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LONG-TERM CHANGES IN THE CONSUMPTION OF HEALTHY AND UNHEALTHY FOODS

Exploring the roles of age, birth cohort, socioeconomic status, and gender

Antti Kähäri

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University of Turku

Faculty of Social Sciences
Department of Social Research
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Abbreviations

APC	Age-period-cohort
APCD	Age-period-cohort Detrended
APCT	Age-period-cohort Trended
APCTLag	Age-period-cohort Trended Lag
FES	Food expenditure share
HBHFA	Health Behavior and Health among the Finnish Adult Population
HES	Household expenditure survey
IGI	Intervention generated inequalities
NCD	Non-communicable disease
OECD	Organisation for Economic Co-operation and Development
RHW	Regional Health and Well-being survey
SES	Socioeconomic status
SSB	Sugar sweetened beverage
WHO	World Health Organization

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ABSTRACT

Food habits significantly influence the risks of several non-communicable diseases (NCDs), such as type 2 diabetes, cardiovascular diseases, and memory disorders. NCDs cause heavy burdens on society in the form of human suffering, healthcare costs, and loss of work ability. Depending on the disease, about a third of new cases can be avoided by making dietary changes. Although dietary habits have developed favorably in Finland, the country is still far from reaching the level recommended by the national dietary guidelines, and differences among various social groups persist.

A vast body of literature shows that health and health behaviors are unevenly distributed in society. The life course perspective suggests differences between age groups and birth cohorts. Additionally, the more socioeconomic resources, such as income, education, or occupational prestige, an individual has, the more likely they are to eat fruit and vegetables daily, exercise during leisure time, and not smoke. Choices conducive to good health are more common among women than men. However, differences between groups can change over time.

The overarching goal of this dissertation is to study the long-term trends of healthy and unhealthy food consumption through four social groupings: age, birth cohort, socioeconomic status, and gender. The objective is to assess how these group differences have changed over time. Drawing on the literature on the life course perspective, this thesis compares consumption patterns between age groups and birth cohorts, paying special attention to separating age, period, and cohort effects. Moreover, building on the literature on health inequalities, this dissertation analyzes how socioeconomic and gender differences in consumption have evolved over time. The first article assesses how the consumption of vegetables, fruit, and fish varies by age, period, and birth cohort. The second article examines changes in the consumption of sugar products and non-alcoholic beverages of birth cohorts and the changes in socioeconomic differences in consumption among birth cohorts. The third article investigates how socioeconomic differences in fish consumption have changed over time. Finally, the fourth article focuses on clarifying the changing gender differences in vegetable intake.

This thesis utilizes the Finnish Household Expenditure Survey from 1985 to 2016, the data samples of the Health Behavior and Health among the Finnish Adult Population collected between 1979 and 2014, and the Regional Health and Well-being Studies collected between 2013 and 2017. These long-running surveys are

analyzed with relatively new age-period-cohort models (APCD, APCT, and APCTLAG) as well as linear and logistic regression models. Consumption of healthy food is operationalized as food expenditure shares (FES) of vegetables, fruit, and berries, as well as fish, and the prevalence of daily vegetable intake. Unhealthy food consumption is evaluated through the expenditure shares of sugar products and non-alcoholic beverages (excluding mineral waters).

The results showed that the proportion of total food expenditures on vegetables, fruit, and fish as well as the prevalence of self-reported daily vegetable intake increased during the study period. FESs of vegetables, fruit, sugar products, and non-alcoholic beverages were higher in more recent birth cohorts. Fruit and fish consumption were the highest in the over-50 age groups, while sugar and non-alcoholic beverage consumption were the highest in young adults and declined toward older age groups. A dip in healthy food consumption and an increase in unhealthy food consumption were observed in the midlife group. Socioeconomic differences in the FES of fish widened during the study period, leading to the higher income and education groups to expend greater shares of their food baskets on fish over time. Non-alcoholic beverages occupied a larger portion of the high socio-economic status groups' food budgets in cohorts born before the 1950s. This gap reversed over time, leading to larger FESs of non-alcoholic beverages in low socio-economic status groups in cohorts born after the 1950s. Daily vegetable intake was more common among females than males, and this difference grew significantly during the study period.

In conclusion, this dissertation confirmed that healthy food consumption has been on the rise. It also found that the proportions of sugar products and non-alcoholic beverages in the food budget have increased across birth cohorts. The adoption of these trends depended on consumers' stage of life, socioeconomic status and gender, leading to changing group differences. While cohort theories usually posit that young adulthood is the defining time for cohort differentation in values and habits, this study found that fruit and fish consumption increased most in the baby boomers when they were over 50. Midlife with its family and work demands is associated with less healthy food consumption patterns. Children learn to eat what their parents buy, which points to the importance of this life-stage for the formation of food habits in the next generation. The finding that socioeconomic differences in the food expenditure share of non-alcoholic beverages turned around across birth cohorts provides an empirical demonstration of how new consumption patterns are first adopted by those with more income before diffusing through the social strata. The widening socioeconomic differences in fish consumption should raise our attention, as food prices have increased significantly in the period following this finding, worsening thte situation for those in a low socioeconomic position. Finally, the steeper upward trend in vegetable intake among women has lead to increasing gender differences. Gender is thus not becoming of lesser importance in food consumption, even in a context of growing gender equality.

Keywords: food consumption, health, life course, age-period-cohort, long-term change, health inequality, gender

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Ruokatottumukset vaikuttavat merkittävästi riskiin sairastua elintapasairauksiin, kuten tyypin 2 diabetekseen, sydän- ja verisuonitauteihin tai muistisairauksiin. Elintapasairaudet aiheuttavat suuria kustannuksia yhteiskunnille kärsimyksen, terveydenhoitokulujen sekä alentuneen työkyvyn muodossa. Kuitenkin riippuen sairaudesta, noin kolmasosa uusista tapauksista voitaisiin välttää ravitsemuksellisilla muutoksilla. Vaikka ruokatottumukset ovat kehittyneet monelta osin terveellisempään suuntaan Suomessa, ovat ne vielä kaukana ravitsemussuositusten suosittelemasta tasosta. Myös väestöryhmittäiset erot ruokatottumuksissa ovat osoittautuneet sitkeiksi.

Aiemman tutkimuksen mukaan terveys ja terveyskäyttäytyminen jakautuvat yhteiskunnassa epätasaisesti. Elinkaarinäkökulma kohdistaa huomion iän ja syntymäkohortin rooliin ruoan kulutuksessa. Lisäksi, mitä korkeammat tulot, koulutusaste tai ammattiasema yksilöllä on, sitä todennäköisemmin hän syö kasviksia päivittäin, harrastaa vapaa-ajan liikuntaa ja on tupakoimaton. Terveydelle edulliset valinnat ovat myös naisten keskuudessa yleisempiä kuin miesten. Väestöryhmittäiset erot voivat kuitenkin muuttua ajan myötä.

Tämä väitöskirja tarkastelee pitkän aikavälin muutoksia terveellisten ja epäterveellisten ruokien kulutuksessa iän, syntymäkohortin, sosioekonomisen aseman ja sukupuolen kautta. Tutkimus kysyy miten nämä väestöryhmittäiset erot ovat muuttuneet ajan myötä. Hyödyntäen elinkaarinäkökulmaa tutkimus vertailee ikäryhmien ja syntymäkohorttien kulutustottumuksia kiinnittäen erityistä huomiota ikä-, periodi- ja kohorttivaikutusten erottelemiseen. Lisäksi tutkimus analysoi, miten erot sosioekonomisten ryhmien ja sukupuolten välillä ovat kehittyneet, ottaen näin osaa keskusteluun terveyseroista. Ensimmäisessä artikkelissa tarkastellaan, miten kasvisten, hedelmien ja kalan kulutus vaihtelee iän, periodin ja syntymäkohortin mukaan. Toisessa artikkelissa analysoidaan sokerituotteiden ja alkoholittomien juomien kulutuksen muutoksia syntymäkohorteittain, sekä sosioekonomisten erojen muutosta syntymäkohorttien välillä. Kolmannessa artikkelissa tutkitaan, miten tulo- ja koulutusryhmittäiset erot kalan kulutuksessa ovat muuttuneet. Viimeinen artikkeli tarkastelee kasvisten päivittäiskäytön muutosta sukupuolen mukaan.

Kolmessa ensimmäisessä artikkelissa hyödynnetään Tilastokeskuksen vuosien 1985 ja 2016 välillä keräämiä Kulutustutkimus-aineistoja ja neljännessä artikkelissa Terveyden ja hyvinvoinnin laitoksen vuosien 1979 ja 2017 välillä keräämiä ”Suomalaisen

aikuisväestön terveyskäyttäytyminen ja terveys (AVTK)" sekä "Aikuisten terveys-, hyvinvointi- ja palvelututkimus (ATH)" -aineistoja. Näitä pitkiä aikasarjoja analysoidaan ikä-periodi-kohorttimallien (APCD, APCT ja APCTLAG) sekä lineaaristen ja logististen regressiomallien keinoin. Terveellisen ruoan kulutusta mitataan kasvisten, hedelmien ja marjojen sekä kalan osuuksina ruokamenoista sekä kasvisten päivittäisen syönnin yleisyytenä. Epäterveellisen ruoan kulutusta mitataan sokerituotteiden ja alkoholittomien juomien (pl. kivennäisvedet) osuuksina ruokamenoista.

Tulosten mukaan kasvisten, hedelmien, marjojen sekä kalan osuudet ruokamenoista kasvoivat tarkastelujaksolla. Myös kasvisten päivittäinen käyttö yleistyi. Kasvisten, hedelmien ja marjojen, sokerituotteiden sekä alkoholittomien juomien osuudet ruokamenoista olivat suurempia nuoremmissa syntymäkohorteissa. Hedelmien ja marjojen sekä kalan kulutus korostui yli 50-vuotiaiden ikäryhmissä, kun taas sokerituotteiden sekä juomien kulutus oli yleisintä nuorissa aikuisissa ja laski siirryttäessä kohti vanhimpia ikäryhmiä. Keski-iässä terveellisen ruoan kulutuksessa tapahtuu notkahdus ja epäterveellisen ruoan kulutuksessa nousu. Myös sosioekonomisen aseman mukaisia eroja ruoan kulutuksessa havaittiin. Tuloryhmien väliset erot kalan kulutuksessa kasvoivat 2000-luvulla. Juomien osuus ruokamenoista oli ennen 1950-lukua syntyneiden keskuudessa sitä suurempi mitä korkeampi sosioekonominen asema, mutta 1950-luvun jälkeen syntyneiden keskuudessa matalampi sosioekonominen asema oli yhteydessä suurempaan juomien budjettiosuuteen. Kasvisten päivittäinen käyttö oli naisten keskuudessa yleisempää kuin miesten. Tämä ero kasvoi tutkimusjaksolla, kun kasvisten päivittäinen käyttö yleistyi naisten keskuudessa nopeammin kuin miesten.

Tiivistäen voidaan sanoa, että terveellisten ruokien kulutus on kasvanut yli ajan ja syntymäkohorteittain, samalla kun sokerituotteiden sekä alkoholittomien juomien osuus ruokamenoista on kasvanut syntymäkohorteittain. Näissä muutoksissa on havaittavissa eroja ikäryhmien, sosioekonomisen aseman ja sukupuolen mukaan. Vaikka kohorttiteoriat yleensä väittävät, että nuori aikuisuus on määräävä aika kohortin arvojen ja tapojen erilaistumiseen, tässä tutkimuksessa havaittiin, että hedelmien ja kalan kulutus lisääntyi eniten suurten ikäluokkien ollessa yli 50-vuotiaita. Ruuhkavuodet perhe- ja työvaatimuksineen ovat yhteydessä vähempään terveellisen ruoan kulutukseen. Lapset oppivat syömään sitä, mitä heidän vanhempansa ostavat, mikä osoittaa tämän elämänvaiheen merkityksen seuraavan sukupolven ruokailutottumusten muodostumiselle. Havainto, että sosioekonomiset erot alkoholittomien juomien ruokamenojen osuudessa kääntyivät ympäri syntymäkohorttien välillä, tarjoaa empiirisen osoituksen siitä, kuinka enemmän tuloja omaavat omaksuvat uudet kulutustottumukset ennen kuin ne leviävät väestössä. Kalan kulutuksen kasvavien sosioekonomisten erojen pitäisi herättää huomiomme, sillä elintarvikkeiden hinnat ovat nousseet merkittävästi tämän havainnon jälkeisenä aikana. Tämä pahentaa heikossa sosioekonomisessa asemassa olevien tilannetta. Vihannesten syönnin jyrkempi kasvutrendi naisten keskuudessa on johtanut sukupuolten välisten erojen lisääntymiseen. Sukupuolen merkitys ruoan kulutuksessa ei siis ole vähentymässä, vaikka sukupuolten tasa-arvo kasvaakin.

AVAINSANAT: ruoan kulutus, terveys, elinkaari, ikä-periodi-kohortti, pitkän aikavälin muutos, terveyserot, sukupuoli

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List of Original Publications

I. Kähäri, A. (2020). Long-term change in healthy food consumption in Finland during 1985−2016: an age-period-cohort analysis. *The International Journal of Sociology of Food and Agriculture, 26*(2): 89−110.

II. Kähäri, A. (2021). The role of sugar products and non-alcoholic beverages in the food budget: change across birth cohorts and between socio-economic groups. *British Food Journal, 123*(13): 142−161.

III. Kähäri, A., Lindblom, T. (2019). Sosioekonomisen aseman yhteys kalan osuuteen ruokamenoista vuosina 1985−2016. *Sosiaalilääketieteellinen aikakauslehti, 56*(4): 275−290.

IV. Kähäri, A. (2021). Gender differences in vegetable intake over time: results from repeated cross-sectional surveys from 1979 to 2017. *British Food Journal, 124*(13): 53−65.

1 Introduction

In early 2021, *Helsingin Sanomat*, the leading newspaper in Finland, published an article in which a large sample of Finnish consumers were surveyed about their food habits (Nykänen, 2021). Most respondents expressed experiencing pressure to change their diet in one direction or another. Leading experts have echoed this sentiment by stating that *change* is an apt word to describe contemporary food choices. There is a consensus among experts that individuals should change their diets to not only improve overall public health but also better address the global climate crisis. Thus, many consumers feel the social pressure to change their diets in some way or the other. In the spring of 2022, *Helsingin Sanomat* actively published articles on food prices, which are rising faster than the general inflation rate due to several reasons, such as increasing prices of energy and fertilizers exacerbated by the war in Ukraine (Varmavuori, 2022). Hence, it has been estimated that the the average food bill in Finland might increase by over 500 euros this year and that, as a result, consumers are likely to adjust their food choices by including cheaper alternatives or substitutes in their diets (Kukkonen, 2022). This situation makes the idea of social differences in food consumption absolutely topical.

The relationship between food and health is, at the same time, a topical and age-old question. Hippocrates, a doctor in ancient Greece, famously stated, “Let food be thy medicine and medicine be thy food.” Fast forward to 2022, open up a newspaper or the Internet and you are likely to encounter news about the latest findings of nutritional science, practical tips for individuals on how to stick to a healthy diet (based on whatever the latest trend diet might be), or reports on political debates on the taxation of unhealthy foods. These examples illuminate the social nature of our food habits. Although it is individuals who make food choices, their choices are heavily influenced by the current social context (Sobal et al., 2006). Food production, availability, prices, prevailing cultural values and norms, working conditions, social networks, and position in the socioeconomic hierarchy affect food choices and, consequently, the formation of the food habits of individuals in society (Beardsworth & Keil, 2002).

The relationship between food and health has become increasingly important as affordable energy-rich but nutrient-poor foods have permeated the food landscapes

of developed and developing societies. Food landscape refers to factors affecting price formation, taxation, availability, dispay and communication of healthy and unhealthy foods (Erkkola et al., 2019). The increased consumption of fat, sugar, meat, processed snack foods, and caloric beverages, combined with a sedentary lifestyle, has led to chronic diseases, such as diabetes and heart diseases to become the main health burdens of advanced societies (Popkin, 2006). For instance, type 2 diabetes is one of the most rapidly spreading lifestyle diseases in Finland, accounting for approximately 500,000 patients (Arffman et al., 2020; Finnish Diabetes Association, 2021). Meanwhile, the rates of overweight and obesity continue to rise. Of Finnish men, 72 percent were at least overweight (BMI > 25) and 26 percent were obese (BMI > 30), while 63 percent of Finnish women were at least overweight and 28 percent were obese in 2017 (Finnish Institute for Health and Welfare, 2022).

However, as the aforementioned newspaper article suggests, change has not stopped. Nutritional epidemiologist Barry Popkin (2006) suggested that a behavioral change to combat the unwanted consequences of the modernization of diets might occur in higher-income countries. Popkin uses Finland as an example of a country where intersectoral collaboration has been successfully used to make policy changes to promote healthier diets. Indeed, Finland has had a strong history of health promotion policies since the 1970s (Puska & Ståhl, 2010). Nutrition monitoring also shows that several aspects of a healthy diet have become more common at a population level. For example, surveys and food balance sheets show that the consumption of fruit and vegetables has risen significantly over the last 40 years (Helldán & Helakorpi, 2015; Kaartinen et al., 2021; Natural Resources Institute Finland, 2022). However, the consumption of fruit and vegetables remains far from the recommended levels. In 2017, only 14 percent of men and 22 percent of women met the recommendation for a daily vegetable and fruit intake of 500 grams per day (Valsta et al., 2018). Additionally, 79 percent of men and 26 percent of women ate more red and processed meat than the recommended upper limit of 500 grams per week.

It is worth studying how long-term changes in food consumption occur between different social groupings in more detail. The sociological life course perspective directs our attention to the changes in food habits over the life span, for example, due to changing social roles (Devine, 2005). This perspective also emphasizes how life courses are always embedded in a specific historically contingent societal context (Elder & George, 2016). Thus, each birth cohort experiences a particular life stage in a different social and historical context than the preceding and following cohorts, which might lead to the development of lasting cohort effects (Mori & Saegusa, 2010). For example, experiencing war in the formative years might lead to attitudes toward food that the individual carries throughout their life. In short, cohort

effects correspond to the formative effects of social change at critical ages (see Luo, 2015).

However, sociological research on food habits typically treats age merely as a control variable, while cohort analyses of food habits are, historically speaking, scarce due to a lack of adequate datasets and statistical methods. In contrast, research traditionally focuses more on the relationship between socioeconomic status and food habits. One of the most robust findings in the social epidemiology of food habits is that the more income, education, and occupational prestige an individual has, the healthier their diet (Ovaskainen et al., 2013; Pampel et al., 2010). Another well-established finding is that women have healthier food habits as compared to men (Arganini et al., 2012). How these relationships change over the long term has received less attention in the literature.

This dissertation seeks to fill these gaps in the literature using long-running time series of repeated cross-sectional surveys, age-period-cohort modeling techniques, and regression methods. It features four original research articles that study the long-term trends in healthy and unhealthy food consumption according to four social groupings: age, birth cohort, socioeconomic status, and gender. The goal of this thesis is to assess how these group differences have changed over time. Sociologically speaking, this dissertation focuses on how consumers' location in historical time, the life course, the socioeconomic hierarchy, and the gender system are related to changes in food consumption (see Devine, 2005).

The first article analyzes how the consumption of vegetables, fruit, and fish vary by age, period, and birth cohort, and asks whether cohort differences can be explained by rising income, education, and urbanization levels. The second article studies the changes in the consumption of sugar products and non-alcoholic beverages across birth cohorts and the changing socioeconomic differences in consumption within birth cohorts. The third article investigates how socioeconomic differences in fish consumption have changed over time. These three articles use the Finnish household expenditure surveys collected between 1985 and 2016. Finally, the last article assesses how gender differences in vegetable intake have changed between 1979 and 2014 using the Health Behavior and Health among the Finnish Adult Population and the regional health and well-being data samples.

The contributions of this dissertation are manifold. *First*, it contributes substantially to the literature on the determinants of food habits. In particular, it provides new knowledge on the development of vegetable, fruit, fish, and sugar consumption through age-period-cohort analyses as well as the changing role of socioeconomic status in sugar product and fish consumption and of gender in vegetable consumption. *Second*, it adds to the field of life course and cohort analyses by applying relatively new age-period-cohort modeling techniques to data on food

consumption habits. *Third*, it generates knowledge that is useful for policymakers who wish to promote healthy food habits at the population level.

The topics of healthy and sustainable food habits are increasingly visible on the political agenda during the past decade. Two goals of the government program of Juha Sipilä in 2015 were the promotion of public health and the reduction of inequalities. These goals were pursued with the promotion of food habits, health behaviors, and personal responsibility (Prime Minister's Office 2015). The government program of Sanna Marin has mentioned the development of healthy, communal, and ecological school meals and climate-friendly food policies, which are actualized by emphasizing healthy foods in public purchases (Prime Minister's Office, 2019). Considering the need for changes in food consumption habits demanded by NCDs and global warming, the results of this thesis have political and practical implications. The results might prove to be useful, for example, for planning targeted policy measures.

The dissertation is structured as follows: The second chapter discusses food consumption as health behavior and its many social and other determinants, summarizes the changes in Finnish food habits over time, and reviews the characteristics of healthy food habits. The third chapter focuses on the social patterns of food habits and highlights how the observed differences between social groupings are not stable in a changing society. This chapter draws on the sociological life course perspective and the literature on socioeconomic health inequalities as well as gender differences. This chapter can be considered the literature review of this dissertation, whereas chapter two operates on a more general level. The fourth chapter outlines the research design employed in this dissertation to tackle the dynamic process of change in food consumption. The fifth chapter provides an overview of the results obtained in the four research articles. The last chapter is dedicated to discussing the scientific and practical implications of the research conducted in this dissertation.

2 Food consumption and health

The human body needs proteins, fats, and carbohydrates as well as various micronutrients to maintain its healthy functioning. Nutritional science has achieved much success in uncovering the links between nutrition and health. However, our nutritional status is a result of food habits in our daily lives that are formed and carried out in the midst of various social influences and circumstances. This chapter briefly reviews the association between food and health, conceptualizes food habits as socially embedded, provides a historical account of how food consumption developed in Finland, and finally consults the nutritional guidelines and expert reports to see what a healthy and sustainable diet would look like. This, in turn, will motivate the selection of food categories used in this dissertation as dependent variables.

2.1 Food consumption as health behavior

First, let us consider food consumption as health behavior and its effects on health. After this I will demonstrate why this kind of view is insufficient, and a sociological treatment of food consumptin is necessary. Health behaviors have received a lot of attention from scientists in various fields of research, including but not limited to psychology, sociology, education, and public health. According to one definition, health behavior refers to personal actions that impact health, lack of health, and death (Umberson et al., 2010). Another definition, which stresses the habitual and repetitive nature of health behavior, refers to behavioral patterns, actions, and habits that contribute to the maintenance, restoration, or improvement of health (Conner & Norman, 2017). Research on health behavior has often focused on separate behaviors that can be divided into health-enhancing and health-compromising behaviors (Koivusilta, 2012). Health-enhancing behaviors include but are not limited to healthy food habits, regular check-ups, leisure-time physical activity engagement, and a sufficient amount of nightly sleep. Health-damaging behaviors include smoking, binge drinking, drug use, and excess food intake.

The amount of attention health behavior has received in scientific literature is understandable given the role of health behaviors in determining the disease burden

of modern societies. It has been estimated that, in total, health behavior explains up to 40 percent of deaths in the United States and 35 percent of deaths in Finland (McGinnis et al., 2002; European Commission, 2021). Health behavior is linked to these ultimate figures of health mostly through NCDs, such as type 2 diabetes, cardiovascular disease, and diseases caused by smoking and alcohol abuse. Healthy lifestyle habits are also linked to disease-free life-years (Nyberg et al., 2020). This dissertation focuses on food habits. Food habits are one of the central health behaviors that affect the risks of NCDs (Mikkilä et al., 2007). The EAT-Lancet Commission stated in 2019 that "unhealthy diets now pose a greater risk to morbidity and mortality than unsafe sex, alcohol, and drug and tobacco use combined" (Willett et al., 2019, 2).

Meta-analyses of cohort studies show that qualitative changes toward a healthy diet prevent 20–40 percent of new cases of memory illnesses, depression, atherosclerosis, stroke, type 2 diabetes, and cancers, depending on the illness (Grosso et al., 2017; Jankovic et al., 2017; Koloverou et al., 2014; Lourida et al., 2013). These conditions incur significant costs to societies in the form of lower productivity, early work disability, and direct healthcare costs. According to the latest health profile report issued by the European Commission (2021), 18 percent of deaths in Finland can be attributed to unhealthy nutrition.

2.2 The social determinants of healthy food consumption

The starting point for the sociology of food can be traced to Anne Murcott's edited volume "The Sociology of Food and Eating" (Murcott, 1983). It considers that food choices are socially and culturally embedded. In other words, food choices are more than mere health behavior (Jallinoja & Mäkelä, 2017). Sociologists have been interested especially in the cultural aspects of food and eating, studying, for example, food as a way of signaling status and maintaining class distinctions, the role of food in identity formation, and the construction of food-related social problems which are negotiated between the differing agendas of various actors from the public and private sectors (Almerico, 2014; Johnston & Baumann, 2015; Maurer & Sobal, 1995). In addition, sociologists are studying food and eating as a practice in everyday life (Warde, 2016). A noteworthy example is the work of Bente Halkier (2010) on the various ways in which consumers deal with the constant questioning of their everyday food habits. In this constant questioning, taking place in media discussions, the individual consumer is assumed responsibility for larger societal problems such as the climate crisis or the obesity epidemic.

Sociologists have also been interested in how various social circumstances affect food choices (Warde, 1997). Comparative research has showed how food practices

and foods eaten differ between countries (some examples are given later in this chapter). Another notable strand of literature has studied the connection between socioeconomic circumstances and various food-related outcomes (Purhonen et al., 2014; Lindblom, 2017). Further, a sociological life course perspective emphasizes the micro contexts (such as the family, friends, and workplace) and macro contexts (such as markets and food culture) that influence food practices and change over the life courses of individuals (Devine, 2005; Sobal et al., 2006).

The concept of food habits stresses the habitual and social nature of food-related behaviors. According to Leena Räsänen (1983), food habits refer to ways of choosing, consuming, and utilizing certain foods out of all the available foods, assumed by the individual or group under different social and cultural pressures. The social influences on an individual's food habits operate on several levels of proximity, from the immediate family to the more distant but equally important factors such as culinary traditions, food production, and foreign trade (Leach, 1999). In this dissertation food habits are operationalized as consumption of certain food groups consumed over sufficient time periods to indicate habitual consumption (two week accounting period in the Household Expenditure Surveys and one week reference period in the health surveys).

"The Rainbow Model" created by Dahlgren and Whitehead is a classic figure on the social determinants of health (Figure 1). The figure neatly illustrates the multiple levels of social influences on health (Dahlgren & Whitehead, 1991; 2021). Although the figure is not designed to explain food consumption specifically, I use it here to structure my presentation on the social determinants of food consumption. For this purpose, it is well suited. The levels of the rainbow model interact with each other, as larger contextual factors affect the more proximal processes and vice versa. Further, the figure is a cross-section of a point in space and time. There are a lot of cross-temporal and cross-country variations to the extent that various determinants are perceived to affect health and eating. I now discuss different levels of the rainbow model and provide examples relating to food consumption. In Chapter 3, I provide further details on the research on the social determinants studied in this dissertation and how their influence can change over the long term.

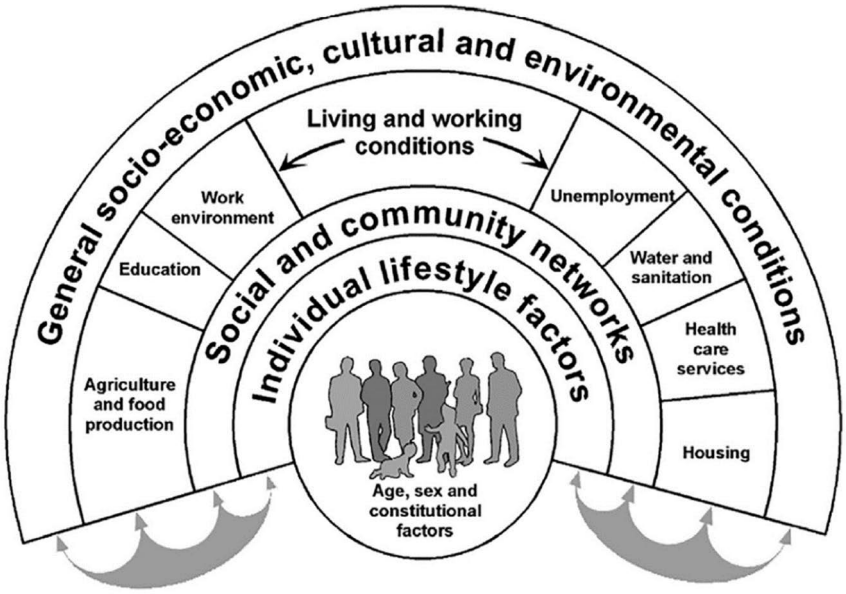

Figure 1. The determinants of health. Source: Dahlgren & Whitehead (2021). Reprinted with permission.

At the center is the individual and their biological characteristics, which are largely unchangeable. For example, one cannot change one's age at a certain point in time. However, the aging process has major implications for health. The sex one is born with is also determined before birth and does not change over the life course. Biological differences are also partly responsible for the health differences between men and women (Massey et al., 2021). Although sex is biologically determined, gender identity might change over the life course and include more than just the male and female classifications (Diamond, 2020). Moreover, differences between men and women in various health indicators are affected by social factors such as gender role expectations. These will be discussed elaborately in Section 3.5.

Constitutional factors refer to genetic predispositions and physiological characteristics. These could include genetic factors that either increase or decrease the probability of falling ill. For example, the alleles of a gene called *APOE* have been shown to influence the risks for Alzheimer's disease and cardiovascular disease (Lumsden et al., 2020). In contrast, Huntington's disease, which is a neurodegenerative disorder, is caused by an inherited defect in a single gene (Roos, 2010). With regard to food consumption, it should be noted that humans have an inborn preference for sweet and fatty foods (Beardsworth & Keil, 2002; Mennell, 1996). This is because the human species evolved under circumstances of perpetual scarcity, making high-calorie foods extremely valuable and desirable (Drewnowski,

2003). This preference for sweet and fatty foods was adaptive in an environment that did not provide predictable nutritional resources.

At the second level are individual lifestyle factors, which refer to the above-mentioned health behaviors and are placed between the individual and their social surroundings. Lifestyle factors include but are not limited to physical activity, diet, use of intoxicants, and sleep. An individual can change their behavior to attain better health. However, the outer levels of the rainbow model significantly influence individuals' choices.

Social and community networks are at the third level of the model. There is a large body of literature on the health effects of social relationships (Cohen, 2004; Umberson & Karas Montez, 2010). Low quantity and quality of social relationships have been linked to an increased risk of death (House et al., 1988). Generally, those who are married exhibit better physical and mental health and lesser alcohol use than the rest of the population (Joutsenniemi, 2011). Usually, those living alone perform the worst on the aforementioned indicators (Joutsenniemi, 2007). Several studies have looked at how different living arrangements and changes in these relate to food habits. Studies have shown that living together makes the diets of individuals more alike (Bove et al., 2003; Laitinen et al., 1997). This is good news for men whose diets typically improve after they begin cohabiting with women (Hartmann et al., 2014; Donkin et al., 1998; Worsley, 1988). In a representative sample of UK adults, being married was linked to increased fruit and vegetable intake, and being single or divorced/separated was linked to low fruit and vegetable intake (Billson et al., 1999). An Australian study of young adults showed that entering cohabitation is associated with "greater increases in BMI [body mass index], waist circumference, and total cholesterol, associated with dietary change in women and decreased physical activity in men" (Burke et al., 2004). Studies have observed mixed patterns regarding the association between becoming a parent and food habits (Elstgeest et al., 2012; Plessz et al., 2016). Most likely, socioeconomic status plays a role in how becoming a parent affects food habits of adults.

The fourth level of the model is living and working conditions. This level includes various socioeconomic and institutional factors. The link between socioeconomic status and food consumption has been well studied. In general, the more income, education, and occupational prestige an individual has, the healthier their diet (Ovaskainen et al., 2013; Pampel et al., 2010). Working conditions also vary by socioeconomic status. For example, access to a workplace cafeteria, which has been shown to be associated with healthier food habits, is more common among higher socioeconomic groups (Raulio & Roos, 2012). With regard to health, in general, access to occupational health care is greatly beneficial to the employed population. The unemployed, however, suffer from losses of income and social relationships, which negatively impact their health and food habits (Jin et al., 1995).

Sections 3.3 and 3.4 discuss the relationship between socioeconomic circumstances and food habits in more detail.

Countries differ in institutional arrangements related to health, welfare, and education. In Finland, these tend to operate according to the principle of universalism (Kuivalainen & Niemelä, 2010). Finnish law states that each citizen is liable to participate in compulsory education and has granted the right to healthcare services. The country also has extensive social security based on residence or work status. A concrete example relating to food is the free school meal, which is universal in Finland, serving as an important part of food education and health promotion (Sarlio-Lähteenkorva & Manninen, 2010). In contrast, in Britain, for example, free school meals are offered as a means-tested social benefit and have been used as an indicator of low socioeconomic status (Hobbs & Vignoles, 2013). Agriculture and food production are placed at the fourth level of the rainbow model. Although it is eventually the individual who chooses what to ingest, they must make the choice out of what is available to them. This availability of food or food products for selection often lies beyond the control of the individual (Leach, 1999). The next chapter highlights in greater detail some of the institutional characteristics of Finland.

Concerning the outermost level, the general socio-economic, cultural, and environmental conditions play an important role in populations' food habits. The food habits prevalent in any society reflect its economic development and current stage of modernization (Hall et al., 2009; Popkin, 2006). According to Engel's law, the more a household earns, the smaller the share of food in the household's total budget (see Zimmerman, 1935). This is also applicable at the population level, in that the share of the food budget of the total budget is an indication of the standard of living of a population. The technological advances brought on by modernization make many aspects of food consumption easier—for example, the proliferation of household appliances such as refrigerators and microwave ovens. Refrigerators have been universal in Finnish households since the 1980s and microwave ovens since the early 2000s (Nurmela & Parikka, 2018). In India, 31 percent of households own a refrigerator, while only 5 percent own a microwave oven (Statista, 2022). Refrigeration increases the longevity of fresh produce, meat, and fish. While modernization and the accompanying economic development may solve the problem of food scarcity and make food more affordable, the excess of food becomes a new problem. Increasing sugar and meat consumption are examples of unhealthy changes in modernizing food consumption habits. Some developing countries suffer from undernutrition and overnutrition simultaneously; this situation has been termed the double burden of malnutrition (Popkin et al., 2020).

Food culture can be defined as a "culinary order whose traits are prevalent among a certain group of people" (Askegaard & Madsen, 1998, 550). On the macro level, regions and countries differ in what is deemed edible from a social standpoint. A

classical example of this is dog meat, which is eaten as food in some cultures while considered taboo in others. Additional cultural differences between countries with regard to food and eating include the structure of the meal, timing, and the location of eating, as well as who makes the food and with whom it is eaten (Gronow & Holm, 2019). Some food cultures are known for their healthy dietary qualities. For example, Mediterranean food culture is well known globally for having a tasty cuisine, has received appreciation for the use of local ingredients, and had a social nature of eating and nutritionally beneficial properties (Helstosky, 2009). The Japanese and Nordic diets have also been regarded as healthy (Imai et al., 2019; Lankinen et al., 2019). In the following chapter, we will see how health became a cultural priority in the Finnish food culture, which modernized with the development of the welfare state.

Geographic conditions play a role in determining what crops are suitable for local agriculture, thereby further shaping the culinary cultures and traditions of countries. For example, Finland, being the northernmost country to cultivate cereal grains, has been successful in growing barley, oats, wheat, and rye (Finnish Cereal Committee, 2014). A cold climate might make energy-dense foods more appealing. In a Finnish food magazine article from early 1952, fatty and nutritious meats, such as pork meat and organ cuts, were recommended to be eaten on cold winter days (Kylli, 2021). Finally, geographic conditions impact the availability of fresh fruit and vegetables, which are available for a longer season and in greater variety in Southern Europe than in Northern Europe (Elmadfa, 2009). It is no accident then that the Mediterranean diet is known for its extensive use of plants and fruit.

Policy

One important thing that the rainbow model does not include is the health (and social) policy. The policy dimension could be situated between the outermost level of general socioeconomic, cultural, and environmental conditions and the fourth level of living and working conditions, as a policy is a crucial instrument that societies can use to improve the inner levels of the rainbow model, leading, if successful, to better health of the population. Many forms of food policies have been introduced in Finland, including those for promoting public awareness, restricting marketing, introducing taxes in favor of healthy diets, and building a healthy school environment (Pietinen et al., 2010; Sarlio-Lähteenkorva & Prättälä, 2012; Suojanen, 2003). Finland has even been used as an example of a country that has been successful at combining different policy aspects to improve the population's nutrition (Popkin, 2006).

Generally speaking, information-based guidance is easier to implement, but it is not as effective as fiscal measures (Brambila-Macias et al., 2011). Currently, Finland is considering more fiscal measures to achieve healthier and more sustainable food

consumption patterns (Valtioneuvosto, 2019). Fiscal policies are most effective in changing consumption toward a healthier and more sustainable direction through simultaneous taxation and subsidization. In other words, foods that are conducive to health and cause low greenhouse gas emissions should be subsidized, while unhealthy foods and foods causing high greenhouse gas emissions should be taxed (Abadie et al., 2016; Thow et al., 2018).

Finland has a history of levying sin tax on sugar products. The taxation of sugar products is based on the idea that consumers lack self-control and are, thus, inclined to engage in consumption behaviors that might be harmful to their health. Finland imposed excise duty on sweets and chocolate during 1926–1999. However, this tax did not apply to domestic sweeteners, such as xylitol, sorbitol, and mannitol. The European Commission decided that this was an undue market advantage and discontinued the tax. However, the tax on sugar-sweetened beverages (SSBs) remained (Rauhanen, 2013). In 2011, Finland imposed an excise tax on sweets, SSBs, and ice cream. The tax did not affect cookies, which motivated manufacturers to categorize candy-like products as cookies (Kosonen & Ropponen, 2012). The tax also excluded other sugar-containing products such as milkshakes and juices. In 2017, the tax was discontinued because the European Commission deemed that it skewed competition and defied the rules on state aid. The tax was also criticized for its minimal effect on the consumption of the targeted products.

Universal policies are meant to affect all people equally. However, some universal policies, particularly media campaigns, might face the issue of intervention-generated inequalities (IGIs) (Lorenc et al., 2013). IGIs refer to the phenomenon in which the desired changes occur predominantly in parts of the population for whom health is already a greater concern or have greater resources to act on their health motivations (White et al., 2009). Paradoxically, universal policies might actually make the gaps between groups even larger. Moving toward healthier and more sustainable diets requires the implementation of policy measures at all levels of the food system, as food consumption patterns are affected by agriculture, food companies, retail, and consumers, as well as all the fields of policy affecting the aforementioned (Saarinen et al., 2019). More generally, a Health in All Policies approach has been argued for, meaning that all kinds of policies should be conducive to good health or at least not have negative consequences for health (Watkins et al., 2018).

In conclusion, the food habits of individuals are deeply embedded in the proximate social contexts and broader societal contexts in which they were developed and enacted. In the next section, a brief presentation of the modern history of food consumption in Finland is provided to set the context of this dissertation.

2.3 Development of food habits in Finland

From scarcity to abundance

I begin the history of Finnish food consumption patterns from the 1860s, a time when the industrialization of European societies was at its beginning. In Finland, the 1860s was a decade of scarcity. The industrialization of European societies had begun, but Finland was still an agricultural society, and largely remained so at the beginning of the 20th century. Before industrialization began in Finland, people were accustomed to eating a rather sour-tasting diet. At the end of the 19th century, the main pillars of the population's diet consisted of grains, potatoes (that had only recently replaced turnips), and milk products. Fish, meat, vegetables, berries, and fruit were eaten occasionally and in a preserved form for most of the year. Further, the typical crop, rye, was sensitive to changes in the forces of nature, with one notable problem being the ergot fungus. The 1860s saw several crop failures, and the last famine in Western Europe crystalized the need for adaptation to change (Heikkinen & Maula, 1996; Sillanpää, 1999).

From the 1870s onwards, the role of dairy animal husbandry in domestic food production started to increase, as cultivating cereal grains was not enough to feed the growing population anymore (Sillanpää, 2003). Further, dairy provided food security when crop yields were not adequate. The standard of living rose significantly between the end of the 19th century and the beginning of the 20th century. From the 1860s to the 1950s, consumption rose to quantitatively adequate levels to feed all the people, and famines became a thing of the past (Heikkinen & Maula, 1996). However, the structure of food consumption changed at a slow pace. The increasing role of dairy was reflected by the increase in butter and milk consumption between 1860 and 1960 while the consumption of grains remained stable. The period up until the 1920s was marked by coffee consumption being a common phenomenon, with daily per capita consumption of coffee growing from 5 to 15 grams (Heikkinen & Maula, 1996). Sugar consumption also started to rise after the 1860s.

In the first half of the 20th century, the modernization of Finnish society was slowed down by several shocks. The two world wars had both short- and long-term effects on food production and consumption. Food shortage during World War I concerned mostly the urban population that was more dependent on store-bought foods and imported foods, the influx of which was hampered by the war (Sillanpää, 1999). World War II led to shortages of butter, cream, and meat, the luxury goods of the time. Sugar and coffee consumption was also negatively affected by the war. However, this time, famine was avoided. Retrospective interviews indicate that the children during the shortage years adapted relatively well to the circumstances, regarding substitute food as normal (Sillanpää, 1999).

While the changes in food consumption before the 1950s were largely quantitative, the following period was characterized by significant qualitative changes in diet accompanied by rapid societal changes. The transition from an agrarian society to a modernized welfare state with an abundant consumer culture was more rapid in Finland than in most other OECD countries (Alestalo & Kuhnle, 1986). The simultaneous industrialization, urbanization, and change toward a service economy were most rapid in the 1960s and 1970s (Karisto et al., 1998, 171).

The modernization of the Finnish diet seems to have started in earnest during the 1950s after the payment of war reparations and the end of the controlled economy (Heikkinen & Maula, 1996). Sweet and fatty foods were valued after World War II, and the more sour-tasting traditional foods (such as fermented vegetables, salted fish, or rye gruel) became less popular. The modernizing food consumption pattern can be characterized by meat consumption, which started to grow in earnest in Finland after the 1950s. Sugar consumption also continued to increase. Most people did not think about the healthiness of food but enjoyed the sweet and fatty foods as a welcome contrast to the earlier years of war and scarcity (Sillanpää, 2003). The 1950s was the first decade when Finns could eat as much butter as they wanted, as butter production was exceeding the domestic demand (Kylli, 2021). The declining use of starchy staples is also a characteristic of modernizing food consumption patterns in Finland (Popkin, 2006), and since the 1950s, the consumption of grains and potatoes has fallen. Milk was a staple in agrarian Finland, but fluid milk consumption had dramatically fallen from the 1960s onward. Despite the decline in milk consumption, the use of dairy products such as yogurt and cheese has increased, and most recently the use of quark (Sillanpää, 2003; Piipponen et al., 2018).

The standard of living continued to increase in the 1960s, and the Finnish food culture started getting influenced by foreign factors due to increase in traveling and expanding global markets (Sillanpää, 2003). The range of available foods, especially import goods, expanded as Finland joined the European Free Trade Association in 1961 (Kylli, 2021). Technological advances also led to the development of new products. As examples of these developments, sausages became affordable everyday food, light milk entered the market, and fruit intake became more common (Kylli, 2021; Sillanpää, 2003). People living in the 1960s and the 1970s witnessed and were affected by large-scale changes such as paid employment becoming the main source of sustenance, migration to cities, and increasing employment of women (Karisto et al., 1998). The transition from agrarian to urban food consumption patterns in Finland was one of the fastest in Europe (Kylli, 2021).

Rising health consciousness among consumers

In the 1970s, the healthiness of food started gaining more importance in the Finnish food culture. Ritva Kylli (2021) cites the leading Finnish newspaper *Helsingin*

Sanomat, which in 1972 stated that "nutritionally speaking, the rising standard of living is a double-edged sword: on the one hand, there is plenty of food and possibilities to choose; on the other hand we can continuously eat wrong" (389). The modernization process had come to a point where scarcity had turned into overabundance. The 1970s have, thus, been dubbed the promised decade of health education (Sillanpää, 2003). Increasing concern for public health was at the heart of the increasing importance placed on the healthiness of diets. The growing role of chronic diseases as causes of death was already noticed in the 1950s. Thus, the lifestyle factors that had been changing due to the increased standard of living became a focal point for health promotion policies of the 1970s (Kauhanen et al., 2013). Further, developments in nutritional science propagated the idea that diets could be manipulated to achieve better health outcomes (Mozaffarian et al., 2018).

In the 1970s, heart disease mortality in Finnish men was the highest in the world, particularly in the eastern parts of the country. The spread of lifestyle diseases led to health promotion efforts in Finland. In 1972, a law was enacted that shifted the emphasis of the healthcare system to the prevention of disease (Kylli, 2021). A globally notable intersectoral health promotion project, the North-Karelia project, was launched in the same year (Puska et al., 2009). This project aimed to alleviate the risk factors of heart disease according to the latest epidemiological knowledge. The key goals of this project were to make food habits healthier and reduce smoking. Large-scale health information campaigns became commonplace. The impact of the project was significant, especially since measures were scaled to the whole country during the 1970s (Jousilahti, 2006).

The food habits of the Finnish population have developed in a positive direction in many ways since the 1970s (Kylli, 2021). Food balance sheets show that fruit and vegetable consumption started increasing, in particular, after the 1970s (Natural Resources Institute, 2022). Health surveys confirm that the proportion of the population eating fresh vegetables daily has doubled between 1979 and 2014 (Helldán & Helakorpi, 2015), and consumers have largely switched from using butter as spreads and cooking oils to vegetable oils and margarine during the same period (Jallinoja et al., 2015). Finally, studies using household expenditure surveys have documented the increasing role of vegetables in the food budget and an increase in non-meat-eating households (Lindblom, 2017; Vinnari et al., 2010). According to FinDiet surveys, the intake of vegetables, fruit, and fiber has increased from 1997 to 2017 (Kaartinen et al. 2021).

During 1966–2006, the consumption of fruit doubled in Finland (Viinisalo et al., 2008). However, fruit consumption did not increase as fast as vegetable consumption. In 2014, 32 percent of the population ate fruit or berries daily (Helldán & Helakorpi, 2015). Despite the growing trends in fruit and vegetable consumption, in 2017, only 14 percent of men and 22 percent of women met the recommended

level of daily vegetable and fruit intake of 500 grams per day (Valsta et al., 2018). Besides the growing numbers of vegetables and fruit consumed, their varieties have also been increasing steadily with consumers' increasing exposure to foreign cuisines (Kylli, 2021).

Household expenditure surveys show that fish consumption has been between 10 and 13 kg per capita each year since the 1970s (Viinisalo et al., 2008; Aalto, 2018). In contrast, according to food balance sheets, fish consumption grew from 12 to 14 kg per capita per year between 2000 and 2013 (Piipponen et al., 2018), but there have not been any changes in total fish consumption in recent years (Natural Resources Institute, 2022). However, the current demand for fish as food has doubled since the 1980s (Saarni et al., 2021). At the same time, Finnish consumers have turned away from domestic fish and prefer imported fish, particularly salmon. The demand for salmon has slightly declined in the past years due to increasing prices (Saarni et al., 2021).

However, food consumption in Finland has developed in a potentially unfavorable direction with regard to health in some other ways. Meat consumption, being a characteristic of modernization, has on the whole been rising continuously since the 1950s. At the same time, the household expenditure surveys show that the proportion of meat in the food budget has declined (Lindblom, 2017). Meat has, thus, become increasingly affordable. Meat eating in itself is not unambiguously unhealthy; however, at the population level, it has become overconsumed: in 2017, 79 percent of men and 26 percent of women ate more red and processed meat than the recommended upper limit of 500 grams per week (Valsta et al., 2018). However, the most recent food balance sheets show a modest decline in meat availability, and national health studies confirm that consumption of red and processed meat, in particular, has declined in the past decade (Lehto et al., 2021).

Consumption of sugar products peaked in the 1970s (Kylli, 2021; Natural Resources Institute, 2022). During 1966–2006, the number of sugar products bought decreased by a third, while the number of sodas tripled (Viinisalo et al., 2008). From 2012 to 2016, the amount of mineral water consumed by households grew, while the number of soft drinks consumed decreased. Based on statistics from the brewery association and the consumption expenditure surveys, Aalto (2018) concludes that soft drinks are increasingly consumed outside the home, while mineral water is bought in the home. During the same period, consumption of sweets and chocolate stayed stable. Further, consumption of baked goods and sweet pastries has grown in the last 15 years (Piipponen et al., 2018).

Other changes in the Finnish food consumption habits include the increasing consumption of convenience foods and the increasing role of eating out (and more recently food delivery) in the diet. Convenience food as a category has a negative moral connotation (Jackson & Viehoff, 2016), but it is worth noting that, nowadays,

it is as easy to find healthy convenience foods as unhealthy ones. In Finland, the use of convenience foods is more common among younger adults, men, and those living alone (Kahma et al., 2016). Between 2012 and 2016, a Finnish household's expenditure on food decreased slightly, whereas expenditure on restaurants and cafes increased (Aalto, 2018). Eating out is not necessarily an unhealthy thing, as, in Finland, there is a large canteen sector that caters meals at schools and workplaces, prioritizing health. However, a high rate of eating out has been associated with a poorer diet and a higher intake of soft drinks, as restaurant meals are typically high in calories and salt (Gesteiro et al., 2022).

In the current context, Jallinoja, Mäkelä, and Niva (2018) aptly described Finnish people's relationship with food as one that can be characterized by the necessity of choice amid abundance and attempts to set limits to eating. They pointed out that industrially produced foods promise effortless life, but some consumers deem them to be tasteless and unhealthy. Further, the tension between indulgence and health is strong: on the one hand, excess control of eating has the potential to spiral into eating disorders; on the other hand, free-ranging in the current food environment comes with health risks (Jallinoja et al., 2018). Discussions of the health implications of food are accompanied by concerns for the environment and animal welfare now more than ever (Kaljonen & Niva, 2022; Niva & Mäkelä, 2021; Sundin et al., 2021). This sentiment is echoed by Finnish consumers who were interviewed in the newspaper article mentioned in Chapter 1 of this dissertation (Nykänen, 2021).

In relation to this growing interest in healthy and sustainable diets, Finnish consumers' conceptions of eating healthy have diversified in the 2000s, as information on food and eating has become more available and extracted from an increasing variety of sources. For example, awareness of the potential adverse health effects of dietary sugar is becoming more widespread, and at the same time, the harmfulness of dietary fat is becoming less agreed upon, especially among the proponents of a low-carbohydrate approach to diet management (Jallinoja et al., 2014). Accordingly, the proportion of Finns reporting decreasing their sugar intake for health reasons has increased, while the proportion of Finns reporting decreasing their fat intake for health reasons has decreased (Helakorpi et al., 2000; Helldán & Helakorpi, 2015). At the same time, low fat content of food has become a less determining factor in food choices (Peltoniemi & Yrjölä, 2012). In line with these results, during 2000–2011, a quarter of margarine users shifted to butter, with women being more likely to do so (Prättälä et al., 2016).

In the past decade, the popularity of low-carbohydrate diets has declined and the prevalence of veganism and various other forms of plant-based diets has been on the rise, particularly among young highly educated women (Lehto et al., 2021). However, the field of special diets has diversified further, with specific diets emphasizing either health, oversensitivity, plant foods, or weight management

(Jallinoja et al., 2019). The pursuit of well-being through consumption, "wellness consumption," has been associated with older consumers (Marjanen et al., 2016).

2.4 Defining healthy food and the choice of food categories to be studied in this dissertation

What does a healthy diet contain and what does it exclude? What does a sustainable diet contain and exclude? In the current era of social media, there exist more different answers to these questions than ever. Despite the individual differences in opinions, there are aspects of a healthy and environmentally sustainable diet that most experts and laymen can agree upon. Luckily, there is research that shows that a healthy diet is often environmentally friendly and vice versa. Additionally, the term sustainability includes the aspects of both health and the environment. (Lang & Mason, 2017) When it comes to defining a healthy diet, this dissertation relies on nutritional recommendations. These recommendations have been issued at both national and international levels by health organizations. However, here, we shall specifically refer to the latest Finnish guidelines (National Nutrition Council, 2014).

According to the latest Finnish nutritional recommendations published by the National Nutrition Council, the first and foremost qualitative aspects of a healthy diet are vegetables, fruit, and berries. It is recommended that people eat 500 grams or from five to six portions a day of fruit, berries, and vegetables (National Nutrition Council, 2014). About half of this portion should consist of fruit and berries, and the other half is vegetables, which are eaten cooked or fresh. These foods contain fiber, vitamins, and minerals that are important for the healthy functioning of the body (National Nutrition Council, 2014). A recent meta-analysis showed that a 200 gram per day increase in vegetable and fruit consumption was associated with lower risks of stroke, cardiovascular disease, cancers, and all-cause mortality (Aune et al., 2017).

The next recommendation is to eat fish two to three times a week. Fish is regarded as an excellent source of protein, polyunsaturated fats (omega-3), and vitamin D. Intake of omega-3 fatty acids has received the most attention because it has been linked to numerous health benefits (Swanson et al., 2012). Consequently, the market for omega-3 supplements has expanded (Adarme-Vega et al., 2014). However, some evidence suggests that eating fish is more beneficial for health than eating mere omega-3 supplementation (He, 2009).

Next, the nutrition guidelines recommend nuts and seeds as good sources of unsaturated fats, which should be moderately consumed. Nuts such as almonds have high concentrations of monounsaturated fatty acids, which are preferable to saturated fats for cardioprotective function (Ros & Mataix, 2006). Nuts and seeds are also loaded with micronutrients that are necessary for maintaining vital functions. For

example, Brazil nuts contain an exceptionally high concentration of selenium (Ip & Lisk, 1994).

Finally, nutritional guidelines advise people to eat whole grain cereal products rather than refined grains. The reasoning behind this recommendation is that whole grains contain more fibers and are more nutrient dense than their refined counterparts, which, in turn, contain more calories. This is a great example of how foods differ based on how satiating they are per calorie. As a recent meta-analysis concluded, "consumption of whole grain foods, compared with refined grain foods, significantly impacts subjective appetite and might partly explain the inverse associations between whole grain food intake and risk of overweight, obesity, and weight gain over time" (Sanders et al., 2021, 1177).

In addition to recommending the intake of the above-mentioned food groups, nutritional guidelines have been increasingly advising against excess consumption of certain food groups. Consumption of added sugars, particularly SSBs, has been linked to adverse health outcomes, including type 2 diabetes, dental caries, and metabolic syndromes, but the evidence remains inconclusive (Rippe & Angelopoulos, 2016). Health authorities have nonetheless set recommendations for the upper limit of sugar intake. The World Health Organization recommends that added sugar intake should be less than 10 percent of total energy consumption and that additional health benefits can be derived if sugar intake is reduced to less than 5 percent of total energy consumption (Borges et al., 2017). In addition, various countries are developing and implementing schemes to tax added sugars in order to combat the negative health consequences of excess sugar intake (Escobar et al., 2013; Nakhimovsky et al., 2016). While the debate on the impact of sugar consumption on health continues, research has found that high sugar intake is associated with lower fiber, fruit, vegetable, rye, and fish intake, and higher butter intake (Kaartinen, 2018).

Meat consumption is a hot topic because of its environmental impact. Excess red meat consumption has also been linked to an increased risk of gastric cancer (Kim et al., 2019). The Finnish nutrition recommendations advise not to exceed the intake of 500 grams of cooked red or processed meat per week, which corresponds to 700 to 750 grams of raw meat (National Nutrition Council, 2014). The recommendations consider meat as a good source of protein and iron. However, it is stressed that the best meat choices are those that are low in fat and salt content. Thus, a healthy diet might contain plenty of vegetables, fruit and berries, and fish several days a week, some nuts and seeds, whole grains rather than refined grains, a limited amount of lean meat, and at most, a small amount of added sugar.

The food groups studied in this dissertation reflect the nutritional recommendations. This dissertation aims to study in more detail the changes in the consumption of certain food groups that could be either increased or decreased to the

ends of health and sustainability. Thus, as opposed to a whole-diet approach, this dissertation focuses on single food groups. To study the consumption of healthy foods, consumption expenditure shares of vegetables, fruit, berries, and fish are considered. Vegetable consumption is also measured by estimating the prevalence of daily intake. In this dissertation, consumption expenditure shares of sugar products and non-alcoholic beverages (excluding mineral waters) are used to indicate unhealthy food categories.

The selection of fish over meat as a studied food category has been motivated by the following points: First, the dietary guidelines recommend increasing fish consumption and decreasing meat consumption. In a simulation study, encouraging consumers to eat more fish was found to be more beneficial for public and planetary health than recommending them to cut down their meat consumption (Irz et al., 2018). Second, fish consumption, especially from a sociological perspective, has received less attention in the literature, as sustainability research often focuses on meat consumption or the exclusion of meat from the diet (e.g. Lehtonen & Irz, 2013; Vinnari et al., 2010). Third, in 2017 an analysis of the the changing income group differences in meat consumption was already published (Lindblom, 2017). However, a similar analysis has not been conducted on fish consumption.

With regard to the choice of foods to be studied in this dissertation, a few disclaimers need to be offered. The healthiness of a diet depends on the whole. Thus, this dissertation does not claim that the consumption of vegetables or fish is exclusively healthy or that the consumption of sugar is always unhealthy. Instead, it suggests that adjustment of the balances between these food groups can lead to a healthier and more sustainable diet on the whole. I should also acknowledge that the choices of food categories were to an extent affected by my personal interests. For example, I was more interested in the consumption of vegetables and sugar products than whole grain products and fats. Finally, a sociologist must note that nutritional science is not the only institution defining what food is good for health. Even committee work of experts is deeply embedded in webs of social interaction between industries, academia, or the hierarchy of scientists.

3 Changing group differences in food consumption

While the previous chapter explored the many determinants of food consumption at various levels of social organization, this chapter focuses on the determinants researched in this dissertation, and discusses how the influences of these determinants can change over time. First, the life course perspective is introduced in this chapter to study how food consumption changes over the life stages of an individual, emphasizing the changing social roles accompanying the aging process. Then, attention is paid to how coming of age at different historical times impacts the attitudes and habits of different birth cohorts. The life-course perspective has great potential for the study of food consumption as will be demonstrated. Next, reviewing the literature on inequality of food consumption, the study of changing socioeconomic differences in food consumption will be justified. This chapter concludes with a review of gender differences in food consumption and points out the unstudied question of how these differences may change over time.

3.1 Food consumption according to age and over the life course

The life course perspective (sometimes called the life course framework, the life course approach, or life course studies) is an overarching research perspective spanning multiple disciplines and methodologies. The general theme that unifies these research areas is the study of lives across age phases (Shanahan et al., 2016). In this perspective, attention is paid not only to differences between age groups but to how the past affects the present (Burton-Jeangros et al., 2015; Kuh et al., 2003). From a sociological standpoint, the essence of the life course perspective is a focus on life-long development embedded in social institutions and history (Elder & George, 2016). It is precisely this interplay between individual biographies and the historical, as well as the institutional contexts in which they unfold, that C. Wright Mills (1959) insisted sociologists pay attention to in his famous conceptualization of the sociological imagination. Thus, the life course perspective has the advantage of

studying change on micro, meso, and macro levels simultaneously. Key reasons for the emergence of a life course framework have been the increasing availability of longitudinal datasets, rapidity of social change, aging of populations, and other changes in the composition of populations (Elder, et al., 2003). Consequently, the life course approach has been established in many fields of social science such as sociology, economics, social epidemiology, and psychology in the latter part of the 20th century.

Compared to epidemiological or psychological life course perspectives, the sociological life course perspective has some unique orientations relating to sociology in general. Sociologists are often interested in the institutional arrangements in society and the roles individuals take on within these institutional settings and the norms that govern their actions. Sociological life course studies look at how people are distributed across social positions and embedded in the institutional order across their lifespan (Mayer, 2004). The social roles of an individual change across the life course and have varying effects on their health and health behaviors (Devine, 2005). Next, I present how the life course perspective has been adapted to the study of food consumption in the literature.

The life course perspective is concerned with how food choice trajectories develop and change over a person's lifespan and how these changes are related to changing micro and macro contexts (Figure 2). Food choice trajectories are defined as "a person's thoughts, feelings, strategies, and actions with food and eating developed over the life course in a social and historical context" (Devine, 2005, 122). They are characterized by quite a stable movement in a certain direction. For example, in interview studies, many respondents have described making minor adjustments to follow a healthier diet (Devine et al., 1998; 1999). A notable feature of food choice trajectories is that they are cumulative. They include the attitudes and habits of individuals formed over the life course. Indeed, many studies have observed tracking of food habits from childhood to adolescence and from adolescence to adulthood (Kelder et al., 1994; Kvaavik et al., 2005; Lien et al., 2001; Mikkilä et al., 2005).

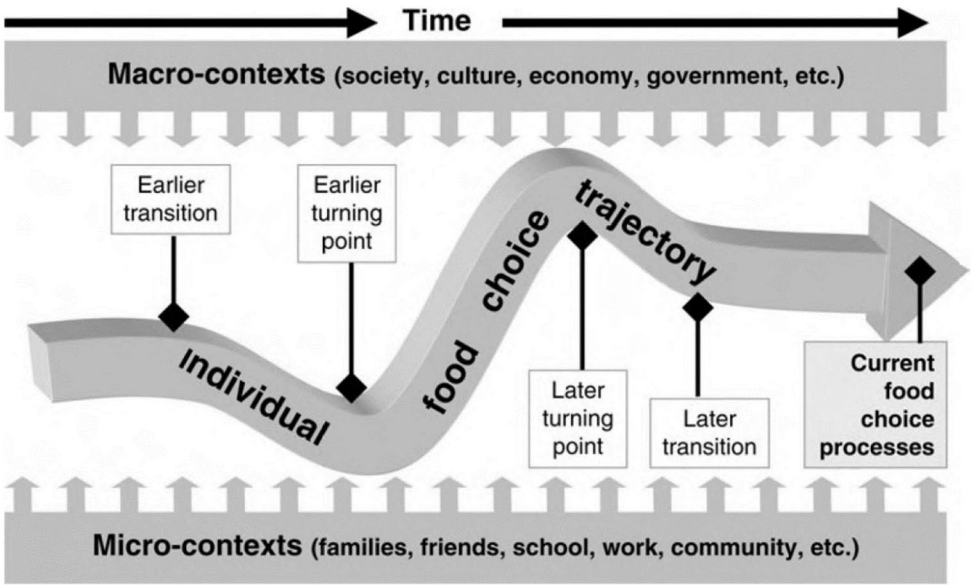

Figure 2. Individual food choice trajectories influenced by macro and micro contexts. Source: Sobal et al. (2006). Reprinted with permission.

The life course trajectory includes transitions that are usually linked to changes in social roles (Hogan, 1978). Examples of transitions include moving out of the parental home, entering cohabitation, becoming a parent, or getting unemployed (Yap & Kapitan, 2017). The family life cycle and household structure are also sometimes related to consumption more strongly than socioeconomic status (Räsänen, 2005). For example, the use of convenience foods is more common among younger adults, men, and those living alone, whereas it does not vary as much across social classes (Kahma et al., 2016). Examples of how the family life cycle might affect food habits could also include increasing fish intake when the children grow up and move out or eating more fast foods when busy with work and activities of school-aged children (Devine, 2005). A study investigating the employees in the City of Helsinki found that strong work-family conflicts are associated with poorer health habits (Roos et al., 2007).

A typical food choice trajectory, thus, includes transition points, but outright turning points are rare. A turning point is characterized by a significant change in food habits, and they are often related to changes in personal identity and self-redefinition (Devine, 2005). Redefinition of a person's identity as an eater has, for example, been observed in people who have adopted a vegetarian or vegan diet. People undergoing a dietary change tend to reflect upon where they stand in relation to other eaters, reflecting the social nature of food habits (Vainio et al., 2016). Major life-changing events could include a life-threatening disease or the death of a spouse

for instance. For some, receiving a type 2 diabetes diagnosis might be sufficient for a lifestyle change but not so much for others (Kauhanen et al., 2013).

Let us now review some previous studies of changing food consumption over the life course. Generally, the young age groups are more unrestricted in their consumption than older age groups (Kuoppamäki et al., 2017). Humans and rats both consume more calories relative to their body weight during adolescence than at other life stages, displaying an abnormally great desire for food and drink during adolescence (Wilmouth & Spear, 2009). Indeed, early adulthood has been characterized as a period that is "associated with poor diet and rapid weight gain" (Winpenny et al., 2018, 1). The low intake of vegetables and fruit among young adults has become a concern in recent decades (Lallukka et al., 2001). A Finnish study found that the liking for fast food can be explained most accurately by young age (Purhonen et al., 2014). These findings can reflect several notions, including peer pressure, increasing use of own money, lessening parental control, and an inability to assess the long-term consequences of food choices.

Studies from Australia, Norway, and the United States have shown that the transition from childhood to adolescence and from adolescence to adulthood is acompanied by unhealthy dietary changes, such as increasing the intake of sugar products and sodas and a decreased tendency to eat breakfast or vegetables and fruit (Burke et al., 2004; Larson et al., 2007; Lytle et al., 2000; Winpenny et al., 2018). However, some follow-up studies from the United Kingdom and Finland have shown food habits getting healthier from adolescence to adulthood (Lake et al., 2004; Mikkilä et al., 2004). A Swedish study found that during the transition from adolescence to adulthood, men decreased their fruit consumption, while women decreased their meat consumption (von Post-Skagegård et al., 2002).

While longitudinal studies on the middle of the age range are lacking, such studies with older age groups have become more common. Accordingly, follow-up studies have examined how the transition to old age retirement is associated with food habits, but the results have varied across countries (Ali-Kovero et al., 2020; Plessz et al., 2015; Si Hassen et al., 2017). A study conducted with the employees of the City of Helsinki compared changes in the healthiness of diet among those who retired and those who stayed in employment. It showed that women who entered old age retirement saw positive changes in the healthiness of their diets (measured using a dietary index) as compared to those who stayed in employment (Helldán et al., 2012). However, entering old age retirement was not associated with healthier food habits among men. A later analysis of the same cohort, but with a longer follow-up, showed that entering statutory retirement was associated with decreased vegetable consumption among women and increased fruit consumption among men (Ali-Kovero et al., 2020). This variation in results might be related to the differing historical and societal contexts of the participants. Further, follow-up studies might

mistake period effects for age or transition effects. However, some follow-up studies indicated that food habits seem to get healthier with age even when the secular trend is downward (Sijtsma et al., 2012).

Cross-sectional samples that have exhibited age differences in dietary habits in the adult population generally show that older adults tend to consume less sweet and fast foods but more grains, fruit, vegetables, and fish than younger adults (Bojorquez et al. 2015; Drewnowski & Schultz 2001; Jahns et al. 2014; Nesbitt et al., 2008; Nicklett & Kadell, 2013; Olsen, 2003). The consumption of sweet foods and sweet beverages seems to also decrease with age (Ervin & Ogden, 2013; Miller et al., 2013; Sluik et al., 2016). However, among older adults, decreased energy intake seems to be a particular problem, as that leads to nutrient deficiencies (Suominen et al., 2012). This is likely influenced by age-related changes in the body, such as slower gastric emptying, altered hormonal responses, decreased basal metabolic rate, and altered taste and smell (Drewnowski & Schultz, 2001).

As the follow-up studies regarding changing food consumption over the life course have been conducted for limited time frames and both follow-up studies and cross-sectional studies suffer from the possibility of confusing age effects for period and cohort effects, we must study age patterns in healthy and unhealthy food consumption through an age-period-cohort analysis. In this dissertation, I use the age-period-cohort model to study the average food choice trajectories at the population level.

3.2 Birth cohort and generation

The sociological life course perspective emphasizes the historical and societal contexts in which an individual's life course unfolds. It places changing food choices in the wider historical context of social, demographic, economic, political, and cultural trends. Here, the concepts of cohort and generation become relevant. A cohort is defined as a group experiencing an event of interest at the same time. In empirical social research, this typically indicates birth cohorts (Elder & George, 2016, 59). A birth cohort is a group of people who were born within the same time interval and are aging together. In contrast, the concept of generation implies a shared generation consciousness resulting from shared experiences.

In his seminal article, *The Cohort as a Concept in the Study of Social Change*, Norman Ryder (1965) proposed a demographic approach to the study of social change based on the continuous "personnel replacement" occurring through fertility and mortality. Key to Ryder's thinking is the notion that any given cohort lives their life in a "unique location in the stream of history." It is this embeddedness of the individual life course in a specific historical time and context that differentiates birth cohorts from one another. Each birth cohort experiences a particular life stage in

different social and historical contexts than the preceding and following cohorts. People born at the same time go through similar education, enter the labor market at roughly the same time, and face historical turmoils and economic turns at similar ages (Erola & Moisio, 2014). In summary, birth cohort effects correspond to formative effects of social change at critical ages (see Luo, 2015).

The term "generation" is used to emphasize the historical and cultural experiences of people born at the same time, and these experiences have a lasting impact on the life course (Erola & Moisio, 2014, 94). In his seminal article, *The Problem of Generations,* Karl Mannheim (1952) introduced the concept of generation into sociology. Mannheim emphasized the experiential dimension to the problem of generation, paying special attention to the shared social environment as a key determinant of shared experiences of a particular generation. According to Mannheim, a generation shares a social location in history, which limits their experience and predisposes them to certain kinds of action.

Following Mannheim and Ryder, the concept of generation has been more closely associated with qualitative research and the concept of cohorts with quantitative research (Nilsen, 2014). Further, it has been noted that cohort is a more clearly defined concept than generation (Wilska, 1999), making it easier to apply to research. This dissertation concentrates on the concept of birth cohorts rather than generation. It is possible to observe a birth cohort effect without the assumption of generation consciousness implied by Mannheimian's concept of generation.

Both Ryder and Mannheim posited that the formative years are especially sensitive to the formation of cohort effects (Mannheim, 1952; Ryder, 1965). Changes in the food environment that take place during this life stage could lead to shared food preferences among birth cohorts that continue to characterize their consumption habits over the life course (Mori et al., 2016). For example, many newer sugar products might be popular mostly among younger generations, as their available range and affordability have become significantly better in the last decades of the 20th century (Mustajoki, 2015). Indeed, in the 1990s in the United States, younger cohorts developed a taste for carbonated soft drinks, while older cohorts' preference for coffee persisted (Drescher & Roosen, 2013). According to an example from Finland, generations that witnessed the shortages during World War II and the following expansion of food markets still remember their first bananas and oranges (Sillanpää, 2003).

The possibility of cohort or generation effects in food consumption is thus based on the assumption that food habits that are learned in the formative years are passed on to adulthood and beyond. Indeed, health habits, diet included, seem to track from youth to adulthood. Studies have shown that several food habits, including soft-drink consumption, seem to track from childhood to adolescence and from adolescence to

adulthood (Kelder et al., 1994; Kvaavik et al., 2005; Lien et al., 2001; Mikkilä et al., 2005).

Let us now review the previous age-period-cohort studies of food consumption. The earliest study of food consumption from the perspectives of age, period, and cohort in Finland was that of Timo Toivonen (1995). Using Finnish Household Surveys from 1966 to 1990 and a multivariate analysis of variance, Toivonen asked to what extent the changes in Finnish food consumption, from traditional to modern patterns, resulted from age, period, and cohort effects. The food items studied were bread, butter, cheese, coffee, milk, and eating out. According to this study, cohort and period effects are more important than age effects. The consumption of butter decreased over time, and this change was most pronounced in the oldest cohorts.

The literature on the birth cohort differences in food consumption habits using modern age-period-cohort modeling methods began to emerge in the 21st century. These studies have come mainly from the United States, Japan, and some European countries. In Japan, younger birth cohorts are consuming less fruit and fish than older birth cohorts (Mori et al., 2000; Mori & Saegusa, 2010; Mori & Stewart 2011; Mori et al., 2016). These are traditional foods in the Japanese diet, but older birth cohorts consume them more often. Mori (2022) notes the link between turning away from these traditional foods among the younger birth cohorts and subsequent stalling in stature growth and speculates on the possible effects of an increase in deficiency of essential nutrients found in fruit and vegetables. Further, in the United States, younger birth cohorts are consuming fewer fruit and vegetables than their older counterparts (Stewart & Blisard, 2008), and a significant decrease in the Healthy Eating Index was observed in those born between 1950 and 1990 (Beatty et al., 2013).

Gustavsen et al. (2014) studied how eating fish for dinner in Norway varies with age, birth cohort, education, and gender. Their descriptive results indicated that older birth cohorts eat fish for dinner more frequently than younger ones, but further analyses revealed that this result might be confounded by education. The authors concluded that, except for men without college degrees, younger birth cohorts have a higher probability of consuming fish for dinner.

Gustavsen and Rickertsen (2014) have also studied the purchases of milk, carbonated soft drinks, and other soft drinks in different birth cohorts from Norway. The preliminary analysis showed a negative cohort effect for milk purchases and a positive cohort effect for soft-drink purchases. However, after controlling for censoring, "for carbonated soft drinks, there are no cohort or negative age effects, while there are positive age but no cohort effects for other soft drinks" (Gustavsen & Rickertsen, 2014, 427). Additional age-period-cohort analyses revealed that milk consumption has declined across birth cohorts in the United States (Stewart et al.

2012), and eating-out behavior has become more common across birth cohorts in Germany (Drescher & Roosen, 2013).

However, these results are context-specific, and the picture might differ significantly in a Nordic welfare state such as Finland. As detailed in Section 2.2, Finland has a reputation for its preventive health policies and intersectoral collaboration when it comes to health promotion (Popkin, 2006). Examples relating directly to food consumption include free school meals, national nutrition recommendations, extensive information campaigns, and fiscal policies. Thus, there is a need to study in more detail how food consumption habits have developed in birth cohorts in such a context. Additionally, this dissertation asks if the observed birth cohort patterns can be explained by societal trends such as urbanization and rising educational and income levels.

3.3 Health inequality and food consumption

The term "health inequality" refers to social inequality in health and illnesses. This is what differentiates health inequality from health differences arising from genetics and other such factors (Bartley, 2016). Usually, health inequality refers specifically to socioeconomic differences in health. Health inequalities related to social causes are, in principle, preventable. Therefore, they are often regarded as unjust in the context of an egalitarian welfare state (Lahelma & Koskinen, 2002). The general finding in developed societies is that the better the socioeconomic status, the better the health (Marmot, 2004; 2015).

Socioeconomic status is a concept that locates a person or a group in the social structure and indicates the resources available to them (Galobardes et al., 2006). In health research, it is often thought that the distribution of resources creates a hierarchical structure (Lahelma & Rahkonen, 2011). In this structure, the distribution of wealth, knowledge, power, prestige, and other material or non-material resources is gradual. The relationship between socioeconomic status and health reflects this gradual distribution of resources. Michael Marmot (2004) summarized this as the "social gradient of health," which posits that health inequality does not operate merely between the rich and the poor, but differences are observed among different levels.

Health inequalities can be reported in relative or absolute measures. These are suitable for different purposes. Relative differences tell, for example, if the risk of cardiovascular disease is bigger among manual workers than among office workers. Relative measures can be used to describe the occurrence, magnitude and causes of health inequalities. Absolute measures, on the other hand, indicate if the frequency of cardiovascular disease is higher among manual workers or office workers. Thus, absolute measures inform us about the actual amounts of people in various groups.

This kind of measures are useful for practical health policy. (Lahelma & Rahkonen, 2011).

The most common indicators of socioeconomic status are education, income or wealth, and occupational status. Although these indicators are related, they all capture distinct aspects of socioeconomic status. Education indicates non-material or cultural resources such as knowledge, skills, attitudes, and values. Education has been a popular measure in health research, as one's educational level is quite stable across the life course, and information on education is often readily available in datasets (Bartley, 2016). Income is an indicator of economic resources (Nolan & Whelan, 1996; 2011). Disposable income, in combination with retail prices, constitutes the budget restraints, which determine which goods a consumer can afford (Niemelä, 2005). A certain level of income is needed to secure the necessities of life, and additional income further increases the possibility of spending on healthy foods, leisure time-physical activities, and health care. Occupational status relates to qualities of the work environment and the work itself as well as prestige. Occupational status is closely related to the concept of social class, which is usually based on occupational relations, such as being an employee versus being an employer, the degree of autonomy over one's work, and the skills required (Bartley, 2016). Resources linked to occupational status and conditions and exposures related to work tasks are important background factors that affect health (Lahelma & Rahkonen, 2011). Socioeconomic inequalities in health can be observed according to virtually all the indicators of socioeconomic status such as income, education, and occupational status, and in all the different measures of health and illness such as life expectancy, self-rated health, health service use, and health behavior (Blomgren & Virta, 2020; Chetty et al., 2016; Diderichsen et al., 2012; Kangas & Blomgren, 2014; Karvonen et al., 2017; Lahelma et al., 2019; Mackenbach et al., 2018; Roser et al., 2013; Shkolnikov et al., 2012; Tarkiainen et al., 2012; Tarkiainen et al., 2017; Wamala et al., 2006).

Differences in health behavior contribute significantly to socioeconomic differences in health and illnesses. On average, health behaviors account for 25 percent of the socioeconomic disparities in health (Pampel et al., 2010). However, this figure varies according to the indicators of health and socioeconomic status that are used as well as the country in question. For example, it has been estimated that, in Finland, the deaths caused by alcohol and tobacco explain roughly half of the difference in life expectancy between the lowest and the highest income quintiles (Martikainen et al., 2014). Interestingly, the association between socioeconomic status and health behavior is not universal in developed countries. Comparative studies looking at employee cohorts have found that there is no association between occupational status and smoking, heavy drinking, unhealthy food habits, physical inactivity, and obesity in Japan (Lahelma et al., 2010; Silventoinen et al., 2013).

As is the case with most indicators of health and health behavior, food habits have been consistently associated with socioeconomic status. Education, income, and occupational class are all associated with healthier food choices (Lallukka et al., 2007). Review articles have shown that, in Western Europe, there is an association between indicators of socioeconomic status and fruit and vegetable intake as well as micronutrient intake (De Irala-Estévez et al., 2000; Novaković et al., 2013). Comparative studies show cross-national heterogeneity in the association between socioeconomic status and consumption of healthy foods, with fruit consumption showing the most consistent socioeconomic gradients (Boylan et al., 2011). Socioeconomic differences in food habits exist even in children in most European countries, including Finland (Fismen et al., 2021; Skaffari et al., 2022). In Finland, several studies over the past decades documented that food habits are healthier among the higher socioeconomic status groups (Lallukka et al., 2007; Lallukka et al., 2010; Lindblom, 2017; Loman et al., 2012; Ovaskainen et al., 2012; Ovaskainen et al., 2013; Prättälä et al., 1992; Roos et al., 1998; Roos et al., 2008). However, there are some variations in the results depending on the indicators used for socioeconomic status and food habits. For example, the consumption of vegetables and fruit is more influenced by education than income (Lindblom & Sarpila, 2014).

Several mechanisms such as diet costs, health knowledge, purchasing motives, and access to catering services have been found to contribute to this association (Darmon & Drewnowski, 2015; Pampel et al., 2010; Raulio et al., 2010). Nutritionally poor foods and lower-quality diets cost less per calorie and are more commonly chosen from among those of lower socioeconomic status (Darmon & Drewnowski, 2015). Furthermore, the association between dietary costs and fruit and vegetable intake is stronger among the less-educated and lower-income groups (Mackenbach et al., 2015). Indeed, those in lower socioeconomic positions tend to rank price and familiarity as the most important motives that guide their food purchase. The importance of health as a motive grows with increasing income (Konttinen et al., 2013). Further, there is evidence that health literacy and health knowledge are better among the higher socioeconomic status groups (McKinnon et al., 2013). Finally, access to workplace meals is better among those with higher education and higher occupational class and those who work in bigger workplaces (Raulio et al., 2012). In turn, school and workplace meals promote healthy food habits (Raulio et al., 2010).

3.4 Evolution of socioeconomic differences in food consumption

While the literature reviewed above showed associations between socioeconomic status and health and food behavior, the sociologically interesting question of how

these associations change over time is yet to be explored. Now, we turn to the classical sociological accounts of the relationship between socioeconomic status and consumption. Thorstein Veblen, Georg Simmel, and Pierre Bourdieu were interested in how different consumption styles spread across the strata over time. Veblen asserted that consumption patterns in a given society reflect its economic progress (Dolfsma, 2000). He paid particular attention to the consumption style of the upper class. The key to this "conspicuous consumption" was that the commodities bought were rare and expensive (Veblen, 2007; 1899). Only when the prices of these commodities come down that the consumption style of the upper class can move to the lower social strata. In Veblen's thinking, societal and economic development is correlated with an increase in conspicuous consumption (Dolfsma, 2000). As an example of how Veblen's thinking has been used in recent times, Barauskaite et al. (2018) studied healthy eating as a form of conspicious consumption. Puska et al. (2016) studied organic food consumption from the perspective of status signaling. They found that in an urban area, the pro-organic signalers were perceived more positively on multiple dimensions than the non-signalers, but this finding did not hold in the rural setting. Georg Simmel (1957; 1986) reached a similar stance through his analysis of the social nature of fashion. On the one hand, fashion binds people together, and on the other hand, it excludes others. The fashion of the upper class distinguishes them from the lower class. The lower class then starts to appropriate the style of the upper class, who then have to find a new style to again differentiate themselves. This is called the trickle-down effect.

Like Veblen and Simmel, Pierre Bourdieu also analyzed the consumption styles of different social strata. For Bourdieu (1984), taste is an important factor in distinguishing social classes. The sociological concept of taste differs from its biological variant in important ways. Natural scientists have studied how the body perceives the five basic tastes (i.e., sweet, salty, sour, bitter, and umami) and their functions in human survival and nutrition (Breslin, 2013). According to Bourdieu (1984), status groups and social classes differentiate or try to differentiate themselves through consumption, taste, and style. Bourdieu (1984) noted that showcasing one's status can happen not only through the use of status items such as sports cars or expensive watches but also through more mundane practices such as food and cooking. Sushi consumption in Western countries provides a great example of how a Bourdieuian approach can be used to grasp the changing role of a product over time and its connection to the social and cultural hierarchy. According to Lindblom and Mustonen (2016), liking sushi and visiting sushi restaurants are clearly tied to the class structure: they are more common among the higher education, income, and occupational classes. Additionally, a part of the higher classes report not liking sushi but still visiting sushi restaurants, hinting at socially motivated consumption. According to a Finnish analysis that employed a Bourdieuian approach to map the

relationships between taste and various demographic factors, the liking for light and ethnic foods is associated with high education, young age, female gender, and living in a metropolitan area (Purhonen et al., 2014). Kahma et al. (2016) found that among Finns, "distinction within everyday food choices was manifested in the use of healthy and unprocessed foods and 'moderate hedonism' in contrast to more restrictive tastes." A study of the organization of cultural practices in Britain found that while there were class differences in the frequency of eating out and cuisines preferred, eating at home was remarkably similar across the class spectrum (Bennett et al., 2009).

The mechanisms by which the differences in consumption between socioeconomic status groups change have been elaborated on since the days of classical sociology. In the context of the life course perspective, the diffusion mechanism focuses on the rate at which new attitudes or behaviors are adopted within birth cohorts (Elder & George, 2016). Typically, those with a high socioeconomic status are early adopters of new/emerging consumption styles (Katz, 1999; Pampel, 2005). Subsequent cohorts adopt the new behavior in increasing amounts, and the link between socioeconomic status and the behavior in question weakens across birth cohorts. Higher socioeconomic status groups might then adopt new ways of distinction. For example, being thin has replaced being overweight as a sign of affluence in the modern Western context (Ho et al., 1999). Globally, diffusion dynamics can be seen in how socioeconomic differences in food consumption shift as countries get wealthier (Drewnowski, 2003). In Asia, developing countries exhibit a positive relationship between body mass index (BMI) and socioeconomic status, but in relatively developed countries, the association is negative (Murayama, 2015). Pampel (2005) showed that, for smoking, the highest socioeconomic status group was associated with smoking in older cohorts, while lower socioeconomic status predicted smoking in younger cohorts, although the average effect of socioeconomic status was insignificant. Thus, a reversal of socioeconomic differences in health behavior was observed. These results highlight the need to analyze how the link between socioeconomic status and consumption evolves over time.

The history of food consumption includes many examples in which the socioeconomic differences in the consumption of a food product or food products have changed over time. This changing dynamic between consumption and socioeconomic status can be related to the changes in production or consumption technology, the market, and the availability of a product, or changing cultural meanings placed upon a product. A fine example of how socioeconomic differences have turned around comes from the history of bread consumption. In the premodern era, bread was darker on the tables of peasants and servants. White bread was a luxury reserved for those who were the highest in the social hierarchy. Efficient

technology for refining grains did not yet exist, so refined bread was a scarce delicacy. The technological advancements brought on by industrialization have made refined grains and white bread cheap commodities that are more popular among the lower socioeconomic strata. Nowadays, as the focus has shifted toward health, it is the upper classes that more often follow the advice of eating whole grains, reflecting the changing cultural meanings of dark bread. As another and more recent example, French bread was held in high regard in the 1950s, but it slowly morphed into a cheap commodity that is available to all social classes (Sillanpää, 2003).

In the premodern era, imported goods were rare and valuable, acting as a means of distinction for the upper classes. Spices were some of the first commodities that formed trade routes at sea (Kylli, 2021). In the 18th century, the kitchens of wealthy gentry could smell like ginger, cinnamon, black pepper, nutmeg, or cloves that originated from Southeast Asia. Nowadays, most spices are kitchen staples throughout the social strata, but exceptions such as saffron still remain.

Sugar consumption has seen a similar development. In the 1600s and 18th century, Europe imported sugar from its colonies. Sugar was expensive, and only the wealthiest of society could afford it. Even among the nobility, sugar was reserved for special occasions. However, since sugar has become nearly universally available now, socioeconomic differences have become inverted. In contemporary Western societies, those with a lower socioeconomic status tend to consume more sugar than those with a higher socioeconomic status (Kotakorpi et al., 2011; Lindblom, 2017; Mestral et al., 2017; Popkin & Drewnowski, 1997; Thompson et al., 2009).

These historical examples occurred over a long period and tell the story of industrialization and modernization of society. However, how do socioeconomic differences evolve in the modern era? Some of the earlier analyses of long-term trends in socioeconomic differences in food habits in Finland established that "men and women of lower social class follow trends set by upper social classes with a time lag of about ten years," echoing the sociological theories reviewed above (Prättälä et al., 1992). An analysis of national health surveys during 1979–2002 showed that differences between educational and income groups in daily vegetable intake narrowed slightly (Roos et al., 2008). A study of employees of the City of Helsinki between 2000 and 2007 found that while consumption of recommended foods increased, the differences between the socioeconomic status groups remained stable (Seiluri et al., 2011). Lindblom (2017) analyzed how socioeconomic differences in the FESs of vegetables, fruit and berries, meat, and sugar products evolved between 1985 and 2012 and found that differences between income groups narrowed but did not disappear. Data from the FinDiet surveys, which were collected between 1997 and 2017, showed that educational differences in fish consumption have fluctuated during this period (Raulio et al., 2016).

This dissertation will continue in the tradition of the above-mentioned studies but extend them by studying changing socioeconomic differences in two outcomes that have received lesser attention in both Finnish and international research: differences in fish consumption and the consumption of sugar products and non-alcoholic beverages over birth cohorts. Socioeconomic status will be measured through both income and education.

3.5 Gender differences in food consumption

Another clear division in the healthiness of food habits is between men and women. Many studies have documented differences by gender in food preferences and food intake during childhood, adolescence, adulthood, and old age. The vast majority of the studies conducted in developed countries found that in all age groups, women have a healthier diet than men (Baker & Wardle, 2003; Cooke & Wardle, 2005; Kiefer et al., 2005; Morse & Driskell, 2009; Roos et al., 1998). Health-promoting behaviors, in general, are more common among women than men, with the exception of physical exercise, while health-damaging behaviors are more common among men (Manierre, 2015; Neve et al., 1996; Pampel, 2001; Rogers et al., 2010; Slater & Tiggemann, 2011; Waldron et al., 2005).

It is worth noting that in sociology, there exists a distinction between sex and gender. Sex refers to biological aspects, whereas gender refers to sociocultural aspects of being a man or a woman (Varì et al., 2013). However, in empirical survey research, the line between these two concepts becomes blurred as the respondents are often asked merely to state whether they are a man or a woman. In addition, it is often difficult to point out if observed differences are due to biological or sociocultural factors. In most cases, it is likely that the mixture of these two is captured.

In Finland, gender differences in healthy and unhealthy food consumption have been observed across different age groups. Among the Finnish school-aged children, girls are more often healthy eaters as compared to boys (de Figueiredo et al., 2019). According to the latest FinDiet survey, there are clear gender differences in the consumption of fruit, vegetables, as well as red and processed meat. It was found that 14 percent of men and 22 percent of women met the recommendation for a daily vegetable and fruit intake of 500 grams per day. In addition, 79 percent of men and 26 percent of women ate more red and processed meat than the recommended upper limit of 500 grams per week (Valsta et al., 2018). A recent Finnish study showed that emotional eating was more prevalent among women than men and that emotional eating was associated with financial strain and lower educational levels among women (Rosenqvist et al., 2022).

A number of reasons for the gender differences in food consumption habits have been presented in the literature (Turrell, 1997). One potential biological explanation can be found in sex hormones and their influences on appetite. It seems that "estrogen inhibits food intake, whereas progesterone and testosterone may stimulate appetite" (Hirschberg, 2012, 248). Concerning sociocultural reasons, women tend to have more knowledge of dietary recommendations and believe that dietary guidelines are healthy more often than men (Davy et al., 2006; Turrell, 1997). A cultural explanation given to the observed differences between men and women relates to the issues of masculinity and femininity (Prättälä et al., 2007). In this view, some foods and food habits are considered symbolic markers of femininity or masculinity (Jensen & Holm, 1999). For example, many authors have noted that meat is commonly associated with masculine qualities such as strength, power, and virility. The status of meat as a cultural signifier of masculine traits seems to hold cross-culturally, and it has been noted that gender-specific food stereotypes exist in every culture (Jensen & Holm, 1999; Varì et al., 2013).

Yet another reason for gender differences in diet quality is related to aesthetic concerns, which are more prominent among women than among men (Wardle et al., 2004). Aesthetic concerns manifest as greater awareness of body weight and dieting (Wardle et al., 2006). Some studies indicate that health beliefs and the motivation to control weight may explain up to 50 percent of the gender differences in dietary intake (Westenhoefer, 2005). Body image is a person's perception of their own body, which is influenced by cultural and social norms more in the case of women than men (Slade, 1994). Women have a negative body image more often than men, which is exemplified by the fact that one in six women suffer from an eating disorder at some point in their lives (Silén et al., 2020).

However, studies examining the evolution of gender differences over time are lacking. Some insights into how gender differences in food habits evolve can be derived from cross-national comparisons. Prättälä et al. (2007) examined gender differences in meat, fruit, and vegetable consumption between Finland and the Baltic countries. They found that gender differences were similar for all the countries, across all age and educational groups, and in both rural and urban settings. Consequently, based on the similarity of gender differences across countries and population subgroups, the researchers concluded that the patterns of masculine and feminine food habits seem to be constant. However, the results tend to vary in studies conducted in different contexts. For instance, Hall et al. (2009) studied the prevalence of low fruit and vegetable intake in 52 low- and middle-income countries. Their study revealed significant gender differences in only 15 countries, of which 10 showed a higher prevalence of low fruit and vegetable intake in men and 5 showed a higher prevalence in women. Therefore, the findings from existing studies indicate

that gender differences might be more pronounced in more economically developed societies.

While cross-sectional studies of gender differences in diet are numerous, only few studies have looked at how gender differences in food habits change over time, usually using very limited time frames. A Norwegian study compared the food habits of children aged 10–12 years between 2001 and 2008. During this period, gender differences remained stable (Hilsen et al., 2011). Some studies indicate that women might be quicker to adopt different kinds of diets. The increase in the use of high-fat dairy resulting from the low-carbon boom in Sweden was more than twice as large among women than among men (Huseinovic et al., 2019). A Finnish study looked at the prevalence of daily vegetable intake according to gender between 1979 and 2002 and found that daily vegetable intake spread faster among women than among men (Roos et al., 2008).

Thus, the temporal element emphasized by the life course perspective has not been sufficiently incorporated in previous research. For example, gender defines an individual's actions differently at different ages, and the meaning of gender and the associated role expectations change over historical time. This dissertation follows the suggestion offered by Carol Devine that "research using a life course approach on gender and food choice would examine how the changing nature of gender roles for men and women, links to social structures, and access to health and food resources over time are related to changing food choices" (Devine, 2005, 124). Finland is an excellent context to study the relationship between gender and healthy food consumption and how this relationship evolves over time. Finland is one of the leading countries in this gender equality (World Economic Forum, 2017). Also, the availability of long-running health surveys allows for the study of changes occurring over exceptionally long time frames.

4 Research questions, data, and methods

4.1 Research objective

The overarching goal of this dissertation is to examine the long-term trends in healthy and unhealthy food consumption according to four social groupings: age, birth cohort, socioeconomic status, and gender. The objective is to assess how these group differences have changed over time. First, the focus is directed on how long-term changes occur between people in different life stages and between those born at different times. Then, it is examined how long-term changes occur between groups of varying socioeconomic status and genders. These objectives are tackled with the assessment of four original research articles. It should be kept in mind that these objectives regard aggregate level change, as the research design consisting of repeated cross-sectional surveys cannot asses change on an individual level. For an explanation of the choice of dependent variables, see chapter 2.4.

The research questions posed in the individual articles are based on the research gaps identified in chapter 3. We saw that the life-course perspective can be a valuable vantage point in the study of food consumption, but that cross-sectional and follow-up studies have certain pitfalls within this framework. Age-period-cohort analysis was identified as a research design that can take historical change and life-course variation into account simultaneously, and that has been underused in the study of food consumption. Chapter 3 showed that numerous studies have been conducted on the relationship between socioeconomic status and food consumption as well as the relationship between gender and food consumption. However, it was identified that studies examining these relationships over long time periods are lacking. These are the research gaps that the following articles will fill.

The first research article is concerned with the general picture of how healthy food consumption has changed and how this change has occurred across age groups and birth cohorts. Inspired by the sociological life course perspective, the article examines how healthy food consumption varies over time across birth cohorts and age groups. Additionally, it studies if the changes between birth cohorts can be explained through income, education, or level of urbanization. In addition the article

tests if household structure affects the relationship between age and consumption. Healthy food consumption is measured through the consumption of vegetables, fruit and berries, and fish. This article addresses the gap in our knowledge of the roles of age and birth cohort in changing healthy food consumption.

In the second article, the focus shifts to unhealthy food consumption, which is measured through the consumption of sugar products and non-alcoholic beverages (excluding mineral waters). Drawing on the sociological life course perspective and the literature on health inequality, this article studies how the consumption of sugar products and non-alcoholic beverages has changed across birth cohorts while taking into account the role of age. Moreover, it examines how the socioeconomic differences in the consumption of sugar products and non-alcoholic beverages have changed across birth cohorts. This article fills the research gap on birth cohort differences in the consumption of sugar products and non-alcoholic beverages and the socioeconomic variation within birth cohorts in the consumption of said products. Thus, it contributes to the life-course literature as well as the literature on the diffusion of consumption habits across the social strata. The first and second articles both use Finnish household expenditure surveys from 1985 to 2016 and utilize age-period-cohort models.

The third and fourth articles focus again on healthy food consumption. Building on the literature on health inequality and socioeconomic differences in food habits, the third article examines how the association between socioeconomic status and fish consumption has changed over the past three decades. Fish consumption has received less attention than vegetable and fruit consumption. The third article studies the associations with fish consumption and both income and education. Further, this article examines if the household structure or urbanization level of the home municipality affects these associations. The article uses the Finnish household expenditure surveys from 1985 to 2016 and applies linear regression.

The fourth article focuses on gender differences in vegetable intake. Although the association between gender and vegetable intake is well established, no studies have explicitly tackled the question of how gender differences in vegetable intake evolve over long periods. This article studies how gender differences in daily vegetable intake have developed during the past four decades. It considers age and education as control variables, as these have been associated with vegetable intake. It uses Finnish health survey data from 1979 to 2017 and applies logistic regression. The research designs of the studies are summarized in Table 1.

Table 1. Research designs of the studies in this dissertation.

Study	Research questions	Data	Method
Article I: Long-term change in healthy food consumption in Finland during 1985–2016: an age-period-cohort analysis	• How does healthy food consumption vary over time, across birth cohorts, and between age groups? • Can long-term change be explained through income, education, or urbanization?	Household expenditure surveys from 1985 to 2016	Age-period-cohort Trended and Detrended (APCT and APCD)
Article II: The role of sugar products and non-alcoholic beverages in the food budget: change across birth cohorts and between socio-economic groups	• How has the consumption of sugar products and non-alcoholic beverages changed across birth cohorts? • How have the socioeconomic differences in the consumption of sugar products and non-alcoholic beverages changed across birth cohorts?	Household expenditure surveys from 1985 to 2016	Age-period-cohort trended lag (APCTLAG)
Article III: Sosioekonomisen aseman yhteys kalan osuuteen ruokamenoista vuosina 1985−2016 (The association between socioeconomic status and share of fish in food costs in Finland from 1985 to 2016)	• How has the association of socioeconomic status and fish consumption changed during the study period? • Does household structure or urbanization level of home municipality affect these differences?	Household expenditure surveys from 1985 to 2016	Linear regression analysis
Article IV: Gender differences in vegetable intake over time: results from repeated cross-sectional surveys from 1979 to 2017	• How have gender differences in daily vegetable intake developed during the study period? • Can these changes be explained by rising educational levels and the aging population?	Health Behavior and Health among the Finnish Adult Population and Regional Health and Well-being surveys from 1979 to 2017	Logistic regression analysis

4.2 Data

There are three main types of data sources used to assess the trends in food consumption: food balance sheets, individual dietary surveys, and consumption expenditure surves (Kearney, 2010). This dissertation utilizes consumption expenditure surveys and individual dietary surveys. The first three articles in this dissertation used the Finnish Household Expenditure Surveys (HES) that were collected between 1985 and 2016. The fourth article used the data samples of the Health Behavior and Health among the Finnish Adult Population surveys collected between 1978 and 2014 and the Regional Health and Well-being Studies collected between 2013 and 2017 (Finnish Institute for Health and Welfare, 2022b).

The HES is a cross-sectional survey that has been conducted by Statistics Finland since 1966, generally, every five years. The HES is used to produce information about the changes and demographic differences in households' consumption expenditure. The person with the highest income in each sampled household was assigned as the reference person for that household. This research uses the internally comparable time series provided by Statistics Finland, which is based on eight cross-sectional samples during 1985–2016. The sample sizes varied between 3,551 and 8,258 households. One notable feature of the data was that the response rate fell from 70 percent to 46 percent during the period 1985–2016 (Statistics Finland, 2018). This is part of a more general trend of falling response rates in questionnaire studies (Brick & Williams, 2013). Statistics Finland used reweighing methods to account for the demographic differences in the response rates. After reweighing, the cross-sectional samples were representative of the household population.

In the HES, consumption is measured by monetary expenditure. Data on food expenditure were gathered using shop receipts and consumption diaries during a two-week accounting period. One problem with the two-week accounting period is that it captures items bought often well, while those that are bought more seldom are not captured as well (Niemelä & Raijas, 2012). The accounting periods were distributed equally across the year to account for seasonal variation in the consumption patterns. For example, fruit and berries are more available during the summer, and non-alcoholic beverages might also appear more attractive in the summer heat. Households have had the possibility of submitting shop receipts from 2001 onwards if they contain information on the products bought. Most of the groceries were apparent from the receipts. However, foodstuffs that the household gather, grow, or hunt were inquired about in the consumption diaries. These foodstuffs were then included in the food expenditure as producer prices. Thus, the data cover foods that the households have either bought or obtained by foraging. The dataset also measures expenditure on food eaten out of the home. However, these data lack information on

the quality of foods that have been consumed outside of the home, which means that it is impossible to assess the healthiness of these meals. Therefore, in this dissertation, I focus on the foods bought for in-home consumption.

Consumption expenditure was measured in euros (€). The food expenditures were categorized into nine sub-categories according to the international COICOP-HBS classification: cereal products, meat, fish, dairy and eggs, fats and oils, fruit and berries, vegetables, sugar products, and other foodstuffs (Statistics Finland, 2018). These nine sub-categories are further divided into more precise groupings. For example, the category of fish includes fresh fish (further divided by fish species), fresh shellfish, salted and smoked fish, as well as other fish products (such as canned fish and fish sticks). However, as the categories get smaller, the standard errors also increase, so it is best to use the general categories for statistical analyses.

Income and education information was obtained from administrative registers. The data on the educational levels of the reference person and possible spouse were obtained from Statistics Finland's Register of Completed Education and Degrees. The data on incomes were obtained from the total statistics on income distribution, which indicate the annual income of the registered households. Full coverage of the registers used in the HES can be found in the user's manual (Statistics Finland, 2018).

The data for the fourth sub-study were drawn from the Health Behavior and Health among the Finnish Adult Population surveys collected between 1978 and 2014 and the Regional Health and Well-being surveys collected between 2013 and 2017. The datasets were collected by the Finnish Institute for Health and Welfare. The Health Behavior and Health among the Finnish Adult Population surveys were conducted annually between 1978 and 2014 as postal surveys to monitor short-term and long-term changes in the health and health habits of the Finnish adult population. In each individual survey, the sample was Finns aged 15–64. As the survey from 1978 lacks information on vegetable intake, this study used the surveys from 1979 onwards. The response rate in these surveys was around 80 percent in the 1980s but has fallen over time. In the 2010s, it fluctuated between 50 percent and 60 percent (Helldán & Helakorpi, 2015).

Since 2014, the Health Behavior and Health among the Finnish Adult Population surveys were incorporated into the Regional Health and Well-being surveys. The Regional Health and Well-being surveys were collected between 2010 and 2017 to monitor regional patterns in adult health, health behavior, and health service use. Unlike in the Health Behavior and Health among the Finnish Adult Population surveys, the samples in the Regional Health and Well-being surveys were Finns over the age of 20. The Regional Health and Well-being surveys were collected as postal and internet surveys. The response rates have been between 60 and 70 percent in the oldest age groups. In the younger age groups, the response rates have hovered around

40 percent in women and 30 percent in men. Appropriate weights are used in the analyses to correct for response bias. For the purposes of this study, only participants aged 20 or over but under 65 were included in the analyses, as information for this age bracket was available in both datasets. The Regional Health and Well-being surveys from 2013 onward were used because this survey had more observations than the last years of the Health Behavior and Health among the Finnish Adult Population surveys.

As this research concerns humans, ethical issues regarding data management should be considered. First, the datasets were pseudonymizes so that no individual person can be identified from them. Second, I formally agreed to not to distribute the data. The data is stored safely behind password protection. This research posed no risk to the well-being of any participants of the original surveys. All the datasets were collected before the General Data Protection Regulation came into effect.

4.3 Indicators

FESs were used as dependent variables in the first three sub-studies of this dissertation. The FES indicates how many percent of the household food budget was allocated to a particular food category such as vegetables. Compared to absolute monetary expenditure, FESs have the advantage of measuring the proportion of a specific food category relative to the whole food basket (Healy, 2014; Lindblom, 2017). The studies used the FESs of 1) vegetables, 2) fruit and berries, and 3) fish as indicators of healthy food consumption. FESs of 1) sugar products and 2) non-alcoholic beverages (excluding mineral waters) were used as indicators of more unhealthy food consumption. The contents of these categories are detailed in the appendix.

In the fourth study, the respondents were asked to indicate how often they had consumed different types of foods in the previous week. The frequency of fresh vegetable or salad intake was used as the outcome variable. The response alternatives were 1) not once, 2) on 1 to 2 days, 3) on 3 to 5 days, and 4) on 6 to 7 days. This variable was dichotomized for the analyses using 0 or 1, with 1 indicating eating fresh vegetables 6 to 7 days of the week and 0 indicating less frequent consumption. This dichotomization was based on the fact that most dietary guidelines advise eating vegetables for every meal and treat them as the cornerstone of a healthy diet. Previous research has also employed this categorization (Roos et al., 2008).

This dissertation measured socioeconomic status with both income and education. The income indicators were constructed as quantiles. The first study used income deciles, the second study used income quartiles, and the third study used income quintiles. The quantiles were calculated from disposable household income, equivalized using the OECD modified equivalence scale.

This dissertation used the education classification provided by Statistics Finland (2021). The scale follows the structure of the education system where the transition from one level to the next happens periodically. The variable indicating educational level contains four items: primary level or less, secondary level, lower tertiary level, and upper tertiary level.

The urbanization level of the home municipality was used in the first and third articles. Three categories were used to indicate the level of urbanization of the household's municipality: city, densely populated, and rural.

The first article used the number of adults and the number of children in the household to assess the household structure. The third article assessed the household structure with a variable having five categories: one-person household (age under 65), two-person household (age under 65), single-parent household, two-parent household, and other.

4.4 Methods

Age-period-cohort models

The first two articles of this dissertation used age-period-cohort modeling techniques. Estimating age, period, and cohort effects pose an identification problem (Glenn, 2005). The linear dependency of age (A), period (P), and cohort (C) results in a situation where the unique effects of each are impossible to empirically or logically disentangle from one another. This leaves statistical methods as the sole tool for the researcher seeking to separate the APC effects.

The traditional methodology for modeling the APC effects is the use of constrained generalized linear models (Mason et al., 1973). It has been argued that the estimation of the APC effects becomes possible if at least two age groups, two periods, or two cohorts are assumed to have identical effects. These identifying constraints break the linear dependency of age, period, and cohort, making an ordinary least squares solution possible. However, this methodology produces meaningful estimates only if the identifying constraints are properly chosen. Accomplishing this task requires prior information, which is seldom available (Yang et al., 2004). The Intrinsic Estimator was developed as a model that could be applied without the availability of prior information, but it has also been shown to be problematic, for example, in terms of implicit assumptions and sensitivity to variable coding (Luo, 2015).

The first article of this dissertation utilizes the APC-trended (APCT) and APC-detrended (APCD) models (Chauvel, 2011; Chauvel & Schröder, 2015), while the second article utilizes the APC-trended lag (APCTLAG) model (Bar-Haim et al., 2019). The APCT model estimates the absolute development of consumption across

cohorts and age groups, whereas the APCD model estimates the relative differences between age groups, cohorts, and periods when compared to a linear trend. The APCTLAG method allows us to compare cohort trends between two groups.

These models were chosen because their assumptions are simple, yet credible. The separation among linear age, period, and cohort effects is basically impossible, whereas non-linear effects are not confounded with one another to the same extent (Glenn, 2005). Therefore, the APCD method focuses on estimating the non-linear variation around a calculated linear trend (Chauvel & Schröder, 2015). The following formula illustrates the APC-detrended model:

$$\begin{cases} y^{apc} = \alpha_a + \pi_p + \gamma_c + \alpha_0 rescale(a) + \gamma_0 rescale(c) + \beta_0 + \sum_j \beta_j x_j + \varepsilon_i \\ \quad \begin{cases} \sum_a \alpha_a = \sum_p \pi_p = \sum_c \gamma_c = 0 \\ Slope_a(\alpha) = Slope_p(\pi_p) = Slope_c(\gamma_c) = 0 \\ \min(c) < c < \max(c) \end{cases} \end{cases} \quad (APCD)$$

In the formula, $\alpha_a, \pi_p,$ and γ_c refer to detrended age, period, and cohort effects, respectively. The coefficients for age and cohort are standardized by rescaling them to the range of -1 to +1 in "$\alpha_0 rescale(a) + \gamma_0 rescale(c)$." This also absorbs the linear trend. The constant is expressed as β_0, and the control variables β_j and x_j are considered, while ε_i denotes the error term. The model is made identifiable by applying the zero-sum and zero-slope constraints. The *a*, *p*, and *c* vectors are made to sum to zero in "$\sum_a \alpha_a = \sum_p \pi_p = \sum_c \gamma_c = 0$", and the slopes are assigned to zero in "$Slope_a(\alpha) = Slope_p(\pi_p) = Slope_c(\gamma_c) = 0$." The first and last cohorts are excluded in "$\min(c) < c < \max(c)$." These constraints do not require the researcher to exercise choice.

The APCT model shows how cohorts differ from one another with the cohort estimates including the linear trend. However, the cohort coefficients are age-controlled and the age coefficients are cohort-controlled (Chauvel & Schröder, 2015). The equation for the APCT model differs from that of the APCD model described above, in that the zero-slope constraint ($Slope_c(\gamma_c)$) in the cohort coefficients is excluded, as is the rescale function ($\gamma_0 rescale(c)$) for the cohort coefficients. Therefore, the cohort and age coefficients absorb the long-term linear progression.

The APCTLAG method allows us to compare the gap in a dependent variable between a dichotomous grouping variable across birth cohorts (Bar-Haim et al., 2019). The model identification constraints rest on two key assumptions. First, we assume that a possible changing trend is a result of cohort replacement rather than periodical changes. Thus, we impose a slope-zero constraint on the period vector. In other words, the model assumes that long-term changes the dependent variable are

driven mainly by the generations replacing each other. The period estimates, therefore, depict "bumps" in the general trend. Next, we assume the age effect to be similar across birth cohorts. APCTLAG constrains the linear trend of age as equal to the average within-cohort age effect. No constraint is now needed in the cohort vector. In this model, the cohort coefficients will include the general trend of social change.

In this dissertation, the APCTLAG model was used to assess the socioeconomic differences in sugar and non-alcoholic beverage consumption across the birth cohorts. To do so, we first calculated the differences in the average FESs between tertiary and non-tertiary educated households and top earners and low earners on the Lexis table. We then estimated the gap between high and low socioeconomic status groups using APCTLAG for the differences as the dependent variables.

Regression models

The third and fourth research articles of this dissertation use regression models to assess how group differences in fish and vegetable consumption changed over time. The third article used linear regression analysis to study how socioeconomic differences in the FES of fish had evolved. The models were run separately for educational differences and income group differences. In both cases, an uncontrolled model with only the interaction between the indicator of socioeconomic status and the statistical year was first estimated. Then, a controlled model was estimated, where the other socioeconomic indicator, age of head of household, household type, and urbanization level of the home municipality were added as control variables.

The fourth article used logistic regression analysis to study how gender differences in vegetable intake evolved. To test trends in daily vegetable intake over time, the outcome was regressed on a variable indicating the survey year (1979–2017 in five-year categories). To assess how gender differences evolved over time, a term for the independent effect of gender and an interaction term for survey year and gender was added to the model. Further, education and age were added as control variables. Graphical representations of the associations were obtained by estimating marginal means for the periods and both genders over the periods.

5 Results

5.1 Age, period, and birth cohort in the consumption of vegetables, fruit, and fish

Drawing on the sociological life course perspective, the first article in this dissertation examined how the FESs of vegetables, fruit, and fish vary according to age, period, and birth cohort. Further, the study asked if cohort trends would be explained by rising income, education, and urbanization levels or if age patterns would be explained by the household structure.

The FESs of all three food categories rose during the study period. The change was 3.7 percentage points for vegetables, 2.3 percentage points for fish, and 2.1 percentage points for fruit and berries. Descriptive findings (see Figure 3) show that the FES of vegetables has generally risen each year in all age groups, with a few exceptions. The change seems to have been slightly faster in the youngest age groups, particularly during the most recent period, 2012−2016. The FES of fruit and berries had risen between most periods in the over-50 age groups, with the exception being the last period, when the FES also rose for the under-50 age groups. While the FES of fish generally rose in the study period, it also rose the most in the over-50 age groups.

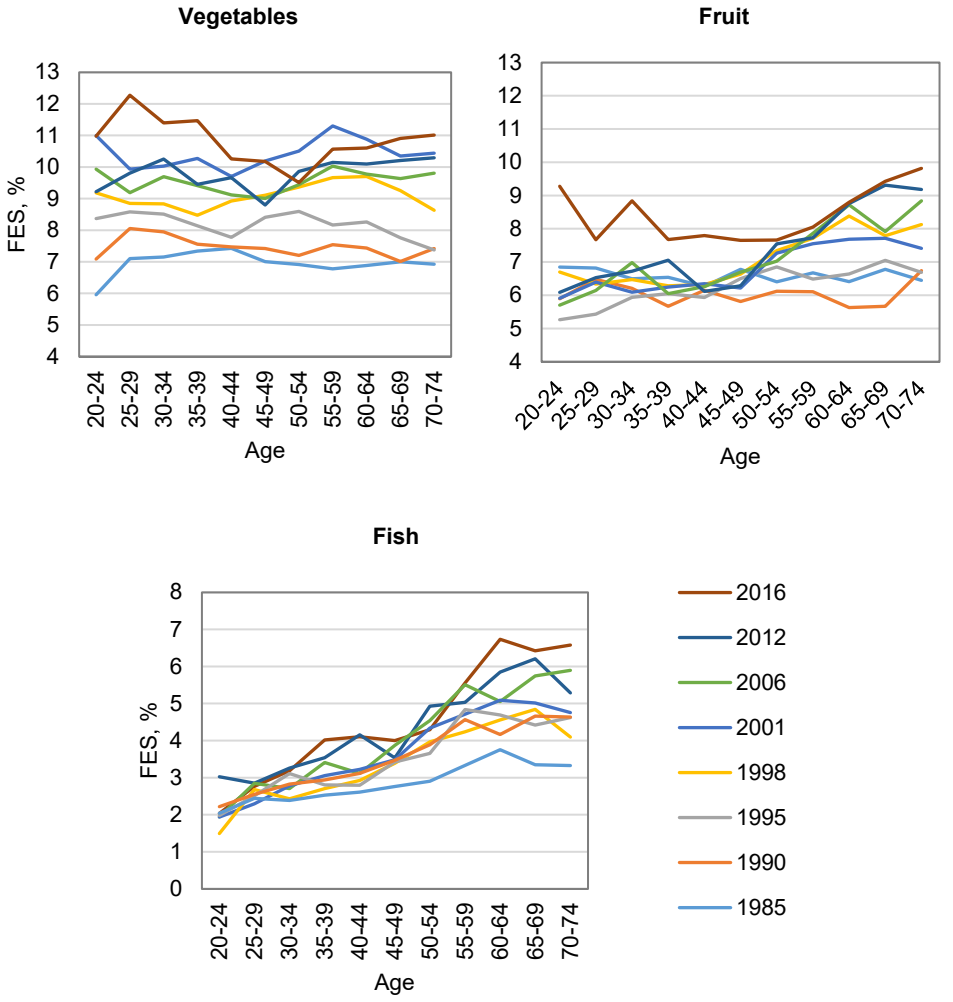

Figure 3. Food expenditure shares of vegetables, fruit and berries, and fish *by age and period*. Source: Household Expenditure Surveys from 1985 to 2016 (Kähäri, 2020).

The modeling results showed that the FES of vegetables rose for succeeding birth cohorts and that cohorts born between 1945 and 1959 had the strongest increase with the 1945−1949 cohort, deviating by 5.3 percent from the linear trend. The FES of fruit increased from the oldest cohort to the youngest cohort, although the estimates stagnated for those born between 1955 and 1974. Cohorts born between 1940 and 1959 had experienced the highest increase, whereas those born between 1925 and 1929 and 1970 and 1974 deviated negatively from the linear trend. The FES of fish increased up until the cohorts born between 1960 and 1964 but declined somewhat

among younger cohorts. The upward slopes were the steepest for those born between 1940 and 1954. Rising incomes, education, or urbanization level did not explain the cohort differences.

The FES of vegetables had typically risen by age when controlled for cohorts. However, the almost linear increase by age was likely a result of intense periodical changes. The model results for fruit and fish suggested a more distinctive age effect. Younger groups had sub-average estimates that stayed relatively stable, but significant increases in the FESs were observed in age groups older than 50. Controlling for the household structure made the age differences in the FES of fish more modest.

FESs could be sensitive to differential price developments between various food groups. Thus, the robustness of the results was tested by examining absolute expenditures. Statistics Finland provides individual inflation rates for each food group, which makes it possible to consider changes in prices. Comparability of expenditures between different kinds of households was achieved by dividing the expenditures by the number of consumption units (the OECD modified equivalence scale). The results of this exercise were generally in line with those gained from the analyses using FESs, with a few exceptions. According to the APCT model, the differences between the youngest and the oldest cohorts and age groups were of a similar pattern but wider in absolute expenditure than in FESs in all studied food categories. The absolute expenditure on fruit was notably lower in age groups of 20−29 years than in older groups. This age difference was smaller in the examination of FESs. The APCD model for absolute expenditure provided results that were in line with those for FESs.

5.2 Role of sugar products and beverages in the food budget: Change across birth cohorts and between socioeconomic status groups

Drawing on the literature on the life course perspective and health inequality, the second article studied how the FESs of sugar products and non-alcoholic beverages (excluding mineral waters) changed across birth cohorts and how the socioeconomic differences in the consumption of mentioned products evolved across birth cohorts. Socioeconomic differences were assessed through the indicators of education and income. The gaps were calculated between the first and the last income quartile and between those with primary and tertiary education.

The results confirmed the earlier knowledge that sugar and beverage consumption declines with age (Ervin & Ogden, 2013; Miller et al., 2013; Sluik et al., 2016). However, this study showed that the declining age pattern stagnated

between ages 30 and 45. The FESs of sugar products and non-alcoholic beverages rose across birth cohorts, even after controlling for age (see Figure 4). Collectively, sugar products and non-alcoholic beverages comprised almost 10 percent of the food basket in the oldest birth cohort and over 15 percent of the food basket in the youngest birth cohort. In absolute terms, this means an increase of 266 euros in yearly expenditure in 2016 currency.

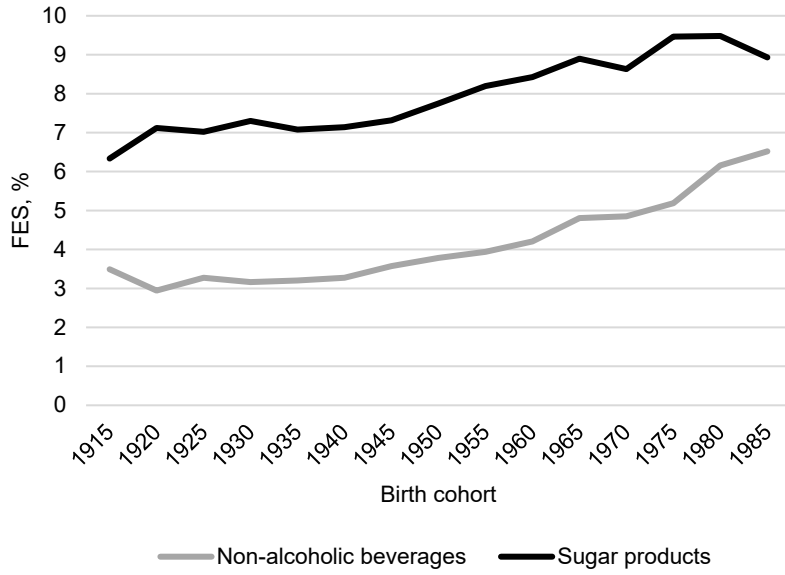

Figure 4. Food expenditure shares of sugar products and non-alcoholic beverages over birth cohorts. Source: Household Expenditure Surveys from 1985 to 2016.

The FES of sugar products was higher in the low-income group in several birth cohorts, with the gap being most apparent in the two most recent birth cohorts. However, the lower educated group had a higher FES of sugar products only in the oldest birth cohort and the most recent one. Yet again, the difference was more notable in the most recent birth cohort. The higher educated group had a higher FES of sugar products in several birth cohorts born between 1950 and 1970.

Socioeconomic differences seemed to have a more apparent and systematic direction in the case of non-alcoholic beverages. As non-alcoholic beverages have become more common in society (Viinisalo et al., 2008), a reversal of socioeconomic differences occurred between the birth cohorts: in birth cohorts born before the 1950s, non-alcoholic beverages occupied a larger share of higher socioeconomic status groups' food baskets, but in those born after the 1950s, FESs were higher in the lower socioeconomic status groups. Based on the literature on the diffusion of

consumption habits (Elder & George, 2016; Katz, 1999), it seems that the consumption of sugar products had already gone through the stages of socioeconomic diffusion that can be more starkly seen in non-alcoholic beverage consumption.

The sensitivity of the results presented above was tested by running the analyses with absolute monetary expenditures as dependent variables. These analyses reveal that the high-income and highly educated groups spent more euros than their counterparts on sugar products in cohorts born after the 1950s. However, these groups spent more euros on non-alcoholic beverages across all cohorts. It is natural that the higher socioeconomic status groups have more money to spend, and their higher absolute spending might stem from either the quantity or the quality of the products purchased. However, lower FESs for sugar and non-alcoholic beverage products in the high socioeconomic status groups toward younger cohorts indicate that the totality of their food baskets is less occupied by sweets and drinks. The sensitivity of the results was further tested by running the FESs of sugar products and non-alcoholic beverages through the APC Intrinsic Estimator model (Yang et al., 2004). The results were almost identical to those obtained from the APCTLAG model.

5.3 Long-term changes in the socioeconomic Differences in fish consumption

The third article examined how the association between socioeconomic status and fish consumption changed from 1985 to 2016. In addition, the article asked if the socioeconomic differences can be explained by the age of the head of household, household type, or the urbanization level of the home municipality. Fish consumption was measured with FESs.

The FES of fish rose during the study period, which was also observed in the first article. Overall, there was a positive association between income and fish consumption as well as education and fish consumption. The differences between the lowest and the highest income quintiles in the FES of fish and also the absolute expenditure on fish widened in the 2000s (see Figure 5). The added control variables accounted for some of this gap, but the gap was still statistically significant. This means that some of the difference between the highest and lowest income groups was attributable to the control variables. In contrast, the differences between the primary- and tertiary-educated households in the FES of fish were insignificant during the study period and small in terms of absolute expenditure.

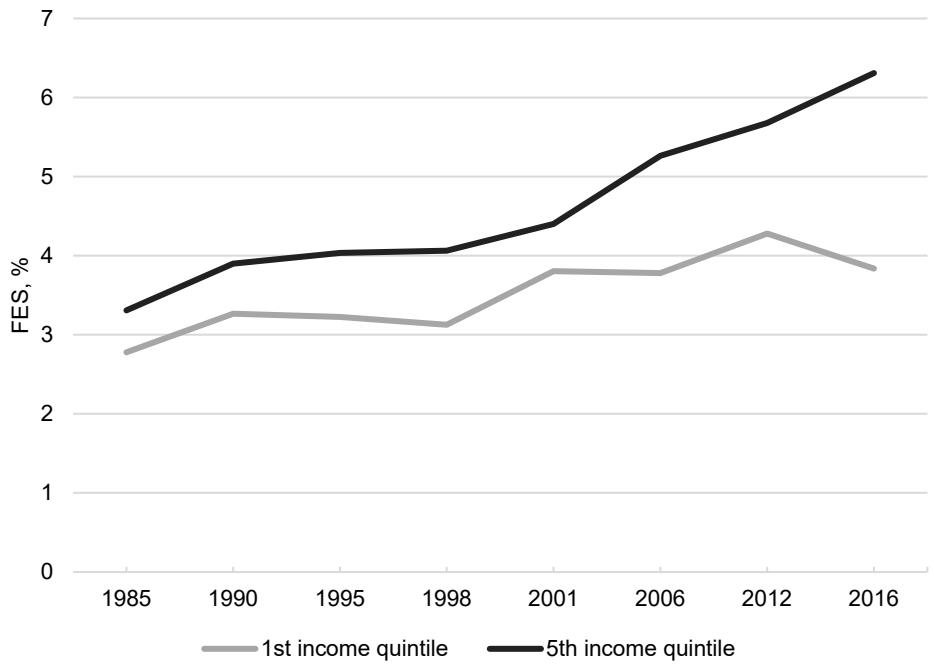

Figure 5. Food expenditure share of fish in the first and fifth income quintiles over the study period. Source: Household Expenditure Surveys from 1985 to 2016.

This article observed that there was an association between household type and the FES of fish. The FES of fish was the highest in households with two adults. In contrast, it was the lowest in households with children, especially in single-parent households. The fish consumption level in single-person households was situated between households with two adults and households with children.

To test the sensitivity of the obtained results, the absolute expenditures on fish were studied based on household income and education. These results showed that in 2016, fish expenditure fell. However, the differences in absolute expenditure between the socioeconomic status groups were bigger than those in FESs. Those with an upper tertiary education spent more euros on fish than those with only basic schooling. This exercise produced an interesting additional finding: in 2016 currency, the difference in yearly fish expenditure between the first and the fifth income quintiles was 35 euros in 1985 and 151 euros in 2016.

5.4 Changing gender differences in vegetable intake

The fourth article focused on gender differences in daily vegetable intake. The main research question was if and how gender differences in daily vegetable intake have changed between 1979 and 2017. The results showed that at the population level, the prevalence of daily vegetable intake rose from 15 percent to 48 percent, which is a notable increase. The prevalence of daily vegetable intake rose from 12 percent to 36 percent among men (an increase of 24 percentage points) and from 18 percent to 57 percent among women (an increase of 39 percentage points). The difference in daily vegetable intake between the genders grew up until 2004, after which it has been relatively stable (see Figure 5). Increasing vegetable intake was partly explained by the changing education and age structures of society, but these trends did not explain the gender differences or the widening of these gender differences.

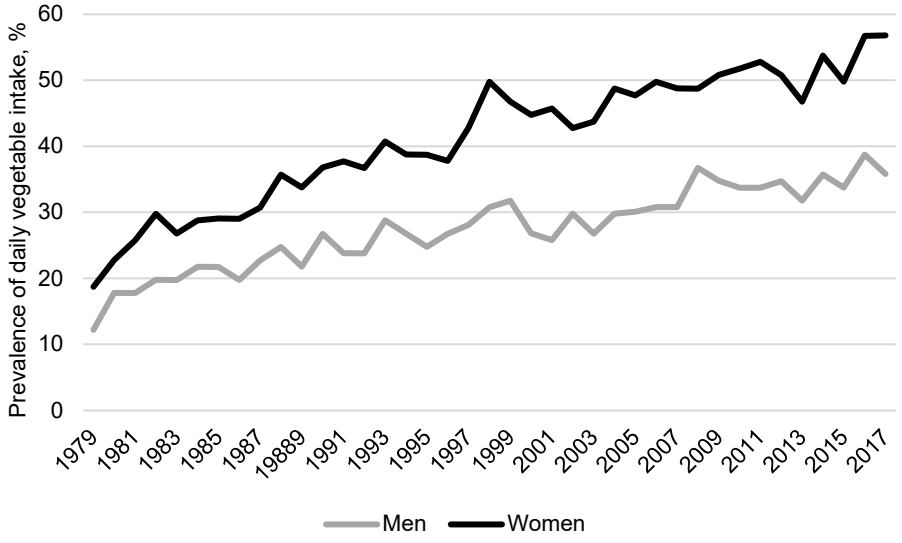

Figure 5. Prevalence of daily vegetable intake in men and women over the study period. Source: Health Behavior and Health among the Finnish Adult Population surveys, and Regional Health and Well-being surveys from 1979 to 2017.

The robustness of the results was tested by examining the temporal changes in the gender differences in fresh vegetable intake using all the categories of the dependent variable. This revealed a more detailed picture of how gender differences in vegetable intake evolved over time. The respondents in the surveys were asked to state how many days in the previous week they ate fresh vegetables. The most

common answer among men was 3–5 times a week, whereas the most common answer for women was 6–7 times a week. During the study period, the prevalence of not eating fresh vegetables at all fell from 10 percent to 2 percent among women and from 16 percent to 5 percent among men. Eating fresh vegetables only 1–2 days a week fell from 36 percent to 15 percent among women and from 40 percent to 24 percent among men. Eating fresh vegetables 3–5 days a week increased from 31 percent to 36 percent among men and fell from 36 percent to 32 percent among women.

5.5 Summary of results

The results of the four articles are summarized in Table 2. The results showed that the consumption of healthy and unhealthy foods has changed over time. The proportion of total food expenditure on vegetables, fruit, and fish as well as self-reported vegetable intake increased markedly during the study period. Moreover, the long-term changes in healthy and unhealthy food consumption varied according to age, birth cohort, socioeconomic status, and gender. Healthy food consumption is typically higher in the over-50 age groups, while the consumption of sugar products and non-alcoholic beverages is higher in young adults. There is a dip in healthy food consumption and an increase in unhealthy food consumption between the ages of 35 and 50. The FESs of vegetables, fruit, sugar products, and non-alcoholic beverages were higher in more recent birth cohorts.

Further, the results showed that the relationship between socioeconomic status and the studied food groups was not stable during the study period. The differences between income groups in fish consumption grew, while educational differences were not as significant. Non-alcoholic beverages occupied a larger portion of the high socio-economic status groups' food budgets in cohorts born before the 1950s. This gap reversed over time, leading to larger FESs of non-alcoholic beverages in low socioeconomic status groups in cohorts born after the 1950s.

Finally, the results confirm that women are more likely to eat vegetables daily than men. They also show that while daily vegetable intake has roughly tripled among both men and women, the role of gender in daily vegetable intake strengthened over the study period.

Table 2. Summary of findings.

Article	Research questions	Main findings
Article I: Long-term change in healthy food consumption in Finland during 1985–2016: an age-period-cohort analysis	How does healthy food consumption vary over time, across birth cohorts and between age groups? Can long-term change be explained through income, education, or urbanization?	The share of total food expenditure of all examined foods increased over time. Increasing vegetable and fruit consumption was reflected in the younger birth cohorts consuming more than the preceding ones. The food expenditure shares of fruit, berries, and fish were the highest and rose most in over-50 age groups.
Article II: The role of sugar products and non-alcoholic beverages in the food budget: change across birth cohorts and between socio-economic groups	How has the consumption of sugar products and non-alcoholic beverages changed across birth cohorts and how have the socioeconomic differences in the consumption of sugar products and non-alcoholic beverages changed across birth cohorts?	Sugar products and non-alcoholic beverages occupied a larger portion of more recent birth cohorts' food baskets. Non-alcoholic beverages occupied a larger portion of the high socio-economic status groups' food budgets in cohorts born before the 1950s but accounted for a smaller portion in cohorts born after the 1950s.
Article III: Sosioekonomisen aseman yhteys kalan osuuteen ruokamenoista vuosina 1985−2016. (*The association between socioeconomic status and share of fish in food costs in Finland from 1985 to 2016)*	How has the association of socioeconomic status and fish consumption changed during the study period, and does household structure or urbanization level of home municipality affect these differences?	As the food expenditure share of fish has grown over time, differences between the highest and the lowest income quintiles in fish consumption have grown in the 2000s, but educational differences have stayed modest and stable.
Article IV: Gender differences in vegetable intake over time: results from repeated cross-sectional surveys from 1979 to 2017.	How have gender differences in daily vegetable intake developed during the study period? Can these changes be explained by rising educational levels and the aging population?	During 1979–2017, the prevalence of daily vegetable intake increased from 12 percent to 35 percent among men and from 18 percent to 56 percent among women. Increased vegetable intake was partly explained by the changing education and age structures of society.

6 Discussion and conclusions

This dissertation studied the long-term trends in healthy and unhealthy food consumption based on four social groupings: age, birth cohort, socioeconomic status, and gender. The objective was to assess how these group differences have changed over time. Theoretically speaking, this study has been informed by the social determinants of health, the sociological life course perspective, and the literature on the changing socioeconomic differences in consumption over the study period.

The results echo the previously established understanding that the food consumption habits of the Finnish population are slowly moving in a favorable direction, albeit still far from what the health authorities recommend. The results are in line with the sentiment shared by the public and health professionals that we should be changing our food habits to address the health and climate effects of excess food consumption (Sundin et al., 2021). As mentioned by the consumers and experts interviewed in the newspaper article discussed in Chapter 1 of this thesis, *change* indeed is an apt word to describe contemporary food habits (Nykänen, 2021).

However, the results showed that long-term trends did not occur evenly across all the studied population groups. This dissertation contributes new knowledge on the development of vegetable, fruit, fish, and sugar consumption through age-period-cohort analyses, the changing role of socioeconomic status in sugar and fish consumption, and the changing role of gender in vegetable consumption. In this chapter, I first review the substantial and theoretical contributions of the research articles studied in this thesis, then discuss the meaning of the findings in terms of their policy implications, draw conclusions with some methodological considerations, and extend some recommendations for future research.

6.1 Interpretation of the results

This dissertation demonstrated in multiple ways how social circumstances are related to food consumption (see Figure 1) and how these relationships change over time. First, the results showed that food consumption is not a stable phenomenon across the life course, providing empirical examples of how food choice trajectories have directions and undergo transitions (see Figure 2). On the one hand, consumption of

healthy foods tends to increase over the life course, while the consumption of sweet foods and drinks decreases. The effects of lifestyle choices on health become more apparent with increasing age, as they have time to accumulate. Younger consumers might be aware of healthy eating, but that does not translate into action on the same scale as it does among older consumers (Brown et al., 2000; Riddell et al., 2011). It could be that as people age, they start paying more attention to their health, with a good example being older consumers being more careful about what food they eat (Cockerham, 2005). On the other hand, there is a dip in healthy food consumption between ages 35 and 54 and a bump in sweet food and drink consumption. The sociological life course perspective emphasizes that the social roles of an individual change over the life course (micro contexts in Figure 2) and have varying effects on their health and health behaviors (Devine, 2005; Mayer, 2004). In a typical Western life course, this life stage is characterized by participation in societal and familial life as workers, spouses, homemakers, and parents, which consumes vast amounts of their time and mental resources. It is possible that the time pressures experienced by consumers during their busiest years drive them to consume convenience foods and food services, thereby reducing their expenditure on whole food ingredients bought for preparing home food (Celnik et al., 2012; Jabs & Devine, 2006; Strazdins et al., 2011). Sociologists should not treat age and life stage merely as control variables but seek to study their effects in more detail.

Second, birth cohort was associated with food consumption, demonstrating the usefulness of the age-period-cohort analysis as a practical application of the life course perspective. The results showed in several ways that birth cohorts can start to diverge from each other, contributing more generally to the field of life course studies. Vegetable consumption increased in all birth cohorts, regardless of age. Each succeeding birth cohort started and lived out their lives in a food environment having more vegetables available for consumption (see Section 2.3). Thus, periodical changes are likely the driving force of this birth cohort pattern. This result might predict that younger birth cohorts will consume more vegetables over their life courses. Fruit consumption rose in cohorts born between the 1920s and 1950s and those born between the 1970s and 1990s. Fish consumption rose from cohorts born in the 1920s to those born in the 1950s. Importantly, the birth cohort differences in fruit and fish consumption arose mainly in the over-50 age groups, suggesting that the sources of change are not always the young age groups, as the classical works of Mannheim (1952) and Ryder (1965) regarding cohort differentiation suggested. Healthy food consumption could be more topical for the over-50 age groups, which could lead them to more readily utilize the increasing availability of healthy foods. The birth cohort patterns in fruit and fish consumption reflect the fact that, as seen in Section 2.2, at the population level, the increases in the consumption of these categories have been more moderate and started later than in the case of vegetables.

However, in the latest data point of 2016, the under-40 age groups had increased their FESs of both vegetables and fruit, which is likely attributable to the recent trends of plant-based eating and wellness consumption (see Section 2.3). It was interesting to find that rising incomes, educational level, or urbaization did not explain the differences between birth cohorts. This result suggests that the changing food consumption patterns are related to cultural change or other factors unobserved in this study. In other words, increasing consumption of healthy foods seems to be related to broader societal changes than those related to the living conditions of households. One strand of explanations could be related to the health and nutrition policies that have been a part of the Finnish welfare state since the 1970s (Pietinen et al. 2010).

Further, the results demonstrated that sugar products and non-alcoholic beverages play a major role in the food baskets of younger birth cohorts, even when age is accounted for. The result makes sense as the availability of these products has become virtually limitless in the past 50 years. Thus, a young, hungry, and thirsty consumer who grows up amid an abundance of sweet products is likely to carry a sweeter tooth into their later age phases than their older counterparts, regardless of the intrinsic downward age pattern found in the consumption of sweet foods and drinks. The age-period-cohort analysis proved to be useful here, as population aging and the downward age effect in sugar and beverage intake might obscure long-term trends.

In terms of relative birth cohort differences, Finnish baby boomers (born in 1945−1954) were above the long-term trend in all studied categories of healthy food. These cohorts grew up and came of age in a period of especially rapid social changes that are characterized by rising living standards, urbanization, market expansion, and the education system. It could be that the baby boomers' experiences in their early adulthood, from the 1970s onward, of preventive health policy and nutritional education (Niemelä et al., 2015; Puska et al., 2009) influenced their consumption during older adulthood, at which point health became a more important motivating factor, and the availability of healthy foods has been on the rise at a societal level. These empirical examples highlight the importance of studying age, period, and cohort together and relating the results to wider societal and historical contexts to minimize the potential of incorrect conclusions (Glenn, 2005).

Third, this dissertation demonstrated changing socioeconomic differences in food consumption. The gap between high-income and low-income households in fish consumption grew toward the end of the study period. In addition, income was more strongly associated with fish consumption than education. Fish prices have risen in the recent past due to the inability of production to meet the increasing consumer demand for fish (Saarni et al., 2022). This situation is likely to continue since the global situation in 2022 is further increasing the prices of foods in general

and fish in particular (Kukkonen, 2022; Varmavuori, 2022). In February 2023, the price of food was reported to be 16 percent higher than a year ago. Fish consumption, which has been encouraged in the nutritional guidelines, seems to be becoming a luxury, which is possible only for high-income consumers. Thus, researchers should be paying special attention to inequality in food consumption and food insecurity in the near future. Despite all the efforts, inequality on the plate is a growing concern in our society.

While socioeconomic differences did not develop systematically in the consumption of sugar products, a reversal of socioeconomic differences was observed in the consumption of non-alcoholic beverages: FESs were greater in the higher income and higher education groups in birth cohorts born before the 1950s as well as in the lower income and lower education groups in birth cohorts born after the 1950s. This result tells the story of the higher socioeconomic status classes as trendsetters and the following diffusion of beverage consumption across the social strata, which lead to the situation of beverage consumption becoming commonplace (cf. Bourdieu, 1984; Simmel, 1986; Veblen, 2007 [1899]). It is then only logical that those with less income spend a greater share of their income on non-alcoholic beverages. This is in line with the research showing that in contemporary times, lower socioeconomic status families consume greater quantities of soft drinks than high socioeconomic status families (Vereecken et al., 2005; De Coen et al., 2012). This result provides an excellent example of the diffusion of consumption styles across the social strata theorized by the classic sociologists and developed by the life course perspective (Elder & George, 2016) and the diffusion of innovation literature (Katz, 1999).

Fourth, this dissertation explored the issue of gender differences in vegetable consumption. While it is well known that women tend to eat more vegetables than men, this dissertation provides new insights into how gender differences develop in the Nordic welfare state context. As the intake of vegetables has increased, the role of gender in consumption has strengthened, leading to widening gender differences. This result supports the notion that the adoption rates of new behaviors differ between genders according to their compatibility with traditional gender roles, rather than gender differences narrowing as male and female gender norms become more similar (see Waldron, 1997). Previous research has shown that aesthetic concerns play a big role in the dietary habits of women, and these concerns seem to be intensifying in the age of social media (Wardle et al., 2004; Slater & Tiggemann, 2011; Åberg, 2020). It is also worth noting that the tendency of women to eat more healthily than men has another side to it: in Finland, 1 in 6 females but only 1 in 40 males are affected by an eating disorder at some point in their lives (Silén et al., 2020). Further research should be conducted to study gender differences in the

healthiness of diets in a comparative fashion to better understand the contextual factors behind them.

Encouraging people to eat more vegetables and fruit has been a focal point for a long time, and the results of this dissertation suggest that it should remain so. If we were to think about targeted nutritional interventions, the results suggest that these would be most needed in younger people, those in midlife, men, and those with lower socioeconomic status. In addition, the social contexts of and influences on food consumption should be kept in mind when providing nutritional counseling for individuals while taking into account factors such as their life stage and household composition. Since sugar products and fruit both provide the sweet sensation that humans are genetically predisposed to prefer (see Section 2.1), it can be speculated that some of the expenditure on sugar products could be steered toward the nutritionally more desirable category of fruit and berries, for example, through taxes and subsidies. Currently, Finland is considering more fiscal measures for promoting healthier and more sustainable food choices among consumers (Valtioneuvosto, 2019). As we saw in Section 2.2, fiscal policies are the most effective in steering consumption toward a healthier and more sustainable direction when both taxes and subsidies are used. In other words, foods that are conducive to health and cause low greenhouse gas emissions should be subsidized, while unhealthy foods and foods with high greenhouse gas emissions should be taxed (Abadie et al., 2016; Thow et al., 2018). Lastly, the situation in 2022 of rising inflation rates and even more rapidly rising food prices demand political attention to the issues of food security and ability to eat healthy food among socially and economically vulnerable groups.

6.2 Methodological considerations

This dissertation used exceptionally long-running time-series datasets from Statistics Finland and the Finnish Institute for Health and Welfare. These datasets, covering periods of 31 years and 39 years, respectively, allowed for the analyses of long-term trends according to multiple sociologically relevant groupings. Most notably, the data allowed for the novel application of age-period-cohort modeling techniques to food consumption studies. Conducting an age-period-cohort analysis on food consumption using the APCD, APCT, and APCTLAG models proved to be fruitful in the Finnish welfare state context (Chauvel, 2011; Chauvel & Schröder, 2015; Bar-Haim, 2019). The age-period-cohort analysis permitted the analysis of age patterns across the adult life course, which follow-up studies and cross-sectional studies have difficulty in ascertaining, providing estimates of both general age trends and deviations from these trends. However, conclusions about birth cohort effects must be kept tentative, as we saw in Section 4.3 that even the best age-period-cohort methods cannot fully disentangle the relationship between age, period, and cohort,

and results should always be interpreted in the context of relevant historical developments (Glenn, 2005).

The use of expenditure data in this dissertation provided a complementary approach to the methods typically used in the study of food consumption. Studies on food consumption often rely on food frequency questionnaires as the instrument of dietary assessment. While they are a convenient tool to measure diet, it is useful to employ other measures of food consumption as well. This dissertation used household expenditure surveys to broaden the knowledge base on changing food consumption habits. Compared to the traditional self-report method, the fact that respondents in the household expenditure surveys were not reporting eating but purchases could make the data less subject to the bias of socially acceptable answering.

As was mentioned in chapter 4, survey research has suffered from falling response rates during the past decades (Brick & Williams, 2013). To take this into account, Statistics Finland and the Finnish Institute for Health and Welfare have built weights to counter the underrepresentation of certain population groups in the data. After weighing, the cross-sectional samples were considered representative of the household population. However, with the falling response rates in survey research, the question of representativeness needs to be kept in mind. In addition, it must be stressed that cross-sectional data, even when it repeatedly collected over long periods cannot assess change on an individual level. Thus, all changes that have been empirically described in this dissertation have happened on a population and group level, not an individual level. To study changes within individuals, a longitudinal study design is needed.

Measuring food expenditure excludes the food selection process and the actual amounts and quality of food that are consumed. In addition, the measures of expenditure can be affected by food prices. Lastly, the household expenditure surveys cannot assess the contents of meals eaten out or at school and workplace canteens. Hence, this dissertation could not take into account the increasing trend of eating out (see Warde et al., 2019). Still, most foods are eaten at home. For these reasons, future research should validate the results obtained in this thesis by applying more direct measures of food intake. This ties into the challenge of developing better and more accurate methods of measuring the different aspects of food consumption happening at various sites, such as the home, the school or work canteen, restaurants, and on the go. The increasing use of food delivery services, its demographic correlates, and the effects on the healthiness of consumer diets deserve scientific attention. The use of objective purchase data is a promising avenue for future research on food consumption patterns and their change. These kinds of data are generated in grocery store chains when consumers use loyalty cards (Erkkola et al., 2019b). This would effectively circumvent the socially desirable responding bias that

self-reported measures used in survey research are prone to. In Finland, a collaboration like this is already taking place between one of the key grocery store chains and two large universities.

In addition, this dissertation studied the consumption of certain food groups, as opposed to using a whole-diet approach. Both approaches have their merits. Using single food categories permitted this dissertation to study in more detail the changes in consumption of certain food groups that could be either increased or decreased to the ends of health and sustainability. However, not everything can be studied in one dissertation, and an obvious limitation of this study is that it did not examine the consumption of meat. Fish consumption was studied instead of meat consumption, as it has received less attention in the literature.

6.3 Conclusions

This dissertation contributed substantially to the literature on the determinants of food habits. In particular, it provided new knowledge on the development of vegetable, fruit, fish, and sugar consumption through age-period-cohort analyses, the changing role of socioeconomic status in sugar and fish consumption, and the changing role of gender in vegetable consumption. The use of the life course perspective as a theoretical and a methodological apparatus proved fruitful, and the relatively new age-period-cohort modeling techniques suited the data on food consumption habits used in this study. Finally, studying the social determinants of healthy and unhealthy food consumption helps obtain a better understanding of population-level changes and their drivers and target policies aimed at the promotion of healthy food consumption. A sociologically informed approach to the study of changing food consumption is warranted.

In conclusion, this dissertation confirmed that healthy food consumption has been on the rise. It also found that the proportions of sugar products and non-alcoholic beverages in the food budget have increased across birth cohorts. The adoption of these trends depended on consumers' stage of life, socioeconomic status and gender, leading to changing group differences. While cohort theories usually posit that young adulthood is the defining time for cohort differentation in values and habits, this study found that fruit and fish consumption increased most in the baby boomers when they were over 50. Midlife with its family and work demands is associated with less healthy food consumption patterns. Children learn to eat what their parents buy, which points to the importance of this life-stage for the formation of food habits in the next generation. The finding that socioeconomic differences in the food expenditure share of non-alcoholic beverages turned around across birth cohorts provides an empirical demonstration of how new consumption patterns are first adopted by those with more income before diffusing through the social strata.

The widening socioeconomic differences in fish consumption should raise our attention, as food prices have increased significantly in the period following this finding, worsening thte situation for those in a low socioeconomic position. Finally, the steeper upward trend in vegetable intake among women has lead to increasing gender differences. Gender is thus not becoming of lesser importance in food consumption, even in a context of growing gender equality.

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Appendix

Appendix 1. The contents of the food categories used in studies 1, 2, and 3.

Vegetables

A0117	Vegetables incl. potatoes
A01171	Salad, spinach, parsley and other leafy greens
A0117101	Chinese cabbage
A0117102	Salad
A0117103	Fresh herbs
A0117104	Spinach, celery sticks, sprouts, etc.
A01172	Cabbages
A0117201	Cabbage
A0117202	Cauliflower
A0117203	Boccoli, red cabbage, brussel sprouts, etc.
A0117204	Boccoli, red cabbage, brussel sprouts, etc.
A01173	Tomato, cucumber, bell peppers, peas, etc.
A0117301	Tomato
A0117302	Cucumber
A0117303	Bell peppers
A01173S1	Peas, beans, zucchini, eggplant, etc.
A01174	Root vegetables, onions, and mushrooms
A0117401	Carrots
A01174S1	Other root vegetables
A0117405	Onion
A0117406	Fresh button mushrooms
A0117407	Other fresh mushrooms
A0117408	Frozen mixed vegetables
A0117409	Unclassified vegetables
A01175	Dried vegetables
A0117501	Dried peas, vegetables and root vegetables
A01176	Other preserved vegetables and products

A0117601	Pickled cucumber
A0117602	Preserved beet roots
A0117603	Other preserved vegetables
A01176S1	Vegetable patties and ready meals from vegetables
A0117606	Salads
A01176S2	Ready meals from vegetables (soups, casaroles, etc.)
A01177	Potatoes
A0117701	Potatoes
A01178	Potato products and other tubers (excluded)
A0117801	Powdered mashed potatoes
A0117802	Potato chips etc.
A0117803	French fries and potato wedges
A0117804	Potato salad
A0117805	Potato puree and potato casarole, etc.

Fruit and berries

A0116	Fruit and berries
A01161	Citrus fruit
A0116101	Oranges
A0116102	Mandarins
A0116103	Other citrus fruit
A01162	Bananas
A0116201	Bananas
A01163	Apples
A0116301	Apples
A01166	Berries
A0116601	Grapes
A0116602	Blackcurrants
A0116603	Red and white currants
A0116604	Strawberries
A0116605	Other garden berries
A0116606	Blueberries
A0116607	Lingonberries and cranberries
A0116608	Cloudberries and other forest berries
A0116609	Mixed frozen berries and unclassified berries
A01167	Other fresh fruit
A01167S1	Other fresh fruit

A01168	Dried fruit
A0116801	Nuts and almonds
A0116802	Raisins and currants
A0116803	Other dried fruit and berries
A01169	Preserved fruit and fruit products
A0116901	Preserved fruit and berries
A0116902	Babies fruit purees
A0116903	Fruit and berry soups and kisel

Fish

A0113	Fish
A01131	Fresh fish
A0113101	Baltic herring
A0113102	Vendace
A0113103	Salmon
A0113104	Rainbow trout
A0113105	Other fresh fish
A0113106	Pollock
A0113107	Herring fillet
A0113108	Other fish fillets
A0113109	Fish unclassified
A01132	Fresh shellfish and mollusc
A0113201	Fresh crab, mussels, squid etc.
A01133	Salted and smoked fish, etc.
A0113301	Salted fish
A0113302	Lutefisk
A0113303	Smoked and grilled fish
A0113304	Cooked shrimp, mussels, etc..
A01134	Other fish producs, and canned fish
A0113404	Fish sticks and battered fish
A0113405	Baltic herring casserole, Jansson’s temptation, etc.
A01134S1	Preserved herring, Baltic herring and anchovy
A01134S2	Canned tuna
A01134S3	Other canned fish and shellfish
A01134S4	Salads and other ready-made foods from fish and shellfish

Sugar products

A0118	Sugar, jams, honey and sweets
A01181	Sugar
A0118101	Sugar cubes
A0118102	Fine grained sugar
A0118103	Fructose
A0118104	Other sugar
A01182	Jams, marmelades and honey
A0118201	Jams and mashed fruit
A0118202	Marmelades
A0118203	Honey
A01183	Chocolate
A0118301	Chocolate bars and –sweets
A01184	Sweets
A0118401	Sweets, pastilles etc.
A0118402	Chewing gum
A01185	Ice cream, sorbet and ice pops
A01185S1	Ice cream and sorbet
A0118503	Ice pops
A01186	Syrup
A0118601	Syrup

Beverages

A0122	Mineral waters, soda pops and juices
A01221	Mineral waters (excluded)
A0122101	Mineral waters (excluded)
A01222	Soda pops
A0122201	Soda pops
A01223	Berry and fruit juices
A0122301	Jucie drinks, juice and nectars
A0122302	Berry and fruit juice concentrates
A0122303	Uncategorized juices
A01224	Other non-alcoholic beverages
A0122401	Vegetable juices
A0122402	Kvass and mead
A0122403	Sport drinks and other non-alcoholic beverages

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