, Ridderost) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

| | 0 | 1/2 | 1 | 2-3 | 4-5 | 6-7 | 8-14 | 15-21 | 22-28 | 29-35 | 36+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Leverpostei, vanlig | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Leverpostei, mager | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Servelat, vanlig | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Lett servelat, kalverull, kokt skinke, okserull o.l. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Salt pølse, spekepølse (fårepølse, salami o.l.) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

| | 0 | 1/2 | 1 | 2-3 | 4-5 | 6-7 | 8-14 | 15-21 | 22-28 | 29-35 | 36+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Kaviar | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Makrell i tomat, røkt makrell | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Sardiner, sursild, ansjos o.l. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Laks, ørret | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Reker, krabbe | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

| | 0 | 1/2 | 1 | 2-3 | 4-5 | 6-7 | 8-14 | 15-21 | 22-28 | 29-35 | 36+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Syltetøy, marmelade, frysetøy | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Honning, sirup, sjokolade-, nøttepålegg | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

| | 0 | 1/2 | 1 | 2-3 | 4-5 | 6-7 | 8-14 | 15-21 | 22-28 | 29-35 | 36+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Grønnsaker som pålegg (agurk, tomat o.l.) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Frukt som pålegg (banan, eple o.l.) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Salater med majones | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Majones på smørbrød | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

## 6. EGG

(kokt, stekt, eggerøre, omelett)

| | Antall pr. uke | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0 | Mindre enn 1 | 1 | 2 | 3-4 | 5-6 | 7 | 8+ |
| | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

# 7. FROKOSTGRYN, GRØT OG YOGHURT

Svar enten pr. måned **eller** pr. uke. <1 betyr sjeldnere enn 1 gang.

| | Gang pr. måned | | | | | Gang pr. uke | | | | | | Mengde pr. gang | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | <1 | 1 | 2 | 3 | 1 | 2-3 | 4-5 | 6-7 | 8+ | | 1 | 1 1/2 | 2 | 3+ |
| Havregryn, kornblandinger (4-korn, usøtet müsli o.l.) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | ☐ | ☐ | ☐ | ☐ |
| Cornflakes, puffet ris, havrenøtter o.l. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | ☐ | ☐ | ☐ | ☐ |
| Havregrøt | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1-2 ☐ | 3-4 ☐ | 5-6 ☐ | 7+ ☐ |
| Sukker til frokostgryn, grøt | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (ts) | 1 ☐ | 2 ☐ | 3-4 ☐ | 5+ ☐ |
| Yoghurt, naturell, frukt | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (beger) | 1/2 ☐ | 1 ☐ | 1 1/2 ☐ | 2+ ☐ |
| Lettyoghurt | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (beger) | 1/2 ☐ | 1 ☐ | 1 1/2 ☐ | 2+ ☐ |
| Go´morgen yoghurt inkl. müsli | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (beger) | 1/2 ☐ | 1 ☐ | 1 1/2 ☐ | 2+ ☐ |
| Melk søt, sur på gryn, grøt og dessert | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 3/4 ☐ | 1 ☐ | 2 ☐ | 3+ ☐ |

# 8. KAFFE OG TE

(1 kopp kaffe = 1,2 dl, 1 kopp te = 2 dl)

| | Drikker ikke/ikke daglig | Antall kopper pr. dag 1/2 | 1 | 2 | 3-4 | 5-6 | 7-8 | 9-10 | 11+ |
|---|---|---|---|---|---|---|---|---|---|
| Kaffe, kokt | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Kaffe, traktet, filter | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Kaffe, pulver (instant) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Kaffe, koffeinfri | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Te | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Nypete, urtete | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

| | Antall teskjeer eller biter pr. kopp 0 | 1/2 | 1 | 2 | 3 | 4+ |
|---|---|---|---|---|---|---|
| Sukker til kaffe | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Sukker til te | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Kunstig søtstoff til kaffe eller te | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Fløte til kaffe | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

# 9. ANDRE DRIKKER?

Svar enten pr. måned **eller** pr. uke. < 1 betyr sjeldnere enn 1 gang.
Merk at porsjonsenhetene er forskjellige. 1/3 liter tilsvarer en halvflaske øl og 2/3 liter tilsvarer en helflaske.

| | Gang pr. måned | | | | | Gang pr. uke | | | | | | Mengde pr. gang | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | <1 | 1 | 2 | 3 | 1 | 2-3 | 4-5 | 6-7 | 8+ | | 1/2 | 1 | 2 | 3 | 4 | 5+ |
| Vann | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (glass) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Appelsinjuice | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (glass) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Annen juice, most, nektar | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (glass) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Saft, solbærsirup m. sukker | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (glass) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Saft, kunstig søtet | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (glass) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Brus, Cola, Solo o.l., med sukker | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (liter) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Brus, Cola, Solo o.l., kunstig søtet | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (liter) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Farris, selters o.l. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (liter) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Alkoholfritt øl, vørterøl, lettøl | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (liter) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Pilsnerøl | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (liter) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Vin | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (glass) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Brennevin, likør | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (1 dram = 4 cl) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

# 10. MIDDAGSRETTER

Vi spør både om middagsmåltidene og det du spiser til andre måltider. Tell til slutt sammen antall retter du har merket for og se om summen virker sannsynlig.
En "dl" tilsvarer omtrent mengden i en suppeøse. Med "ss" menes en spiseskje.

| | Gang pr. måned | | | | | | | | | | Mengde pr. gang | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | <1 | 1 | 2 | 3 | 4 | 5-6 | 7-8 | 9+ | | 1/2 | 2/3 | 1 | 1 1/2 | 2+ |
| Kjøttpølse, medisterpølse | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (kjøttpølse) | ☐ | ☐ | ☐ | ☐ | ☐ |
| Hamburger, karbonader o.l. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1 ☐ | 2 ☐ | 3 ☐ | 4 ☐ | 5+ ☐ |
| Grill- og wienerpølse | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (pølse) | 1 ☐ | 2 ☐ | 3 ☐ | 4 ☐ | 5+ ☐ |
| Hamburger-, pølsebrød, lomper | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1 ☐ | 2 ☐ | 3 ☐ | 4 ☐ | 5+ ☐ |
| Kjøttkaker, medisterkaker, kjøttpudding | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1 ☐ | 2 ☐ | 3 ☐ | 4 ☐ | 5+ ☐ |
| Kjøttdeigretter (saus eller gryte med kjøttdeig, lasagne o.l.) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1 ☐ | 2 ☐ | 3 ☐ | 4 ☐ | 5+ ☐ |
| Taco (med kjøtt og salat) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1 ☐ | 2 ☐ | 3 ☐ | 4 ☐ | 5+ ☐ |
| Pastaretter | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1 ☐ | 2 ☐ | 3 ☐ | 4 ☐ | 5+ ☐ |

| | Gang pr. måned | | | | | | | | | | Mengde pr. gang |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | <1 | 1 | 2 | 3 | 4 | 5-6 | 7-8 | 9+ | | |
| Pizza (500-600 g) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (pizza) | 1/8 ☐ 1/4 ☐ 1/2 ☐ 3/4 ☐ 1+ ☐ |
| Biff (alle typer kjøtt) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1/2 ☐ 1 ☐ 1 1/2 ☐ 2 ☐ 2 1/2+ ☐ |
| Koteletter (lam, okse, svin) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1/2 ☐ 1 ☐ 1 1/2 ☐ 2 ☐ 2 1/2+ ☐ |
| Stek (lam, okse, svin) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (skive) | 1-2 ☐ 3-4 ☐ 5-6 ☐ 7-8 ☐ 9+ ☐ |
| Stek (elg, hjort, reinsdyr o.l.) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (skive) | 1-2 ☐ 3-4 ☐ 5-6 ☐ 7-8 ☐ 9+ ☐ |
| Gryterett med helt kjøtt, frikassé, fårikål o.l. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1-2 ☐ 3-4 ☐ 5-6 ☐ 7-8 ☐ 9+ ☐ |
| Lapskaus, suppelapskaus, betasuppe | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1-2 ☐ 3-4 ☐ 5-6 ☐ 7-8 ☐ 9+ ☐ |
| Bacon, stekt flesk | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (skive) | 1-2 ☐ 3-4 ☐ 5-6 ☐ 7-8 ☐ 9+ ☐ |
| Kylling, høne | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1/4 ☐ 1/3 ☐ 1/2 ☐ 3/4 ☐ 1+ ☐ |
| Leverretter | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (skive) | 1-2 ☐ 3-4 ☐ 5-6 ☐ 7-8 ☐ 9+ ☐ |
| | 0 | <1 | 1 | 2 | 3 | 4 | 5-6 | 7-8 | 9+ | | |
| Fiskekaker, fiskepudding, fiskeboller | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (kake) | 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5+ ☐ |
| Fiskepinner | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1-2 ☐ 3-4 ☐ 5-6 ☐ 7-9 ☐ 10+ ☐ |
| Torsk, sei, hyse (kokt) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5+ ☐ |
| Torsk, sei, hyse (stekt, panert) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5+ ☐ |
| Sild (fersk, speket, røkt) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (filet) | 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5+ ☐ |
| Makrell (fersk, røkt) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (filet) | 1/2 ☐ 1 ☐ 1 1/2 ☐ 2 ☐ 3+ ☐ |
| Laks, ørret (sjø, oppdrett) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (skive) | 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5+ ☐ |
| Fiskegryte, -grateng, suppe med fisk | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1-2 ☐ 3-4 ☐ 5-6 ☐ 7-8 ☐ 9+ ☐ |
| Reker, krabbe | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl, renset) | 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5+ ☐ |
| | 0 | <1 | 1 | 2 | 3 | 4 | 5-6 | 7-8 | 9+ | | |
| Risgrøt, annen melkegrøt | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1-2 ☐ 3-4 ☐ 5-6 ☐ 7-8 ☐ 9+ ☐ |
| Pannekaker | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1-2 ☐ 3-4 ☐ 5-6 ☐ 7-8 ☐ 9+ ☐ |
| Suppe (tomat, blomkål, ertesuppe o.l.) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1-2 ☐ 3-4 ☐ 5-6 ☐ 7-8 ☐ 9+ ☐ |
| Vegetarrett, vegetarpizza grønnsakgrateng, -pai | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (bit/dl) | 1-2 ☐ 3-4 ☐ 5-6 ☐ 7-8 ☐ 9+ ☐ |
| | 0 | <1 | 1 | 2 | 3 | 4 | 5-6 | 7-8 | 9+ | | |
| Brun/hvit saus | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1/2 ☐ 1 ☐ 1 1/2 ☐ 2 ☐ 2 1/2+ ☐ |
| Smeltet margarin, smør til fisk | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (ss) | 1-2 ☐ 3-4 ☐ 5-6 ☐ 7-8 ☐ 9+ ☐ |
| Bearnaisesaus o.l. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (ss) | 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5+ ☐ |
| Majones, remulade | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (ss) | 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5+ ☐ |
| Ketchup | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (ss) | 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5+ ☐ |

# 11. POTETER, RIS, SPAGHETTI, GRØNNSAKER

Svar enten pr. måned **eller** pr. uke. <1 betyr sjeldnere enn 1 gang.
Disse spørsmålene dreier seg først og fremst om tilbehør til middagsretter, men spiser du for eksempel en rå gulrot eller salat til lunsj, skal det tas med her.

| | Gang pr. måned | | | | | Gang pr. uke | | | | | | Mengde pr. gang | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | <1 | 1 | 2 | 3 | 1 | 2-3 | 4-5 | 6-7 | 8+ | | 1 | 2 | 3 | 4 | 5+ | |
| Poteter, kokte | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | ☐ | ☐ | ☐ | ☐ | ☐ | |
| Pommes frites, stekte poteter | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1 ☐ | 2 ☐ | 3 ☐ | 4 ☐ | 5+ ☐ | |
| Potetmos, -stuing, gratinerte poteter | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1 ☐ | 2 ☐ | 3 ☐ | 4 ☐ | 5+ ☐ | |
| Ris | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1-2 ☐ | 3-4 ☐ | 5-6 ☐ | 7-8 ☐ | 9+ ☐ | |
| Spaghetti, makaroni, pasta | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1-2 ☐ | 3-4 ☐ | 5-6 ☐ | 7-8 ☐ | 9+ ☐ | |
| Gulrot | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1/2 ☐ | 1 ☐ | 1 1/2 ☐ | 2 ☐ | 3+ ☐ | |
| Hodekål | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (skalk) | 1 ☐ | 2 ☐ | 3 ☐ | 4 ☐ | 5+ ☐ | |
| Kålrot | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (skive) | 1 ☐ | 2 ☐ | 3 ☐ | 4 ☐ | 5+ ☐ | |
| Blomkål | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (bukett) | 1-2 ☐ | 3-4 ☐ | 5-6 ☐ | 7-8 ☐ | 9+ ☐ | |
| Brokkoli | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (bukett) | 1-2 ☐ | 3-4 ☐ | 5-6 ☐ | 7-8 ☐ | 9+ ☐ | |
| Rosenkål | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1-2 ☐ | 3-4 ☐ | 5-6 ☐ | 7-8 ☐ | 9+ ☐ | |
| Grønnkål | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1 ☐ | 2 ☐ | 3 ☐ | 4 ☐ | 5+ ☐ | |
| Løk | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (ss) | 1 ☐ | 2 ☐ | 3 ☐ | 4 ☐ | 5+ ☐ | |
| Spinat, andre bladgrønns. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1 ☐ | 2 ☐ | 3 ☐ | 4 ☐ | 5+ ☐ | |
| Sopp | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1-2 ☐ | 3-4 ☐ | 5-6 ☐ | 7-8 ☐ | 9+ ☐ | |
| Avocado | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1/4 ☐ | 1/2 ☐ | 3/4 ☐ | 1 ☐ | 1 1/4 + ☐ | |
| Paprika | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (strimmel) | 1 ☐ | 2 ☐ | 3 ☐ | 4 ☐ | 5+ ☐ | |
| Tomat | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1/2 ☐ | 1 ☐ | 1 1/2 ☐ | 2 ☐ | 3+ ☐ | |
| Tomatbønner, bønner/linser | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1 ☐ | 2 ☐ | 3 ☐ | 4 ☐ | 5+ ☐ | |
| Mais | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (ss) | 1-2 ☐ | 3-4 ☐ | 5-6 ☐ | 7-8 ☐ | 9+ ☐ | |
| Erter, frosne grønnsak-blandinger | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1 ☐ | 2 ☐ | 3 ☐ | 4 ☐ | 5+ ☐ | |
| Salatblandinger | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1 ☐ | 2 ☐ | 3 ☐ | 4 ☐ | 5+ ☐ | |
| Dressing | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (ss) | 1/2 ☐ | 1 ☐ | 2 ☐ | 3 ☐ | 4+ ☐ | |
| Rømme | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (ss) | 1/2 ☐ | 1 ☐ | 2 ☐ | 3 ☐ | 4+ ☐ | |

Hvor mange ganger om dagen spiser du vanligvis grønnsaker utenom grønnsakene du spiser til middag?

0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5+ ☐

## 12. TYPE FETT TIL MATLAGING

| Smør/margarin | | Oljer | |
|---|---|---|---|
| ☐ | Smør (meierismør) | ☐ | Olivenolje |
| ☐ | Bremykt | ☐ | Soyaolje |
| ☐ | Melange, Per | ☐ | Maisolje |
| ☐ | Soft-, soyamargarin (pakke, beger) | ☐ | Solsikkeolje |
| ☐ | Solsikke | ☐ | Valnøttolje |
| ☐ | Oliven | ☐ | Andre oljer |
| ☐ | Annen margarin | | |

## 13. FRUKT

Svar enten pr. måned **eller** pr. uke. < 1 betyr sjeldnere enn 1 gang.

| | Gang pr. måned | | | | | Gang pr. uke | | | | | | Mengde pr. gang | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | <1 | 1 | 2 | 3 | 1 | 2-3 | 4-5 | 6-7 | 8+ | | 1/2 | 1 | 2 | 3+ |
| Eple | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | ☐ | ☐ | ☐ | ☐ |
| Appelsin, mandarin, grapefrukt | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | ☐ | ☐ | ☐ | ☐ |
| Banan | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | ☐ | ☐ | ☐ | ☐ |
| Druer | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (klase) | ☐ | ☐ | ☐ | ☐ |
| Eksotisk frukt (kiwi, mango) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | ☐ | ☐ | ☐ | ☐ |
| Annen frukt (fersken, pære m.v.) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | ☐ | ☐ | ☐ | ☐ |
| Jordbær, bringebær (friske, frosne) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | ☐ | ☐ | ☐ | ☐ |
| Blåbær | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | ☐ | ☐ | ☐ | ☐ |
| Multer | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | ☐ | ☐ | ☐ | ☐ |

Hvor mange frukter spiser du vanligvis pr. dag?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9+ |
|---|---|---|---|---|---|---|---|---|---|
| ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

# 14. DESSERT, KAKER, GODTERI

Svar enten pr. måned **eller** pr. uke. < 1 betyr sjeldnere enn 1 gang.

| | Gang pr. måned | | | | | Gang pr. uke | | | | | | Mengde pr. gang | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | <1 | 1 | 2 | 3 | 1 | 2-3 | 4-5 | 6-7 | 8+ | | 1/2 | 1 | 2 | 3+ |
| Hermetisk frukt, fruktgrøt | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | ☐ | ☐ | ☐ | ☐ |
| Puddinger (sjokolade, karamell o.l.) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1 ☐ | 2 ☐ | 3 ☐ | 4+ ☐ |
| Is (1 dl = 1 pinne = 1 kremmerhus) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1 ☐ | 2 ☐ | 3 ☐ | 4+ ☐ |
| Boller, julekake, kringle | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1 ☐ | 2 ☐ | 3 ☐ | 4+ ☐ |
| Skolebrød, skillingsbolle | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1 ☐ | 2 ☐ | 3 ☐ | 4+ ☐ |
| Wienerbrød, -kringle o.l. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1 ☐ | 2 ☐ | 3 ☐ | 4+ ☐ |
| Smultring, formkake | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1 ☐ | 2 ☐ | 3 ☐ | 4+ ☐ |
| Vafler | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (plate) | 1/2 ☐ | 1 ☐ | 2 ☐ | 3+ ☐ |
| Sjokoladekake, bløtkake, annen fylt kake | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1/2 ☐ | 1 ☐ | 2 ☐ | 3+ ☐ |
| Søt kjeks, kakekjeks (Cookies, Bixit, Hobnobs) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1-2 ☐ | 3-4 ☐ | 5-6 ☐ | 7+ ☐ |
| Sjokolade (60 g) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (plate) | 1/2 ☐ | 1 ☐ | 2 ☐ | 3+ ☐ |
| Drops, lakris, seigmenn o.l. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (stk) | 1-2 ☐ | 3-4 ☐ | 5-6 ☐ | 7+ ☐ |
| Smågodt (1 hg = 100g) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (hg) | 1/2 ☐ | 3/4 ☐ | 1 ☐ | 1 1/2 ☐ |
| Potetgull (1 pose 100g = 7 dl) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1-2 ☐ | 3-4 ☐ | 5-6 ☐ | 7+ ☐ |
| Annen snacks (skruer, crisp, saltstenger, lettsnacks o.l.) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (dl) | 1-2 ☐ | 3-4 ☐ | 5-6 ☐ | 7+ ☐ |
| Peanøtter, andre nøtter (1 pose 100g = 4 never) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | (neve) | 1 ☐ | 2 ☐ | 3 ☐ | 4+ ☐ |

# 15. KOSTTILSKUDD (bs = barneskje, ts = teskje)

| | Hele året | Bare vinterhalvåret | Gang pr. uke: 0 | <1 | 1 | 2-3 | 4-5 | 6-7 | | Mengde pr. gang |
|---|---|---|---|---|---|---|---|---|---|---|
| Tran | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | | 1 ts ☐ 1 bs ☐ 1 ss ☐ |
| Trankapsler | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | kapsler | 1 ☐ 2+ ☐ |
| Fiskeoljekapsler | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | kapsler | 1-2 ☐ 3-4 ☐ 5-6 ☐ 7+ ☐ |
| **Multipreparater** | | | | | | | | | | |
| Sanasol | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | bs | 1 ☐ 2 ☐ 3 ☐ 4+ ☐ |
| Biovit | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | bs | 1 ☐ 2 ☐ 3 ☐ 4+ ☐ |
| Vitaplex | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | tablett | 1 ☐ 2 ☐ 3 ☐ 4+ ☐ |
| Kostpluss | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | tablett | 1 ☐ 2 ☐ 3 ☐ 4+ ☐ |
| Vitamineral | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | tablett | 1 ☐ 2 ☐ 3 ☐ 4+ ☐ |
| Annet | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | tablett | 1 ☐ 2 ☐ 3 ☐ 4+ ☐ |
| Hvis annet, hvilket? ..... | | | | | | | | | | |
| **Jernpreparater** | | | | | | | | | | |
| Ferro C | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | tablett | 1 ☐ 2 ☐ 3 ☐ 4+ ☐ |
| Hemofer | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | tablett | 1 ☐ 2 ☐ 3 ☐ 4+ ☐ |
| Duroferon Duretter | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | tablett | 1 ☐ 2 ☐ 3 ☐ 4+ ☐ |
| Annet | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | tablett | 1 ☐ 2 ☐ 3 ☐ 4+ ☐ |
| Hvis annet, hvilket? ..... | | | | | | | | | | |
| B-vitaminer | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | tablett | 1 ☐ 2 ☐ 3 ☐ 4+ ☐ |
| C-vitamin | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | tablett | 1 ☐ 2 ☐ 3 ☐ 4+ ☐ |
| D-vitamin | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | tablett | 1 ☐ 2 ☐ 3 ☐ 4+ ☐ |
| E-vitamin | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | tablett | 1 ☐ 2 ☐ 3 ☐ 4+ ☐ |
| Folat (folsyre) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | tablett | 1 ☐ 2 ☐ 3 ☐ 4+ ☐ |
| Kalktabletter | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | tablett | 1 ☐ 2 ☐ 3 ☐ 4+ ☐ |
| Fluortabletter | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | tablett | 1 ☐ 2 ☐ 3 ☐ 4+ ☐ |
| Annet | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | tablett | 1 ☐ 2 ☐ 3 ☐ 4+ ☐ |
| Hvis annet, hvilket? ..... | | | | | | | | | | |

## 16. NÅR SPISER DU PÅ HVERDAGER?

HOVEDMÅLTIDER som frokost, formiddagsmat, middag, kvelds.

Omtrent klokken

| 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 2 | 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ |

MELLOMMÅLTIDER som kaffe, frukt, godteri, snacks m.v.

Omtrent klokken

| 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 2 | 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ | ☐ ☐ |

17. MENER DU SVARENE I SPØRRESKJEMAET GIR ET BRUKBART BILDE AV KOSTHOLDET DITT? Ja ☐ Nei ☐

Er det matvarer/produkter du regelmessig bruker, og som ikke er nevnt i skjemaet?

.....

.....

18. ER DU FORNØYD MED KROPPSVEKTEN DIN SLIK DEN ER NÅ?

- ☐ Ja
- ☐ Nei, jeg ønsker å slanke meg
- ☐ Nei, jeg ønsker å legge på meg

19. KJØNN Mann ☐ Kvinne ☐

Vennligst se etter at du har svart på alle spørsmål.

**Takk for innsatsen!**

RANDSBORG AS

# Appendix 6

*Information letter to invited subjects in 2006, including form for written consent to participate.*

**UNIVERSITETET I OSLO**
**DET MEDISINSKE FAKULTET**

**Institutt for medisinske basalfag**
*Avdeling for ernæringsvitenskap*
Postboks 1046, Blindern
0316 Oslo

*Besøkadresse*
Domus Medica
Sognsvannsveien 9

Telefon: 22851372
Telefaks: 22851341
e-post: ekvaavik@medisin.uio.no

Oslo, 18. september 2006

# Invitasjon til ny runde av "Kjenn din kropp"-undersøkelsen

I 2004 fikk du informasjon om noen resultater fra "Kjenn din kropp"-undersøkelsen. Første gang du deltok var i 1979, da du var elev ved Ila, Majorstua, Uranienborg, Kjelsås, Vålerenga eller Møllergata skole i Oslo. Det har vært gjennomført oppfølgingsundersøkelser i 1981 (spørreskjema og helseundersøkelse), 1989 (spørreskjema), 1991 (spørreskjema og helseundersøkelse) og i 1999 (spørreskjema). I 2004 sa du ja til å bli kontaktet igjen i år, og vi vil derfor invitere deg til å delta i en 27-årsoppfølgingsundersøkelse av "Kjenn din kropp".

Årets undersøkelse har som mål å studere endring over tid i vaner knyttet til helse, som for eksempel kosthold, fysisk aktivitet og røyking. Vi ønsker også å se på noen fysiologiske faktorer, som kroppsvekt og nivåer av fettstoffer og antioksidanter i blodet.

For å kunne studere kostholdet i en gruppe og sammenhengen med helse og andre vaner, er det nødvendig å kartlegge hva som vanligvis spises og drikkes. I denne oppfølgingsundersøkelsen av "Kjenn din kropp" ber vi deg fylle ut et spørreskjema som omfatter hele kostholdet ditt. Skjemaet likner på det som ble brukt i 1999. I tillegg til kostholdsskjemaet ber vi om at du fyller ut bakgrunns- og helsevanespørsmålene i det korte skjemaet. Disse spørsmålene er også brukt i tidligere "Kjenn din kropp"-undersøkelser.

For å kunne kartlegge fysiologiske faktorer, som kolesterol i blodet og kroppsvekt, ønsker vi at du gjennomfører en helseundersøkelse for å måle høyde, vekt, blodtrykk og livvidde, samt å ta en blodprøve. Vi kontakter fastlegen din og utstyrer ham/henne med nødvendig informasjon, og trenger derfor navn og adresse på legen. Dette kan du fylle inn bakerst i det korte skjemaet. Timen hos fastlegen bør være fra 2 uker etter at du sender spørreskjemaet til oss og før 15. november. Timen hos fastlegen må være mellom mandag og torsdag, ikke fredag, slik at blodprøvene kommer fram til laboratoriet som

skal analysere dem en hverdag. Timen vil være gratis for deg, den skal vi betale. Hvis du er forhindret fra å gjennomføre deler av eller hele helseundersøkelsen hos fastlegen, vil vi gjerne at du likevel fyller ut spørreskjemaene og returnerer dem til oss.

Får vi høy deltakelse i årets undersøkelse, vil den gi en unik mulighet til å studere betydningen av kostvaner over tid på faktorer som er av stor betydning for helsa. Vi håper du tar deg tid til å besvare de vedlagte spørreskjemaene og å besøke fastlegen din. Hvis du vil delta i denne oppfølgingen, ber vi deg om å skrive under på samtykkeskjemaet og svare på spørsmålene i begge skjemaene. Dersom du returnerer de utfylte skjemaene innen 11. oktober (i vedlagte adresserte og frankerte returkonvolutt) og deltar i helseundersøkelsen hos fastlegen din innen 15. november får du et gavekort pålydende kr. 300.

Svarene behandles som i tidligere undersøkelser, strengt konfidensielt, og ingen av opplysningene du gir stilles til rådighet for forskere uten at navnet ditt er fjernet. Det er selvsagt frivillig å delta og du kan når som helst trekke deg fra undersøkelsen uten å gi noen grunn. Dersom du ikke ønsker å delta, ber vi om at du likevel returnerer de ikke utfylte skjemaene i svarkonvolutten (dermed unngår du unødige påminnelser fra oss).

Hovedresultatene fra denne 27-årsoppfølgingsundersøkelsen vil du få tilsendt i form av et nyhetsbrev neste år. Denne oppfølgingen av "Kjenn din kropp"-undersøkelsen er et samarbeid mellom Universitetet i Oslo og Nasjonalt folkehelseinstitutt og finansieres av Norges Forskningsråd. Undersøkelsen er tilrådd av Personvernombudet for forskning, Norsk samfunnsvitenskapelig datatjeneste A/S og av Regional komité for medisinsk forskningsetikk, Midt-Norge (REK). Forskningsbiobanken som opprettes er tilrådd av REK og godkjent av Sosial- og helsedirektoratet.

Prosjektet forventes å være avsluttet til 31.12. 2010. Etter at prosjektet er avsluttet vil opplysningene bli anonymisert og blodprøvene makulert. Det er imidlertid mulig at det vil bli aktuelt å gjennomføre en oppfølgingsundersøkelse før utgangen av 2010. I så fall vil du motta ny informasjon og ny forespørsel om å delta.

**Hva ber vi deg gjøre og hva får du igjen?**
For å gjøre det enklere for deg å vurdere om du kan delta i denne undersøkelsen, er her en oppsummering av hva vi ber deg om og hva du får igjen for det:

**Vi ber om:**

- At du fyller ut de to vedlagte spørreskjemaene om helsevaner, kroppsvekt og bakgrunnsinformasjon (inntekt, utdanning, sivilstand) og returnerer i svarkonvolutten helst innen 3 uker fra du mottar dette brevet
- At du undertegner samtykkeerklæringen og sende inn sammen med skjemaene
- At du bestiller time hos fastlegen din fra to uker etter at du sender inn skjemaene og før 15. november for å få målt høyde, vekt, livvidde og blodtrykk og å ta en blodprøve som analyseres for kolesterol, fett, glukose, jern og antioksidanter ved Ullevål Universitetssykehus og ved universitetet i Oslo. Blodprøven blir avidentifisert og påført et løpenummer

**Du får igjen**:

- En gratis helseundersøkelse hos fastlegen din. Hvis blodtrykket, kroppsvekten eller noen av blodverdiene som blir målt er for høye eller lave vil du bli kontaktet av oss og få veiledning om hva du bør foreta deg
- Du får en gavesjekk pålydende 300 kr. hvis du sender inn utfylte skjema innen 11. oktober og gjennomfører helseundersøkelsen innen 15. november
- Du vil få tilsendt et nyhetsbrev neste år der vi publiserer resultater fra undersøkelsen for alle deltakerne samlet

Dersom du har spørsmål angående undersøkelsen, vennligst kontakt daglig leder av prosjektet, Elisabeth Kvaavik, på telefon 22 85 13 72, eller via e-post: ekvaavik@medisin.uio.no.

**Tusen takk for din deltakelse i "Kjenn din kropp"-undersøkelsene!**

Vennlig hilsen

Elisabeth Kvaavik, PhD
Daglig leder av prosjektet

Knut-Inge Klepp, professor
Prosjektansvarlig

**Samtykke til å delta i 27-års-oppfølgingsundersøkelse av "Kjenn din kropp"**

Hvis du vil delta i denne oppfølgingen av "Kjenn din kropp"-undersøkelsen ber vi deg om å skrive under på samtykket og returnere det sammen med spørreskjemaene.

SAMTYKKE

Jeg har mottatt og lest informasjonsskrivet og har hatt anledning til å stille spørsmål.

Jeg samtykker i å delta i prosjektet.

Sted: _____ Dato: _____

Underskrift: _____

Plass for løpenummer

Postboks 1046 Blindern 0316 Oslo Tlf: 22 85 13 72 Telefax: 22 85 13 41

# Appendix 7

*Extended Table 1 – differences between women and men in included variables at age 40 years (2006)*

***Table 1*** *Difference between women and men in included variables at age 40 years (2006) (mean (SD) [95% CI] / median ($25^{th}$ – $75^{th}$ percentile) or % [95% CI] with given characteristic).*

| | **Women (n = 198)** | **Men (n = 205)** | p-value* |
|---|---|---|---|
| **Health-related- and demographic variables** | | | |
| Age, years [1] | 39.9 (0.9) [39.8, 40.1] | 40.1 (0.9) [40.0, 40.2] | 0.092 |
| BMI, kg/m$^2$ [1 †] | 24.0 (4.2) [23.4, 24.6] | 26.5 (4.0) [25.9, 27.0] | < 0.001 |
| Overweight, BMI ≥ 25 [3 †] | 29.0 [23.0, 35.0] | 58.4 [52.0, 65.0] | < 0.001 |
| Obesity, BMI ≥ 30 [3 †] | 8.8 [5.0, 13.0] | 15.3 [10.0, 20.0] | 0.067 |
| LTPA at least twice weekly [3] | 50.0 [43.0, 57.0] | 43.3 [36.0, 50.0] | 0.217 |
| Smoking, % daily smokers [3] | 25.0 [18.9, 31.1] | 26.5 [20.4, 32.6] | 0.824 |
| Very health conscious [3] | 69.7 [63.0, 76.0] | 41.3 [34.0, 48.0] | < 0.001 |
| Tried to lose weight last 3 months? (% yes)[3] | 27.3 [21.0, 34.0] | 14.8 [10.0, 20.0] | 0.003 |
| Education, more than high school [3] | 63.1 [56.0, 70.0] | 47.5 [41.0, 54.0] | 0.002 |
| **Dietary variables** | | | |
| Soft drinks, grams/day [2] | 53.4 (133.5) / 0.0 (0.0 – 39.0) | 166.9 (392.4) / 39.0 (0.0 – 150.0) | < 0.001 |
| Soft drinks, times/week [2] | 0.9 (2.1) / 0.0 (0.0 – 1.0) | 2.0 (3.4) / 0.8 (0.0 – 2.5) | < 0.001 |
| Sweets, grams/day [2] | 16.5 (21.8) / 12.0 (5.8 – 21.0) | 23.2 (30.3) / 13.0 (7.0 – 29.5) | 0.017 |
| Sweets, times/week [2] | 2.8 (3.2) / 2.0 (1.1 – 3.5) | 3.1 (3.8) / 2.2 (1.1 – 3.5) | 0.606 |
| Added sugar, grams/day [2] | 33.8 (28.5) / 27.4 (15.2 – 41.3) | 53.9 (51.3) / 40.2 (24.5 – 60.6) | < 0.001 |
| Sugar, E% [2] | 6.9 (5.1) / 5.7 (3.7 – 8.5) | 7.9 (6.1) / 6.0 (4.4 – 9.2) | 0.083 |
| Energy, KJ/day [1] | 8065 (2525) [7711, 8419] | 11037 (3279) [10586, 11489] | < 0.001 |
| EI:BMR<1.35 [3] | 56.1 [50.5, 64.6] | 52.7 [46.3, 60.1] | 0.339 |

*Difference between genders were analysed with: [1] Student t-test for unpaired samples, [2] Mann-Whitney U-Test, [3] Chi-square test for independence. † BMI calculated from self-reported height and weight.

# Appendix 8

*Posters presented at the 9th Nordic Nutrition Conference in Copenhagen, 1st to 4th June, 2008.*

# Change in sugar intake from 1999 to 2006 in an adult population: The Oslo Youth Study

Lena Lie Nymoen, Master student  Elisabeth Kvaavik, PhD  Knut-Inge Klepp, PhD, MPH

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UNIVERSITY OF OSLO
FACULTY OF MEDICINE

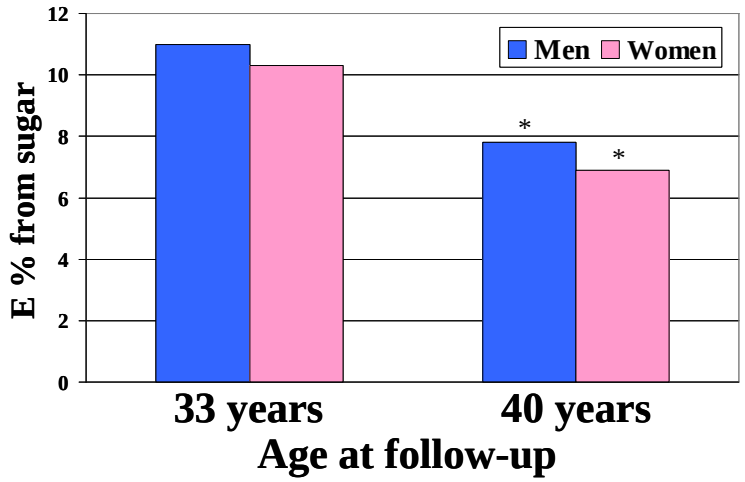
## Objectives

To assess the changes in sugar intake in an adult, Norwegian population from age 33 (1999) to 40 years (2006).

## Methods

The study is based on research data from The Oslo Youth Study. 167 women and 172 men who reported their food intake through validated FFQs at age 33 years (1999) and at age 40 years (2006) are included in the analyses. Paired-samples t-test and Spearman's correlation analysis were used to assess the change in total sugar intake (grams/day and per cent of total energy, E%) from age 33 to 40 years. The proportion of people who stayed in the same quartile of E%, and the proportion who reported an intake above 10 E% at both time points were assessed by chi-square test for independence.

## E% from sugar (mean, SD) at age 33 and age 40 years




* p<0.001, within gender. Men n=172; women n=167.

## Movement between quartiles

44% of men and 48% of women remained in the same quartile after 7 years (both p<0.001).

## >10 E%

Among men who reported to get more than 10% of their total energy from sugar at age 33 years, 43.1% still reported this high intake at age 40 (p<0.001). For women the corresponding proportion was 27.0 % (p<0.001).

## Difference in sugar intake at age 33 and 40 years

| | 33 years (1999) | 40 years (2006) | Difference, mean (SD) [95 % CI] | p-value* |
|---|---|---|---|---|
| **Women (n=167)** | | | | |
| Sugar, grams/day | 55.7 (46.4) | 34.0 (28.4) | -21.8 (41.9) [-28.2, -15.4] | <0.001 |
| Sugar, E% | 10.3 (5.8) | 6.9 (5.1) | -3.4 (5.3) [-4.2, -2.6] | <0.001 |
| Energy, kJ | 8506 (2921) | 8053 (2531) | -453 (2868) [-892, -15] | 0.043 |
| **Men (n=172)** | | | | |
| Sugar, gram/day | 74.7 (66.3) | 55.1 (54.0) | -19.6 (57.1) [-28.2, -11.0] | <0.001 |
| Sugar, E% | 10.9 (7.4) | 7.8 (6.2) | -3.1 (6.7) [-4.1, -2.1] | <0.001 |
| Energy, kJ | 10823 (3450) | 11226 (3303) | 403 (3718) [-157, 963] | 0.157 |

Paired samples t-test for difference between age 33 and 40 years*P<0.001

## Correlation

| | Women (n=167) | Men (n=172) |
|---|---|---|
| **Sugar, E%** | 0.62* | 0.57* |
| **Sugar, g/d** | 0.66* | 0.62* |

*p<0.001

**Acknowledgement.**
The Oslo Youth Study was supported by The Norwegian Cancer Society, the Norwegian Research Council, the EXTRA funds from the Norwegian Foundation for Health and Rehabilitation and from the Norwegian Health Association.

## Conclusion

In this Norwegian adult population, intake of sugar, both grams per day and E%, decreased significantly from age 33 years (1999) to age 40 years (2006). This is most likely a result of both social trends and ageing.

# Stability of soft drink and sweet intake from adolescence to adulthood: The Oslo Youth Study

Lena Lie Nymoen, Master student  Elisabeth Kvaavik, PhD  Knut-Inge Klepp, PhD, MPH

Department of Nutrition, University of Oslo, Norway

UNIVERSITY OF OSLO
FACULTY OF MEDICINE

## Objectives

To assess stability in soft drink and sweet intake from adolescence into adulthood.

## Method

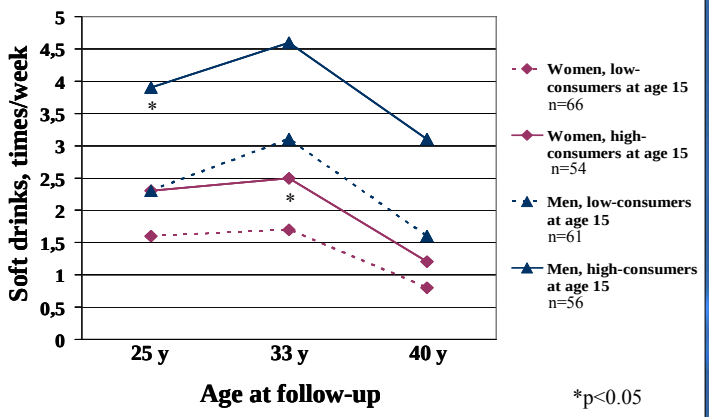
A total of 259 men and women reported their food intake at age 15 (1981/1979), 25 (1991), 33 (1999), and 40 years (2006). Consumption frequencies of soft drinks and sweets were divided into two consumption groups at age 15 ("Seldom/past week" and "Previous day") and at age 25 years ("< 3 t/w" and "≥ 3 t/w"). Mann-Whitney U-Test was used to study differences in intake between these groups at follow-ups.

## Tracking of soft drinks and sweets from age 15 to age 40 years

Frequency (t/w) of soft drink intake at age 25 years was lower among men reporting a low intake compared to men reporting a high intake at age 15 years (p=0.011). For women there was a difference between the groups in both frequency (p=0.050) and grams/day (p=0.046) at age 33 years.

For intake of sweets, there were significant differences between the 15-year consumption groups at age 25 years (men only) and at age 33 years (women and men).

## Tracking of soft drink intake from age 15 to 40 years



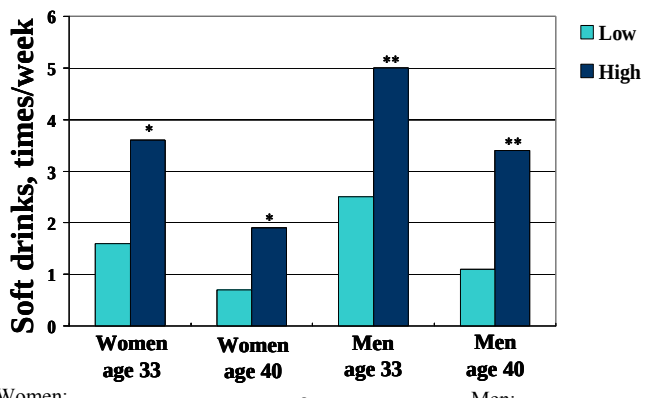

*p<0.05

## Tracking of soft drinks and sweets from 25 to 40 years

Both men and women who reported to drink soft drinks less than 3 times/week at age 25 years had a lower intake at age 33 and 40 years than those reporting a higher intake at age 25 years (p-values between <0.001 and 0.006).

At age 33 and 40 years consumption frequencies and grams/day of sweets were significantly lower in the 25-year low-consumption group compared to the high-consumption group (p-values between <0.001 and 0.027).

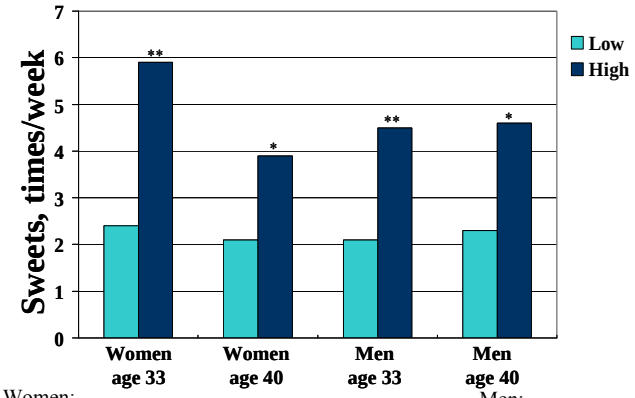
## Tracking of soft drink intake from 25 to 40 years




Women: Low n=102; high n=32

Men: Low n=81; high n=57

## Tracking of sweet intake from 25 to 40 years




Women: Low n=84; high n=45

Men: Low n=88; high n=43

## Conclusion

The level of tracking of soft drink intake from age 15 to 40 years in this was low for both genders, while the tracking from age 25 to 40 years was moderate to high for both men and women.

The level of tracking of sweet intake from age 15 to age 40 years was moderate among men, and from age 25 to age 40 years moderate to high for both men and women.

The Oslo Youth Study was supported by The Norwegian Cancer Society, the Norwegian Research Council, the EXTRA funds from the Norwegian Foundation for Health and Rehabilitation and from the Norwegian Health Association.