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The Economic Effects of Healthy Eating in Sweden

An Analysis of Costs and Benefits

By

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Abstract

Diet-related diseases kill millions of people every year and pose significant costs to the economy and society. In Sweden, this is an increasingly prevalent phenomenon. However, a healthy diet can prevent this. This thesis investigates what costs and benefits there are to adopting healthy eating habits and how these effects impact the Swedish economy. This thesis finds that the costs and benefits vary in the long-, and short-run, and if they are direct or indirect. The analysis finds that healthy eating habits would generate a net benefit of 198 and 2 347 billion SEK in the short-, and long run, respectively. Not all effects are quantified but are nonetheless shown to have major economic ramifications. This thesis concludes that adhering to healthy eating habits in Sweden has a predominately positive impact on the economy and society.

Keywords: healthy eating, health, costs and benefits, Sweden, demographics, economic impact

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List of Abbreviations

DALYs	Diet-Adjusted Life Years
DRNCDs	Diet-related Non-Communicable Diseases
FHM	Folkhälsomyndigheten (Public Health Agency of Sweden)
GBD	Global Burden of Disease
ICD	International Classification of Diseases and Related Health Problems
KPP	Kostnad Per Patient (Cost Per Patient)
LVM	Livsmedelsverket (The Swedish Food Agency)
NCDs	Non-Communicable Diseases
YLDs	Years Lived with Disability

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1. Introduction

Over the past decades, malnutrition has been a significant prevalent issue worldwide. The World Health Organization (WHO) reports that the challenge with nutrition is further emphasized by now being a double burden, where both under-, and overnutrition are present (World Health Organization, 2022a). As countries have developed, food insecurity has diminished and been exchanged with food-related problems, often associated with the quality and myriad of the food supply (Popkin, 2006). As a result, diet-related concerns have become a widespread issue in industrialized countries. One major concern is that poor diets can be associated with the rising occurrence of non-communicable diseases (NCDs). NCDs are non-contagious diseases commonly provoked by poor lifestyle choices such as unhealthy eating or tobacco use. Besides having substantial health consequences, NCDs also pose a significant economic burden on societies (Candari, Cylus & Nolte, 2017). There is, however, growing evidence that adherence to a healthy diet can prevent or delay NCDs and improve overall health outcomes. Therefore, promoting healthy eating habits is becoming a priority (World Health Organization, 2020).

In Sweden, similar to many other developed countries, unhealthy eating habits are a major socioeconomic concern. Despite Sweden being known for having a healthy and sustainable food culture, obesity and other nutrition-related conditions have become an increasing problem (Adamsson et al. 2010; Livsmedelsverket, 2012). According to Folkhälsomyndigheten (2023), around 51% of the Swedish population suffer from obesity or are overweight in 2023. The Swedish Government further estimates the total costs for obesity and overweight to reach 42 billion SEK in 2030, compared to 25 billion SEK in 2016 (Regeringen & Regeringskansliet, 2020).

To account for this, the Swedish government emphasizes the urgent need to prevent suboptimal diets by assigning the mission to two government agencies, Livsmedelsverket and Folkhälsomyndigheten, to develop interventions to mitigate the negative effects of unhealthy eating habits. Their work relies on surveys and previous research on *unhealthy* eating habits. However, as healthy food consumption is the ultimate goal, it is not unreasonable to investigate the costs and benefits of *healthy* diets. Challenging much of the recent economic literature on nutrition, healthy diets have been found to not be completely relieved of external costs

(Anekwe & Rahkovsky, 2013). More attention has further been called to the mental health aspect of healthy eating, not being concerned in previous reports on healthy eating. Therefore, there is reason to question the accuracy of these estimations, suspecting some economic effects are left unaccounted for.

1.1. Aim and Research Question

The aim of this study is to identify and estimate the external socioeconomic costs and benefits of adhering to healthy eating habits in Sweden and review what economic impact they have on the Swedish economy. Gaining knowledge of this may contribute to filling the gap concerning unaccounted-for effects in current research by drawing conclusions from multiple disciplines. It may further assist policymakers in the development of effective interventions based on research that encompasses adequate costs and benefits. The following research question thus acts as a guide to fulfill the aim:

How do healthy eating habits impact the Swedish economy and society?

To answer this question, it is necessary to identify and estimate the costs and benefits of healthy eating habits, to comprehend the extent of economic ramifications. Therefore, the following sub-question is also examined:

What are the external socioeconomic costs and benefits of adhering to healthy eating habits in Sweden?

The thesis' research questions aim to examine the possible costs and benefits through which healthy eating habits have economic consequences and thereby impact the Swedish economy and society. Costs and benefits are direct or indirect and are identified using a qualitative approach. Although public health outcomes are a main concern, the thesis also considers economic effects in other sectors of society, such as education. To estimate the effects in Sweden, a quantitative element is added to the study. As such, the sub-question is first pursued and thereafter proceeded by the first proposed research question. The thesis thus aims to conduct a mixed method analysis by first identifying the costs and benefits of healthy eating

practices, and thereafter quantifying them in order to evaluate the economic outcomes. These approaches are then combined to demonstrate the total economic impact.

1.2. Scope

The research investigates both the long-, and short-term economic and societal impact of public health and nutrition, including both direct and indirect outcomes. Direct outcomes of healthy eating habits tend to be more of a financial concern, such as reduced medical costs or increased government expenditure, while the indirect outcomes are often related to societal benefits such as increased productivity, improved quality of life, and longer life expectancy. The health-related outcomes only concern problems arising directly as a result of malnutrition, meaning diet-related non-communicable diseases (DRNCDs). Malnutrition may give rise to additional health concerns arising from the DRNCDs. These are, however, not considered in the study. The rationale behind this is that it requires additional comprehensive medical research which is beyond the scope of this research.

This study specifically focuses on the contemporary effects, to provide an up-to-date analysis of the external socioeconomic costs and benefits of adhering to healthy eating. In particular, it uses data from 2019 to discount for health effects that the COVID-19 pandemic may have imposed. Furthermore, although NCDs are more prevalent among certain age and gender groups, the economic outcomes of healthy eating affect everyone equally, regardless of age or gender. Therefore, this thesis considers all age and gender groups in its analysis of the economic impacts of healthy eating habits.

The country studied in this thesis is Sweden. Sweden is a compelling country to examine as the socioeconomic outcomes of healthy eating habits are borne by the entire Swedish population. Given that healthcare services in Sweden are funded through taxes, the citizens are responsible for financing the treatment of individuals suffering from DRNCDs. Similarly, the citizens collectively enjoy the advantages of avoiding the associated costs of these diseases. With over half the population being overweight or obese, and the recent assignment of two government agencies to tackle this issue, the situation has become even more noteworthy and emphasizes the importance of the study proposed in the thesis. The current knowledge of

healthy eating habits' impact on the Swedish economy is limited and lacks perspective from multiple disciplines. Therefore, Sweden becomes an interesting country to investigate.

1.3. Structure

The structure of the thesis is as follows: The subsequent section, *background*, introduces key concepts and elemental descriptions of the current situation in Sweden. The next section, *previous research*, presents the theoretical framework of the research and relevant previous empirical literature considering economics and nutrition. Thereafter, the *methodology* outlines the procedure undertaken to conduct the research. The consecutive section, *findings*, presents the result from the research findings. These findings are discussed in the next section, *analysis and discussion*. Finally, the last section, *conclusion*, concludes the research and provides some suggestions for policymakers and future research.

2. Background

The following section provides background information relevant to emphasize the research problem. It begins by elaborating on the burden of malnutrition and thereafter investigates DRNCDs more extensively. Finally, this section provides an overview of what Sweden is currently doing to promote healthy eating habits.

2.1. Malnutrition

The burden of malnutrition in the recent decade is double. Although undernutrition in the poor regions of the world is ongoing, concerns have been raised about the increasing prevalence of overnutrition and its associated health problems (World Health Organization, 2022b). As income increases and countries advance, there is a surplus supply of food. Consequently, the composition of nutrition intake has changed in high-income economies. Individuals have migrated from consuming whole foods and instead divert to high processed foods. These are often energy dense and low in nutritional value. Overconsumption of these foods leads to energy imbalance and, subsequently, overweight and NCDs (Popkin, 2006). This problem is progressing in developed countries, where the burden of poverty-related malnutrition has been exchanged for new challenges with overnutrition. These challenges have significant economic consequences. Therefore, promoting healthy eating habits is of crucial importance. Evaluating the economic costs and benefits of encouraging healthy eating is hence an important task to undertake.

2.2. Non-Communicable Diseases Related to Diet

Non-communicable diseases (NCDs) refer to a range of medical conditions that are not contagious but often caused by lifestyle choices. These conditions include, but are not limited to, cancer, cardiovascular diseases, diabetes, obesity, and mental health issues. According to the World Health Organization, NCDs account for over 70% of all deaths globally and are estimated to be the leading cause of morbidity and premature mortality (World Health Organization, 2022c). Moreover, NCDs pose a great threat to economic and social progression by deterring fundamental drivers of development by affecting public health, labor participation rates, and productivity levels.

NCDs encompass a range of conditions caused by lifestyle factors. However, NCDs are not necessarily linked to poor diets. Modifiable risk behaviors such as smoking, high alcohol consumption, and sedentary lifestyles are also factors for acquiring NCDs (World Health Organization, n.d.a). Hence, it is relevant to differentiate those diseases that specifically arise from suboptimal diets. In this study, these are referred to as diet-related non-communicable diseases (DRNCDs).

DRNCDs put pressure on healthcare and are the source of great productivity losses. These effects have been found to have significant negative economic consequences (Candari et al. 2017). However, the economic outcomes are preventable by adopting healthy eating habits. Besides generating more health and utility on an individual level, it would lead to savings from a macro perspective. Healthier people can work longer and be more productive, as well as being more economically active. As a result, there is a repercussion of outcomes that can affect several parts of society, stimulating higher levels of economic growth. However, to achieve this, it is crucial to change our dietary patterns. It is therefore of interest to policymakers to implement interventions to promote healthy eating.

2.3. Healthy Diet and Nutrition Interventions in Sweden

In Sweden, all healthcare, aside from private clinics for specialist care, is free of charge except for a small fee paid by the patient up until a threshold (1250 SEK). It is primarily funded by the regions through local taxes and government subsidies, that are financed by income taxes (The Commonwealth Fund, 2020). The taxes are paid by the Swedish citizens and are around 30% of private income and 20% of businesses revenue. The healthcare consumed in Sweden is hence paid for by the citizens. In 2019, 11% of the total budget were allocated to healthcare. One of the biggest burdens on Swedish healthcare today is the increasing prevalence of diseases as a result of unhealthy eating habits (Folkhälsomyndigheten, 2017).

As of 2023, Sweden does not use any direct instruments to target the consumption of healthy food. The Value Added Tax (VAT) in Sweden is, on all food products, at a rate of 25% (Skatteverket, n.d.). The current work to promote healthy eating habits is primarily on publicizing information and knowledge on the benefits of preserving a healthy diet. Except for

mandatory physical education and home economics in elementary school, government agencies have had the biggest responsibility to inform consumers about food and its health impact.

The Public Health Agency of Sweden's (in Swedish: Folkhälsomyndigheten, abbreviated FHM) mission on healthy eating habits is to create the right circumstances for adhering to healthy eating habits (Folkhälsomyndigheten, 2018). Another agency tasked to prevent unhealthy eating habits is The Swedish Food Agency (in Swedish: Livsmedelsverket, abbreviated LMV). LMV has recommendations and communication support for the Swedish population, aimed to make it easier for the consumer to choose healthy options.

The dietary guidelines in Sweden are developed by LMV and are advertised by the phrase "Find your way to eat greener, not too much, and be active." (Livsmedelsverket, 2015). These guidelines are in turn based on the 2012 Nordic Nutrition Recommendations. The Nordic Nutrition Recommendations have been developed by a hundred experts in the field of nutrition and contains scientifically backed information on the daily reference value of the optimal intake of macro-and micronutrients (Livsmedelsverket, 2023). The LMV develops official dietary guidelines in Sweden, which serve as a channel for promoting healthy eating habits. Table 1 presents a summary of the recommendations. This thesis considers these recommendations as a proxy for healthy eating habits.

FHM and LMV both have other missions not related to healthy food habits. However, with respect to their work with healthy eating habits, they cooperate, and the work is not mutually exclusive, but rather synergistic. Moreover, there is ongoing work at the request of the Swedish government, where FHM and LMV have in unity been given the task to develop suggestions of interventions and indications of goals to promote and incentivize the Swedish population to eat healthier. This is expected to be finalized in January 2024.

Table 1: The Swedish Dietary Guidelines Developed by Livsmedelsverket

Recommendation	***Amount***
More vegetables and fruit	At least 500g/day
More seafood	2-3 times/week
Switch to wholemeal	70g for women & 90g for men a day
Consume healthier fat	All meals
Consume low-fat dietary products	All meals
Eat less red and processed meat	Max. 500g/week
Decrease salt intake	NA
Decrease sugar intake	NA
Maintain a balance	Not too much nor too little[1]
Look for the Keyhole Symbol	2

Source: Livsmedelsverket, 2015

[1]The Swedish concept of "lagom", meaning "just enough"

[2]National Food Agency symbol found on healthy foods approved by LMV

3. Previous Research

The following section describes previous research related to health, nutrition and economics. Throughout the thesis, some assumptions are made. First, nutrition and overall health are linked. Second, that health has economic consequences, and third, that changes in dietary patterns have economic implications. This section describes the foundation of these assumptions by exploring previous research. The first subsection investigates the assumption that health has economic consequences. The subsequent section scrutinizes the first and third assumptions which are more closely related to nutrition. These sections are later used to discuss the findings in the final section of this thesis.

3.1. Theoretical Framework

3.1.1. Endogenous Growth Theory: Background

Endogenous growth theory is an economic theory that was initially introduced on the foundation of research by Arrow (1962), Uzawa (1965), and Sidrauski (1967). The basic notion of the theory is that long-run economic growth is the result of endogenous forces, such as innovation and human capital (Grossman and Helpman, 2001; Romer, 1986; Romer, 1990). Romer (1990) argues that the economic growth rate is determined by the stock of human capital. Human capital and innovation are moreover considered to be the leading factors of increased productivity. In Romer's models (1986, 1990) human capital is defined as knowledge and education. Other perspectives on endogenous growth theory have also shed light on health. Barro (2013) suggests that health—measured by life expectancy—is an important factor for economic growth and argues that initial health is more important than initial education.

3.1.2. Economic Growth and Health

Barro (2013) introduces a theoretical model and equation to explain the effect of health on economic growth. The model illustrates the direct impact of health on economic growth, holding other variables constant. Barro includes a variable in his model that represents health capital. Health capital, he argues, can increase labor productivity by affecting a worker's energy, reliability, effort, and such. One important element of his equation is the depreciation

rate of human capital, expressed as education. Barro shows that the human capital depreciation rate is a decreasing function of health capital. That is, the higher the health capital, the lower the human capital depreciation rate. This feature has important implications when applying the model. Barro emphasizes that this allows the model to capture the depreciation of education from diseases that do not result in death. Similarly, he shows that the rate of return on health investment increases when health capital increases. This means that interventions that decrease or prevent diseases consequently increase the return rate by increasing life expectancy.

Barro's work has been complemented by other scholars. Bloom, Kuhn, and Prettner (2018) provide an extensive literature review of health and economic growth. They argue that it is difficult to come to any distinct conclusions given that the findings vary greatly. Most scholars agree that improved health has a positive effect on economic growth (except, for example, Acemoglu & Johnson, 2007), but the views on the channels through which health affects growth differ. An advantage of their review is that the authors look at health and economic growth from the perspective of both less developed and developed countries.

Unlike Barro (2013), the authors to a big extent follow the neoclassical approach. The basic setting of health and economic growth in the article is that improved health, and thus increased longevity, raises aggregate savings. The endogenous element is introduced in the framework from Romer's (1986) approach, where the returns to capital accumulation on the aggregate level are not diminishing as a result of spillovers of knowledge.

An important aspect that Bloom, Kuhn, and Prettner bring forward is the distinction between reducing mortality and morbidity in relation to economic growth. Both lead to greater labor supply and increased productivity of educational investments, but mortality reductions also result in more savings and physical capital investments.

In the setting of a developed country, they emphasize that the impact of health on economic growth differs depending on the scheme of the social security design and the specific setting of the healthcare system. Two key elements are identified as concerns. First, health improvements mostly affect the longevity of the elderly, increasing the old-age dependency ratio which can decrease consumption levels. Even though decreasing the prevalence of NCDs improves productivity, the benefits mostly apply to those who are economically inactive. Moreover, the authors point out that the productivity gains from increased health may not be

sufficient to account for the elderly's medical costs. Second, Bloom, Kuhn, and Prettner point out that the costs of advanced healthcare systems may impede economic growth instead of advancing it. However, they conclude that the consumption loss of improved health is smaller than the benefits.

Further studies have tried to summarize the theoretical approach of health and economic growth. Ridhwan et al. (2022) performed a meta-regression analysis on the effect of health on economic growth. Similar to Bloom, Kuhn and Prettner (2018), Ridhwan et al. point out that previous findings are inconsistent and at times contradictory. To solve this, the authors try to find a "mainstream" by analyzing previous studies quantitatively.

The study concludes that economically speaking, being healthy means engaging in productive actions. Better health results in better labor performance and less absenteeism and leads to a rising accumulation of skills and education. The direct economic impact of health, the authors argue, is increased productivity and decreased costs of illness. Indirectly, this also has a positive impact on family members' health which in turn generates possibilities for better health in upcoming generations. Moreover, they also emphasize that mental health is an important aspect of health, arguing that mental well-being can also increase participation in social and economic activities.

The authors' analysis is extensive, and they take different econometric approaches to summarize the findings. For example, they provide their findings presented in tables, based on different statistical methods (such as fixed effect and mixed effect). They also consider endogeneity and heterogeneity in previous studies. Other elements of the studies, such as time series and cross-sectional data and any additional factors that may contribute to economic growth are also accounted for. Ultimately, they conclude that "... health has a genuine positive effect on economic growth despite the pros and cons of previous study findings." (p. 3239). On average, they find that one additional year in life expectancy increases the rate of economic growth (here GDP) by 2,4%. Similar to Bloom, Kuhn and Prettner (2018), Ridhwan et al. (2022) point out that developed countries experience a lower effect on economic growth from health improvements, which may be due to old-age dependency. However, they conclude that countries with a better socioeconomic setting allow the benefits of health to transmit more efficiently to economic growth.

3.1.3. Economic Growth and Nutrition

As illustrated, health is a catalyst for economic growth. However, economic growth and nutrition were first introduced by Popkin (1978) who looked at the relationship between nutrition and labor productivity. Before his research, studies only considered that low income or productivity causes undernutrition. Popkin, on the other hand, found that poor nutrition can decrease labor productivity. He combined nutrition science and economics by looking at medical tests of hemoglobin levels with output-level observations of Filipino labor-intense workers. He showed that undernutrition leads to deficient work performance and fewer work hours. Consequently, the individual's income decreases, and the total net output declines. Popkin henceforth argues that enhanced nutritional health can positively impact labor productivity.

3.2. Literature Review

3.2.1. Economic Impact of Healthy Eating Habits

Previous studies have tried to estimate the impact of healthy and unhealthy eating habits. Studies from the United States find that 32 billion USD can be saved in medical costs by improving dietary habits (Reinhardt, 2019). Estimations have also been provided of productivity loss (Benjamin et al. 2019; Reinhardt, 2019). These are predominantly observing the all-risk loss of productivity. Cardiovascular diseases and diabetes summed to 243 billion USD. However, a large fraction of this is avoidable if a healthy diet is implemented (Reinhardt, Boehm & Salvador, 2021). Reinhardt, Boehm and Salvador (2021) add to this discussion by stating that individuals with DRNCDs can be more receptive to other diseases. Considering the Covid-19 pandemic, Naja and Hamadeh (2020) show that individuals with diabetes type 2 were more vulnerable to the effects of the virus. This is argued to cost the United States' government trillions of dollars.

Furthermore, Anekwe and Rahkovsky (2013) performed a literature-based analysis where they investigated the economic costs and benefits of healthy eating. Their study is based on findings from the United States. The costs are not quantified and regard microeconomic costs, such as individual opportunity and time costs. The benefits are considered on a macroeconomic level, where improved productivity, decreased morbidity, mortality, and averted medical costs are

included. They find that the economic benefits of adhering to healthy eating habits in the United States are $114,5 billion annually. The authors conclude that the costs of healthy eating are predominantly private whereas the benefits are more evenly distributed between individuals and the collective community. On the other hand, Anekwe and Rahkovsky show that increased life expectancy can be associated with healthy eating habits. Increased life expectancy has moreover been found to have negative socioeconomic implications. Weil (1997) shows these effects. He argues that by holding production and consumption constant, population aging suggests that consumption per person will decrease. This is attributed to a change in the demographic composition. Weil argues that declining mortality rates are projected to increase age-specific morbidity rates.

Considering improved nutrition is an integral component of improved health, Weil's findings may suggest that healthy eating habits impose significant external costs as well, in contrast to Anekwe and Rahkovsky's (2013) findings. Conversely, population aging is found to be largely driven by fertility declines and not mortality declines. Another issue being raised is whether increased life expectancy leads to extra healthy years or not (European Commission, 2021). Longer life leads to increased healthcare costs due to extended utilization of social protection services, such as health-and elderly care.

The extent to which the cost and benefits of healthy eating have been investigated in Sweden is limited. One report argues that unhealthy food habits cost Sweden 53 billion SEK yearly (Hjärt-Lungfonden, 2019). Other studies have, on the other hand, estimated the economic impact of diseases that are diet-related. An analysis of the costs of obesity conducted by Andersson, Eliasson, and Steen-Carlsson (2022) found that obesity, in 2016, cost Sweden 2,7 billion EUR (approximately 25 billion SEK in 2016). However, previous research has not explored the cumulative effect of healthy eating habits. Although studies have been conducted on the prevalence of some DRNCDs in Sweden by the Global Burden of Disease study for various years (Forouzanfar et al. 2016; Ng et al. 2014; Vos et al. 2016; Vos et al. 2015), research on the cumulative economic burden is unknown. Similarly, despite being suggested that improved health has economic costs, studies looking at healthy eating habits in Sweden have not identified such. Therefore, the current body of literature in Sweden on healthy eating habits exhibits a research gap.

3.2.2. Nutrition Policies

More recently the increasing problem of DRNCDs has become of more interest, and focus has been shifted to analyzing long-term effects, diet quality, and preference aspects of nutrition (Finaret & Masters, 2019). It is more common to investigate different nutrition policy interventions and instruments' effects on health status, such as subsidies, taxes, nutrition programs and education.

Previous studies have investigated the macroeconomic implications of nutrition and nutrition policy. Mounsey et al. (2020) looked at policies to decrease the prevalence of NCDs. They conducted a systematic review through a literature search on diet-related policy interventions. The authors find that in the majority of researched studies, employment was not negatively impacted and that sugar taxes were an effective intervention to decrease sales volume. However, government revenue was positive. Their findings imply that targeting nutrition through policies has no significant negative economic impact. This review shows an overview and provides a general conclusion for implementing interventions to encourage healthy eating. However, no economic analysis was conducted. This has been done by Rajgopal et al. (2002). They performed a Cost-Benefit analysis of the Expanded Food and Nutrition Education Program (EFNEP) in the United States, which is a program funded by the government that aims to support individuals to adhere to a healthy diet to prevent NCDs in the long run. By identifying the costs and benefits of the program, they found that the benefit-cost ratio was \$10,64/\$1. Hence, the EFNEP had a positive economic outcome. The authors concluded that investing tax money into nutrition programs is economically beneficial.

Further, a report from the World Bank looks at the economic and health impact of obesity. It emphasizes the controversy between policies restricting unhealthy food and the stakeholders in the food and beverage industry, as there is no general agreement on which products to restrict, as there are no recommendations for sugar intake globally (Shekar & Popkin, 2020, pp. 155-156). Moreover, implementation of these strategies and guidelines requires careful evaluation, support, and budget resources to assure the desired target is addressed and achieved.

4. Methodology

The following section presents the methodology applied to the research, including the choices and steps taken to obtain the results. It starts by describing the worldview and method of the study. Then, it illustrates the procedure utilized to collect data and compute the results. Finally, it provides considerations of limitations.

4.1. Research Design

The methodology utilized to conduct the research is navigated by the aim of this thesis. To recapitulate, the aim is to identify and estimate the external socioeconomic costs and benefits of adhering to healthy eating habits in Sweden and review what economic impact they have on the Swedish economy.

The approach to this research therefore consists of two segments, using an exploratory sequential mixed method (Creswell, 2014). This process involves two components. First, to identify the costs and benefits attributable to dietary risk. Second, to quantify the observed effects. Thus, the introductory step is qualitative and the subsequent step quantitative. The motivation behind the use of this method lies in the research problem, which suggests that some components of the effects of healthy eating have not been considered before in an economic setting, thus requiring a qualitative element to investigate these features from multiple disciplines. To thereafter observe the economic impact, the research calls for a quantitative component. By doing this, the study obtains a more comprehensive and exhaustive understanding of the proposed research questions.

The undertaken perspective of this study is based on the pragmatic worldview. The pragmatic worldview is based on practical considerations instead of theoretical ones. According to Creswell (2014), it resonates with the mixed method approach. It applies to the thesis because it focuses on the outcomes of healthy eating habits in practice, rather than theoretical findings. This is further emphasized by the approach taken as it employs both qualitative and quantitative procedures to gain an understanding of the effects. It is the research problem rather than the underlying theory that is of importance.

4.2. Qualitative Element

To identify costs and benefits, the study takes a qualitative approach by doing a content analysis of previous economic research and nutritional science. This choice is based on the nature of the research problem, namely, that some effects may not have been accounted for. Taking a qualitative approach authorizes exploring these effects in a broader context. This is employed by doing a narrative review of the literature. The rationale for employing a narrative analysis is that it allows for a descriptive-based summary of the literature and identifies key patterns (Demiris, Washington & Parker Oliver, 2019). With regard to the research problem of this study, the analysis extracts literature from both economics and nutritional science, which henceforth requires an open approach without predetermined bias of possible findings, such as applying keywords. For the studies to be assumed relevant for the analysis, they must comply with the selection criteria presented in Table 2.

The findings of the qualitative analysis present both direct and indirect effects. Direct effects are those that can be directly attributed to a specific activity whereas indirect effects are effects not explicit for a particular project or activity but arising as a consequence of it (National Institutes of Health, 2022). Moreover, the qualitative study accounts for long-, and short-term effects. This is done to accommodate the unique characteristics of the effects. Meaning, some effects may not be actualized immediately and therefore cannot be compared to the effects that are. This is, however, distinct from indirect and direct effects as indirect does not necessarily mean they are not immediately realized.

Because of biological limitations, increases in health are conditional. Meaning, increased life expectancy must reasonably have a limit. In other words, adherence to healthy eating habits has marginal diminishing returns. The savings accumulated still transpire and can be reallocated to other causes, however, the indirect effects deflate after the reached timeframe and thereafter stay constant.

This research uses estimations from a study conducted by Fadnes et al. (2022) to determine this limit. To the author's knowledge, it is the only identified study that has provided an estimate of the cumulative effect of improved nutrition. This source meets the qualifications based on the selection criteria in Table 2 and is therefore chosen for the estimate. The article

presents different estimations for increased life expectancy, showing various estimations based on at what age the diet is implemented. This research considers the estimate that regards the numerical increase in life expectancy when adhering to it at the age of 20. Age 20 is chosen because the analysis assumes all costs and benefits are realized simultaneously without time lags. For women and men, the increase in life expectancy is estimated to be 10,7 and 13 years, respectively. Given that this research considers both men and women, this value is averaged to 11,85 years.

Table 2: Selection Criteria for Content Analysis of Qualitative Study

Selection criteria	
Type of source	Published, peer-reviewed
Timeframe	Present
Setting	Developed economy or global
Definition of Healthy Eating	Similar to Sweden's dietary recommendations
Gender studied	Females and males
Level of Study	Macro-level

4.3. Quantitative Element

The approach to compute the costs and benefits of healthy eating habits is of quantitative nature, with an exception for the indirect costs. Employing this approach is heterogeneous and the distinct costs and benefits require different processes. These processes are presented in the subsequent sections. Analogous to the qualitative element, the effects are presented as direct or indirect on a long or short-term basis. All computations are made in Excel to minimize estimation bias. To capture the ratio of the total costs and benefits, the direct and indirect benefits are compared with the direct and indirect costs in both the short-and long run.

4.3.1. Direct Benefits

The direct benefits are estimated from primary data obtained from the cost per patient (kostnad per patient in Swedish, abbreviated KPP) database provided by the Swedish Association of Local Authorities and Regions (Sveriges Kommuner och Regioner, 2023). The KPP database is a database that contains cost declarations for somatic and mental healthcare in Sweden. It includes costs from inpatient, outpatient, primary and day healthcare. In the analysis, the medical costs are compiled from inpatient, outpatient, and daytime healthcare. Primary healthcare is not included due to data protection regulations. The KPP database provides information on the total number of contacts, total cost, and the average cost for all the different reasons that healthcare is consumed in Sweden.

The cost per patient data is possible to extract due to the use of the International Classification of Diseases and Related Health Problems (ICD) coding system. ICD is used as a medical classification system that codes and catalogs medical diagnoses in healthcare. Sweden uses the tenth version of the ICD, namely ICD-10-SE. The codes are alphanumeric and consist of up to seven characters, where the first is a letter, the second to sixth a number, and the seventh is either a letter or number (Socialstyrelsen, 2018). See Appendix A for a description of how the diseases are coded and their associated costs.

The costs can be related to a specific disease because the diagnoses set on a patient, meaning the different ICD-10-SE coded to one medical visit, generate a specific sum of money that the region will pay to the healthcare provider. The amount is based on how many DRG (Diagnosis-related groups) points a diagnosis has. DRG is a standardized system used to categorize healthcare contacts with similar diagnoses and resource utilization into one group for payment purposes. The DRGs are deployed for the reimbursement hospitals receive for the services they provide. DRG points are weighted, meaning that higher costs are related to a higher DRG point (Socialstyrelsen, 2019). For example, setting one diagnosis of diabetes type 2 on a patient from a doctor's visit would, on average in inpatient care, generate 1,021 DRG points. This would in turn translate into a specific sum of money that the region pays the healthcare provider. This payment rate is based on historical data and averages. As stated in section 2.3, this is funded

through income taxes in Sweden. The KPP database consists of cumulative, pre-compiled data on the costs associated with the DRG points. Hence, this thesis does not use DRG points to calculate the costs, as this has already been composed in the KPP database. The advantage of the KPP database is that it shows the cost per patient and not per person, meaning that an individual who seeks medical care for a condition twice will be diagnosed twice. The significance of this is that all medical care a person consumes is accounted for.

All data needed for healthcare costs for the DRNCDs in the analysis is obtained from the KPP database. In order to extract relevant data, the analysis requires information on the diseases associated with dietary risk (the DRNCDs) and their associated ICD-10-SE codes. The DRNCDs are identified by the qualitative analysis described in section 4.2. The ICD-10-SE codes associated with each disease are defined on the National Board of Health and Welfare's website (Socialstyrelsen, n.d.). Their search function allows one to browse for search words to acquire the right code(s) for each disease. To assure the correct code is used, another general internet search is conducted to examine other sources and ensure that they match with the codes indicated at Socialstyrelsen.

Data on the fraction of the DRNCDs attributable to diet is thereafter needed. This data is difficult to acquire as no studies, to the author's knowledge, have isolated the cumulative risk of unhealthy eating, but rather look at how specific diets, such as low in fruit or high in sodium, affect the prevalence of diseases. However, to overcome this obstacle, data on years lived with disability (YLDs) is utilized. This data can be found in the Global Burden of Diseases (GBD) database (IHME, 2014). The GBD database provides a thorough overview of mortality and disability across countries and time periods. It is also possible to extract data on risk factors and to what extent they induce diseases. Here, the percentage of YLDs attributable to dietary risk is retrieved.

The main advantage of this approach is that it allows for a standardized way of measuring the burden of disease caused by different risk factors, including an unhealthy diet. YLDs take into account both the number of people affected by a particular disease and the severity of the disability caused by that disease (World Health Organization, n.d.b). One potential drawback of this approach is that it relies on estimates of the proportion of each disease that is caused by an unhealthy diet. These estimates can be uncertain and may vary depending on the population being studied and the methods used to estimate them. However, the data is obtained from the

GBD database, which is a well-recognized database used in previous studies and recognized by the Swedish Food Agency (Livsmedelsverket, 2022). The YLDs are therefore used as a proxy for dietary risk for the direct benefits.

While acknowledging it is not an exact translation, using YLDs to measure the contribution of unhealthy eating habits to a disease shows the extent to which they contribute to economically inactive years. If everyone had an optimal diet, this fraction of YLDs would not exist. Thus, YLDs can be used as an estimate of the frequency of DRNCDs caused by unhealthy eating. It is important to note that this approach assumes YLDs reflect healthcare consumption.

The direct benefits are calculated by multiplying the observed associated cost found in the KPP database with the identified percentage of dietary risk (YLDs). Equation 1 illustrates this.

Equation 1

$$\text{Cost attributable to dietary risk} = \text{\% of YDLs attributable to dietary risk} \times \text{Total cost for disease, obtained from KPP database}$$

4.3.2. Direct Costs

The direct costs associated with healthy eating are collected from the European Union 2021 aging report (European Commission, 2021). The report is an institutional paper issued by the European Union (EU) and provides estimations of the projected financial consequences of an aging population. This thesis assumes that the population ages because of improved health. The selection of this estimation is based on the credibility of the source. It is published on the European Commission webpage, which is an official website of the EU. The European Commission's work is to investigate specific policies, thus requiring adequate and credible research. This report is therefore assumed to be a credible data source for the estimations.

To obtain data on the costs attributable to dietary risk, this research uses the estimate of increased life expectancy attributable to healthy eating habits. As described in section 4.2., this value is 11,85 years. This is in turn translated into a percentage increase based on Sweden’s 2019 life expectancy (LE) value, 83 years, obtained from the World Bank (2022). Equation 2.1.

shows how this is calculated and Equation 2.2. provides the value obtained. This percentage increase is 14,27% and establishes the value for the proportion of increased age-related spending attributable to improvements in nutrition.

Equation 2.1

$$\text{Percentage increase in LE} = \frac{(Sweden's\ LE\ in\ 2019 + Estimated\ increase\ in\ LE)}{Sweden's\ LE\ in\ 2019}$$

Equation 2.2

$$14{,}27\% = \frac{(83 + 11{,}85)}{83}$$

The estimation moreover uses GDP to calculate the direct costs. The data for the Swedish GDP is obtained from the world bank (World Bank, n.d.). It is measured in constant PPP 2017 international dollars. As the direct benefits (see section 4.3.1.) are based on 2019 SEK, the measurement of GDP obtained from the World Bank needs to be adjusted. This is done by using the conversion rate of constant 2017 international dollars to SEK in 2019 (OECD, 2021) and multiplying by the reported GDP of 2019 in 2017 international dollars. Equation 3.1. shows the calculation made to obtain the value of GDP in 2019. Equation 3.2. shows the estimated GDP used in this thesis.

Equation 3.1

$$GDP\ in\ 2019\ SEK\ =$$
$$2019\ GDP, expressed\ in\ 2017\ international\ dollars\ \times\ International\ 2017\ dollars$$

Equation 3.2

$$4\ 769{,}73 = 543{,}25\ \times\ 8{,}78$$

Where 543,25 is the World Bank's estimation of Sweden's GDP in 2019, expressed in PPP constant 2017 international dollars and 8,78 is the value of 2017 international dollars in 2019 (International Monetary Fund, n.d.). The value for 2019 GDP used in the analysis is henceforth 4 769,73 billion SEK.

The direct costs are henceforth calculated by multiplying the projected GDP expenditure on age-related expenditure with the disclosed percentage increase in life expectancy due to healthy eating habits. Equation 4 shows the computation. This value shows the proportion of age-related spending that is due to adhering to an optimal diet.

Equation 4

Increase in age related spending =

Projected future GDP expenditure on age related spending × Percentage increase in LE, 14,27%

4.3.3. Indirect Benefits

The data used to calculate the indirect benefits is obtained from the GBD database and GDP per capita. GDP per capita measurement is obtained from the World Bank (n.d.) and is expressed in 2019 SEK. To estimate the indirect effects attributable to dietary risk, this research uses disability-adjusted life years (DALYs). DALYs are a sum of years of life lost as a result of premature deaths (YLLs) and years lived with a disability (YDLs) as a result of suffering from an illness. One DALY represents losing one year of optimal health. DALYs, therefore, illustrate the total burden of disease, combining morbidity and mortality. If total DALYs were zero, the health status of the population would be optimal (World Health Organization, n.d.c). The DALYs attributable to dietary risk are obtained from the GBD database.

In economics, DALYs are commonly used to measure the economic burden of disease. In this analysis, the number of DALYs attributable to dietary risk for each identified DRNCD is used. One DALY averted is estimated to represent one GDP per capita (Brown, 2008). Thus, a DALY illustrates the output lost due to disease. In the context of this research, this is used to compute the avoided lost output from DRNCDs from adhering to healthy eating habits. The estimation of indirect benefits uses the *number* of DALYs and not the percentage because one DALY represents a one-year loss of being economically active (meaning, one GDP per capita), hence showing output averted if healthy eating habits are adhered to.

The indirect benefits are calculated by multiplying the number of DALYs attributable to dietary risk for each disease with GDP per capita. Equation 5 illustrates this computation.

Equation 5

$$Output\ averted = DALYs\ attributable\ to\ dietary\ risk \times GDP/capita$$

4.3.4. Indirect Costs

The indirect costs in the analysis are not quantified. This is due to the unavailability of data. Instead, the thesis provides estimates from previous research. The collection of these estimations is conducted in accordance with the procedure of identifying the indirect costs as described in section 4.3. All estimations are projections, given that the indirect costs are long-term.

4.4. Presenting the Result

The final quantifiable estimates are presented in a table. These are categorized into direct and indirect benefits and costs. The table summarizes the total direct effects and indirect effects separately, as well as shows the ultimate augmented effect of healthy eating habits. The study accounts for possible differences in short-and long-term effects by presenting two separate estimations. The short-term effects are the ones actualized in an instant, disregarding temporal delays, under the assumption that the entire population adopts an optimal diet immediately. These are assessed on an annual basis. In other words, if healthy eating habits are adopted at the start of the year, the estimated short-term effects are those that would be disclosed at the end of the year.

In contrast, the long-term effects are regarded on an 11,85-year timeframe. The rationale behind choosing this for long-term effects is that the study assumes that if healthy eating habits are adopted today, the long-term effects would be manifested after 11,85 years, which is projected to be the increase in life expectancy, as described in section 4.2. For the effects that are identified as being long-term, the corresponding short-term effects are derived by dividing the long-term effects by 11,85. Similarly, the long-term effects of annualized impacts are computed by multiplying the short-term effects by 11,85. The computation of estimates for indirect effects that surpass the 11,85-year timeframe is shown in Equation 6. They are divided by the previous study's proposed timeframe and multiplied by 11,85 to receive the 11,85-year change.

Equation 6

$$Effect\ in\ 11{,}85\ years = \left(\frac{Identified\ Estimate}{Study's\ timeframe}\right) \times\ 11{,}85$$

4.5. Limitations

This section points out the limitations of the study and what efforts have been made to minimize inadequate results. One limitation is that not all costs and benefits have been captured or accurately measured in the data collection procedure, causing the estimations to be inaccurate. First, it concerns the direct benefits. The costs of medical care are based on the KPP database and the percentage of YLDs that are due to dietary habits. The costs from the KPP database, based on the diagnosis set, are chosen based on the author's knowledge and understanding of the diseases' codes. Although experience in working with the codes exists, no formal education has been given on how to handle the codes or how diagnoses are set. Therefore, there is a possibility that some diseases are wrongly coded and hence associated with incorrect costs. However, this shortcoming is minimized by acquiring as much knowledge as possible on how to use the codes. Moreover, the codes and their respective diseases are controlled by looking at other studies' coding of the diseases.

Second, the long-term indirect effects are challenging to measure, and may thus inaccurately portray the real effect. The extent to which health (driven by improved nutrition), productivity and population aging affect economic growth is frequently debated and there exist several variations of the estimations (Ridhwan et al. 2022). Some scholars argue that it has no effect at all (Acemoglu & Johnson, 2007). Thus, providing an estimate that is widely recognized is troublesome, and capturing the real indirect effect of improved nutrition is complex. Some indirect effects are difficult to put an economic value to, but nonetheless can have economic implications, such as improved self-esteem (Drago, 2011). The indirect effects may in turn have additional fallouts, which can have either positive or negative economic implications. Therefore, some effects may be unaccounted for. These shortcomings are minimized to the biggest extent possible by using well-recognized sources and attempting to identify the effects based on previous research. However, it is acknowledged that not all long-term indirect effects are accounted for.

Third, it is important to acknowledge that the assumptions made may lead to results that are biased. The results are based on that healthy eating increases life by 11,85 years. This is, however, an estimate and not a true value, indicating that the quantified costs and benefits may be under-or overestimated. On the other hand, this is only true for the long-term effects. The annual effects would exhibit the same estimates regardless of the timeframe considered. Further, the analysis assumes that healthy eating is fully adhered to immediately, exhibiting all effects simultaneously. This is unrealistic, given healthy foods are not available to all due to socioeconomic inequalities. The analysis may therefore provide misleading estimates. However, this is assumed to simplify the analysis. The results could instead be interpreted as the effects manifesting in a future setting where the obstacles to adopting healthy eating habits have been eradicated.

5. Findings

The following section presents the findings of the conducted research and interprets the results. The results presented below show the identified and estimated long-, and short-term effects of healthy eating. Sections 5.1-5.4. demonstrate the identified and estimated effects. The last subsection, 5.5., summarizes the observed effects. The estimations are based on 2019 values. Short-term is the annual effects, whereas the long-term effects are projected on an 11,85-year timeframe (see section 4.2. for explanation). All findings are considered as being actualized immediately without temporal delays. The rate of change is assumed to be homogenous every year.

5.1. Direct Benefits

The qualitative review of the literature finds that the direct benefits of healthy eating are the avoided medical costs of diseases that are associated with poor eating habits (Anekwe & Rahkovsky, 2013; Rajgopal et al. 2002), namely, diet-related non-communicable diseases. The majority of literature considers somatic diseases. Afshin et al. (2019) identify cardiovascular diseases, diabetes mellitus type 2, and neoplasms as DRNCDs. The Global Disease Burden Database (IHME, 2014) also identifies chronic kidney diseases as DRNCDs. Moreover, obesity and overweight are DRNCDs commonly identified (World Health Organization, 2022a). The DRNCDs are not inherently caused by suboptimal diet, but rather a fraction of the identified diseases is attributable to dietary risk. The diseases are found to be broadly summarized, and they encompass a wide range of sub-diseases (IHME, 2014).

In addition, the review finds that suboptimal diets can be linked to mental health problems. Studies have found that diet and mental health are correlated (Barthels, Barrada & Roncero, 2019; Jacka, 2016). The mental health DRNCDs are behavioral-disordered consumption of nutrition and may include under-and overeating. These can manifest as somatic (physical) and/or psychological diseases (Barakat et al. 2023). All cases of disordered eating are attributable to dietary risk factors, unlike previously identified disabilities. While genetics can predispose a person to be underweight, the active restriction or overconsumption of food is a component of the disorder itself.

The summarized somatic and psychological DRNCDs identified and their associated percentage of dietary risks are presented in Table 3.

Table 3: Direct Benefits of Healthy Eating illustrated as Diet-related Non-Communicable Diseases and their Associated Percentage of Dietary Risk

Disability	***Diseases included***	***% attributable to dietary risk***
Cardiovascular diseases	Subarachnoid hemorrhage Intracerebral hemorrhage Ischemic stroke Hypertensive heart disease Atrial fibrillation and flutter Other cardiovascular and circulatory diseases Other cardiomyopathy Endocarditis Non-rheumatic calcific aortic valve disease Peripheral artery disease Rheumatic heart disease	22,80%
Obesity and overweight	All types	100,00%
Disordered eating (somatic)	All types (including diseases related to micro-and macro nutrient deficiencies)	100,00%
Disordered eating (psychological)	All types (including diseases related to micro-and macro nutrient deficiencies)	100,00%
Neoplasms	Colon and rectum cancer Esophageal cancer Stomach cancer Breast cancer Tracheal, bronchus, and lung cancer	5,24%
Diabetes mellitus type 2	All types	34,53%
Chronic kidney disease	Chronic kidney disease due to diabetes mellitus type 2 Chronic kidney disease due to hypertension Chronic kidney disease due to diabetes mellitus type 1 Chronic kidney disease due to other and unspecified causes Chronic kidney disease due to glomerulonephritis	3,81%

Source: Global Disease of Burden Database [accessed 5 April 2023]

The estimations for direct benefits are presented in Table 4. The total amount that could be saved from having an optimal diet is 6,9 billion SEK. Cardiovascular diseases account for the most significant costs, indicating that these would accommodate for the biggest savings if the diet was optimal. This finding is interesting, as unhealthy eating most commonly is associated

with obesity. We would expect that obesity, therefore, accounts for the biggest costs. These results, on the other hand, find that the costs are thirteen times larger for diet-related cardiovascular diseases. Another noteworthy finding is that the costs for behavioral-disordered eating are larger than the costs for diabetes. If the somatic and psychological disordered eating costs are summed, these would account for a larger cost than obesity, 0,6 and 0,42 billion SEK, respectively. They are also found to be more frequent than obesity.

It is moreover discovered that although diabetes accounts for the largest percentage attributable to dietary risk, it is associated with the second to last smallest cost. It would be expected that the diseases most attributable to dietary risk would be associated with the largest costs. The findings here indicate that this is not true. However, one possible explanation for this is that there are fewer instances in the total prevalence of diabetes. It may also be that the average direct medical costs are lower for treating diabetes type 2.

Table 4: The Direct Benefits of Healthy Eating Habits, expressed in billions of SEK, 2019

Disease	***% attributable to dietary risk***	***Number of contacts with healthcare***	***Total cost of disease (in billions of SEK)***	***Cost due to dietary risk (in billions of SEK)***
(1)	*(2)*	*(3)*	*(4)*	*(5) = (2) * (4)*
Cardiovascular diseases	22,80%	1 006 571	24,34	5,55
Obesity & overweight	100%[1]	72 347	0,42	0,42
Disordered eating (phycological)	100,00%	33 549	0,37	0,37
Disordered eating (somatic)	100,00%	92 905	0,23	0,23
Neoplasms	5,24%	307 647	4,13	0,22
Diabetes mellitus type 2	34,53%	125 802	0,29	0,29
Chronic kidney disease	3,81%	25 345	0,12	0,0045
Total		***1 664 166***	***29,90***	***6,90***

Source: (1) GBD database; (3, 4) KPP database, see Appendix A; (5) Author's calculations, see Equation 1

[1]Obtained costs exclude obesity caused by medication & other non-diet related cases

5.2. Direct Costs

The content analysis of the literature finds that the direct costs associated with healthy eating are the increases in age-related spending. Anekwe and Rahkovsky (2013) concluded that healthy eating habits increase life expectancy, which can induce greater costs because of a rising prevalence of age-related diseases. A report from the EU finds that longer life also

increases expenditure on pensions, long-term care, and education (European Commission, 2021). Improvements in public health outcomes can alter the demographic composition of the population and, as a result, have economic implications. In developed economies, such changes primarily affect the elderly population, which can lead to an increase in longevity. However, this extension of life expectancy implies that the expenses related to aging individuals would rise (Anekwe & Rahkovsky, 2013). Therefore, expenditures associated with age-related healthcare appoint a direct cost of healthy eating habits.

The estimations of the direct costs are presented in Table 5. Column (A) illustrates the present scenario where diet is suboptimal, and column (B) is a projection of the future where diet is optimal. Column (C) shows the change between the present and future value. As found by Fadnes et al (2022), an optimal diet would increase life expectancy by 11,85 years, which corresponds to a 14,27% increase in life expectancy relative to the value of 2019. This percentage is thus the fraction of increased age-related spending attributable to improved diet. If an optimal diet is adhered to immediately, it translates to a cost of 164,7 billion SEK that is attributable to an optimal diet after 11,85 years, as illustrated in column (B), row (5).

Table 5 : The Direct Costs of Healthy Eating Habits in 2019, expressed in billions of SEK

Scenario		***Present value*** *Suboptimal diet (A)*	***Future value*** *Optimal diet (B)*	***Change*** *(C)*
GDP	*(1)*	4 769,7	4 769,7	-
% of GDP allocated to age-related spending	*(2)*	24,10%	24,20%	0,1 percentage points
Age-related spending, total of GDP, suboptimal diet	*(3) = (1) * (2)*	1 150	1 154	4,77
Fraction attributable to improved diet[1]	*(4)*	0,00%	14,27%	14,27%
Age-related spending attributable to optimal diet (present value)	*(5) = (3) * (4)*	0,00	164,7	164,7

Source: (2) European Commission, 2021; (1, 4, 5) Author's calculations, see Equation 3.2, 2.2 & 4

[1]Based on Fadnes et al. (2022) estimations of an 11,85-year increase in LE

5.3. Indirect Benefits

The review of previous studies uncovers that the indirect benefits of healthy eating are similar to those of improved health (Anekew & Rahkovsky, 2013). Improved nutrition is demonstrated to promote health has both short-and long-term indirect effects. The short-term indirect benefit is the avoided loss of output, meaning GDP per capita, resulting from mitigated absenteeism. These effects vary depending on the disease, which are the same diseases as identified in section 5.1. Consistent with the direct benefits, the observed effects are not inherent to dietary risk, but a specific proportion is. The long-term indirect benefits are the productivity gains accrued from increased life expectancy and improved work (Rajgopal et al. 2002). A study by Ridhwan et al. (2022) moreover observes the relationship between health and economic growth. The study shows, unlike the traditional view of health, that mental well-being is an important integral component of health.

In addition, indirect benefits could be identified by Lock et al. (2010). They state that following the recommendations would lead to a sizable decrease in the consumption of food products that are regarded as unhealthy. On the other hand, the sales of healthy foods such as fruits and vegetables would increase substantially. The authors performed an analysis where they show the effect of three shocks from dietary changes, reduce all consumption from meat products (1), from dietary products (2), or all animal produce (3). Their results showed that the most palpable effects are seen in increased labor supply, increased labor productivity, and various consumption changes of agricultural products. The former two are due to mortality respectively morbidity declines, whereas the latter is due to changed consumption patterns.

A summary of the indirect benefits identified is presented in Table 6. The diseases are the same as for the direct benefits (see Table 3).

Table 6: Short-, and Long-term Indirect Benefits of Healthy Eating

Time	***Outcome***
Short-term	Output averted
Long-term	Productivity gain (increased life expectancy) Productivity gain (improved work performance) Increased labor supply Consumption change (increase)

Source: Anekwe & Rahkovsky, 2013; Lock et al. 2010; Rajgopal et al. 2002; Ridhwan et al. 2022

The findings of the quantifiable indirect benefits are presented in Table 7. For Sweden, it is found that the annual DALYs for all identified diseases in section 5.1.1. are 445 044,19. The total cost for the DALYs is 205 billion SEK per year. In other words, this is the cumulative sum that would be added to aggregate output if DALYs attributable to dietary risk are zero. Hence, if the diet is optimal, 445 000 DALYs are averted, and 205 billion SEK gained. Holding all

other things constant, it would mean that the Swedish GDP increased by 205 billion SEK. In the long run (11,85 years), this would result in increased output of 2 430 billion SEK.

In contrast to the direct benefits, obesity accounts for the largest output averted. It is also the illness with most DALYs. Another dissimilarity from the direct benefits is that disordered eating accounts for a smaller proportion of the total costs for indirect benefits. The results also find that the indirect benefits have a smaller dispersion than the direct benefits. Moreover, the study finds unquantifiable indirect long-term benefits and the estimates are presented in Table 8. The only estimate found is on productivity increase, which showed that productivity per hour would increase, on average 1,4% on an annual basis (European Commission, 2021, p.354). In 11,85 years, this would mean a 16,59% productivity increase per hour, per worker. These, however, have no found fraction attributable to dietary risk.

Table 7: The Indirect Benefits of Healthy Eating Habits, 2019

Disease	***DALYS attributable to dietary risk (number)***	***GDP/capita***	***Total output gained from DALYs averted***
(1)	***(2)***	***(3)***	***(4) = (2) * (3)***
Obesity & overweight	210 328,80	460 860,72	96 932 282 205
Cardiovascular diseases	167 611,64	460 860,72	77 245 621 091
Diabetes mellitus type 2	29 323,47	460 860,72	13 514 035 497
Neoplasms	27 151,62	460 860,72	12 513 115 142
Disordered eating	9 378,55	460 860,72	4 322 205 305,56
Chronic kidney disease	1 250,11	460 860,72	576 126 595
Total	***445 044,19***		***205 103 385 835***

Source: (1, 2) GBD database; (3) World Bank, n.d.; (4) See Equation 5

Table 8: Unquantified Indirect Benefits of Healthy Eating Habits

Effect	*Outcome*	*% Change*	*% attributable to dietary risk*
Indirect Benefits	Productivity gain (increased life expectancy & work performance)	16,59%[1]	NA
	Increased labor supply	NA	NA
	Consumption change (increase)	NA	NA

Source: European Commission, 2021

[1]See Equation 6

5.4. Indirect Costs

The indirect costs associated with healthy eating are identified as a fraction of the indirect costs associated with improved health. These are all long-term. Bloom, Kuhn and Prettner (2018) show that improved health can be associated with indirect costs in developed countries. The analysis finds that better public health requires advanced healthcare systems, which can be costly. Further, improved longevity because of health developments primarily affects the elderly, henceforth increasing the old-age dependency ratio, and declining aggregate consumption levels. The identified indirect costs are presented in Table 9.

Table 9: Indirect Costs Associated with Healthy Eating Habits

Time	*Indirect cost*
Long-term	Increased prevalence of age-related disabilities
Long-term	Decreased consumption
Long-term	Advanced healthcare systems
Long-term	Decreased workforce rate (increased old-age dependency ratio)
Long-term	Decreased aggregate output

Source: Bloom, Kuhn & Prettner, 2018; Weil, 1997

The findings for the indirect costs are presented in Table 10. No estimations of the percentage of indirect costs attributable to an optimal diet are found. Meaning, the costs of population aging due to better nutrition cannot be quantified. However, some country-specific estimates due to population aging of the identified costs could be obtained. The aging report from the EU shows that over 51 years (2019-2070), the share of the working-age population would decrease by 10%. For the 11,85-year timeframe in this analysis, that would mean a decrease of 2,32% (0,2% annually). Furthermore, the analysis of estimates on consumption levels found that over 11,85 years, consumption would decrease by 7,1%.

Table 10: The Indirect Costs of Healthy Eating Habits, 2019

Indirect cost	***Change due to population aging***	***% attributable to optimal diet***
Increased prevalence of age-related disabilities	NA	NA
Decreased consumption (of GDP)	7,10%	NA
Advanced healthcare systems	NA	NA
Decreased workforce rate	-2,32%[1]	NA

Source: EU aging report (2021); Weil (1997)

[1]Author's calculations, see Equation 6

5.5. Total Effect of Adhering to Healthy Eating Habits

All identified effects can be found in Table 11. The results show that the costs and benefits identified can either be short-term or long-term. Direct benefits and costs are unchanging over the long run, meaning that the averted medical costs are annual and over time imply how much

the government has saved from healthy eating habits. The indirect effects, on the other hand, are found to impact productivity and would therefore influence aggregate output.

Table 11: All Identified Effects of Healthy Eating

Type	***Effect***	***Short-term***	***Long-term***
Direct	Costs	Increased old-age spending	Increased old-age spending
	Benefits	Medical costs averted	Medical costs averted
Indirect	Costs	*NA*	Increased life expectancy, advanced healthcare systems, improved longevity
	Benefits	Output loss averted	Productivity gains, changed consumption patterns, increased labor supply

Source: Author's findings, see sections 5.1-5.4

Table 12 presents the total effect of adhering to healthy eating habits in Sweden. Both the short and long-term effects are found to be positive, yielding a net benefit of 198 and 2 347 billion SEK, respectively. Short-term effects indicate that if all individuals are to adhere to an optimal diet today, disregarding lags on the effects, the net benefit would be manifested. The long-term effects are those in place after the 11,85-year projected life expectancy increase.

The results show that the total direct effects on healthy eating habits are negative, with a net cost of 7 respectively 83 billion SEK in the short (annual) and long run. This implies that the increase in age-related spending is projected to surpass the savings from medical costs. When accounting for the indirect benefits, the total effect is positive. On the other hand, the indirect costs are not quantified, meaning that the real net effect cannot be captured. However, long-term unquantifiable indirect benefits were identified in section 5.3. These are presented in Table

13. These should be interpreted as additional effects needed to be considered to comprehend the real effect of adopting healthy eating habits.

Table 12: Estimation of Total Cost and Benefits of Healthy Eating in 2019, expressed in billions of SEK

Type	***Effect***	***Short-term***	***Long-term***
Direct	Cost	-13,9[1]	-164,72
	Benefit	6,90	81,7[2]
Total direct effect		-7,00	-83,01
Indirect	Cost	*NA*	Unquantified[3]
	Benefit	205,10	2430,48[4]
Total indirect effect		205,10	2 430,48
Total effect		***198,10***	***2 347,47***

Source: Author's calculations, see sections 5.1-5.4

[1]Long-term costs divided by 11,85

[2]Short-term benefits multiplied by 11,85

[3]See Table 13

[4]Short-term benefits multiplied by 11,85; See Table 13 for unquantified effects

Table 13: Unquantified Costs and Benefits of Healthy Eating Habits

Effect	***Outcome***	***% Change***
Benefits	Productivity gain (increased life expectancy & work performance)	16,59%
	Increased labor supply	
	Consumption change (increase)	
Costs	Decreased consumption	-7,1%
	Decreased workforce rate	-2,32%
	Advanced healthcare systems	
	Increased prevalence of age-related disabilities	

Source: Author's findings, see sections 5.3-5.4

6. Analysis and Discussion

The following sections discuss the findings from section 5. It begins by reviewing the effects of healthy eating in section 6.1., and thereafter considers the long-term economic impact of adherence to healthy eating habits in Sweden in section 6.2. The section attempts to answer the research questions proposed and fulfill the aim. Furthermore, it emphasizes the contribution of the study to existing knowledge.

6.1. What are the external socioeconomic costs and benefits of adhering to healthy eating habits in Sweden?

The net external socioeconomic costs and benefits of adhering to healthy eating habits in Sweden are positive but have various implications. The direct effects would be manifested as savings, whereas the indirect effects would affect aggregate output. This is because the direct effects do not imply any increases in output, but the effects would be accumulated and reallocated to finance other public sectors. These are found to be negative. This observation diverges from previous studies insofar as none of the studies presented in section 3.2. have exhibited that the direct effect of healthy eating is negative, or in other words, that the direct effect of unhealthy eating is not positive. The existing empirical literature provides no distinct estimates on the direct versus indirect effects of healthy eating habits. The analysis of this study accounts for this shortcoming. This finding carries significant implications, highlighting that reallocating the savings derived from decreased medical costs towards age-related expenditure does not suffice to cover the anticipated future expenses pertinent to the elderly.

The quantifiable indirect long-term effects (averted output), in contrast, would generate a change in aggregate output, since the results illustrate the detrimental output due to unhealthy eating habits. As demonstrated in Table 12, this value exceeds the direct effects considerably. Similarly, all non-quantified effects presented in Table 13 would have long-term effects on aggregate output. These are discussed in section 6.2. This thus implies that the effect on economic growth of healthy eating can be explained by the indirect effects. Therefore, despite the results demonstrating that the cumulative direct effects of adhering to healthy eating habits are negative, this would have no direct negative effect on economic growth.

6.2. How do healthy eating habits impact the Swedish economy and society?

Results obtained from the analysis have, according to the theoretical framework and previous empirical studies, socioeconomic ramifications. Nutritional improvements have been found to generate better overall health (Anekwe & Rahkovsky, 2013). An optimal diet would translate to eradicating a significant fraction of non-communicable diseases. The prevention of NCDs would in turn manifest repercussions, as presented in Table 11, 12 and 13. The identified effects are quite consistent with previous literature. Most notable are the averted medical costs and productivity gains found, which have been emphasized in existing research as well (Anekew & Rahkovsky, 2013; Rajgopal et al. 2002; Reinhardt 2019). The findings distinct from other studies, however, are the relative importance of behavioral-disordered eating (mental health DRNCDs) and the costs of healthy eating habits. These have not before been recognized and have important implications.

On the one hand, total mental health DRNCDs (named "disordered eating" in Table 3) are found to be associated with averted medical costs larger than diabetes. Diabetes has commonly been identified as a costly effect of suboptimal diets, whereas mental health has not before been considered. Given this, it may indicate that previous estimations on the benefits of healthy eating (or the costs of unhealthy eating) have been underestimated. On the other hand, the study identifies costs associated with healthy eating. The direct costs (age-related spending) are considerably larger than the direct benefits (averted medical costs) in the long-, and-short run. This finding implies that, in Sweden, the cost of the elderly exceeds the benefits of the averted medical costs. However, the savings from medical costs are annual, whereas the age-related spending over time levels out. This is because, as mentioned in section 4.2., aging due to healthy eating is limited and, at one point in the future, the full effect is in place and age-related spending stays constant. Thus, in the very-long run, the accumulated savings from medical costs would likely exceed the costs of old-age spending.

As observed with the direct costs of healthy eating, the indirect costs have been overlooked in previous research. With the exception of Anekwe and Rahkovsky (2013), existing research has neglected that improved nutrition in well-developed countries has heterogeneous productivity fallouts. On the one hand, healthy eating is found to generate more effective work and less absenteeism. On the other hand, it is disclosed to impede productivity through an aging

population. The issue at hand is determining which factor holds greater dominance in Sweden: health-related productivity improvements or population aging. The results in Table 13 find that labor productivity will increase by 16,59% whereas the share of the working-age population will decrease by 2,32% in Sweden. Although healthy eating habits only account for a fraction of these changes, it is likely that the total effect on GDP from changes in labor input are positive. Therefore, the changes in productivity from an optimal diet should be predominantly positive. This would thus mean that the increases in productivity account for the rising old-age dependency ratio.

However, Bloom, Kuhn and Prettner (2018), as described in the theoretical framework and found in the analysis, emphasize that an increased old-age dependency ratio decreases consumption levels. Previous research shows that changes in the age structure cause consumption changes (Weil, 1997). The elderly is found to consume more public goods and services and consumer goods. This change in consumption would mean a bigger tax burden for the government, as more budget needs to be allocated to the elderly. This is found to be true in Sweden (see Table 11 and 12), where the age-related spending is projected to increase.

This issue manifests as a collective concern impacting all citizens in Sweden. Given that public amenities in Sweden are to a large extent funded by citizen taxes, the population accounts for the augmented costs of the elderly. A rising older population also suggests a decreasing share of the working-age population. Consequently, it generates a diminishing labor force (Weil, 1997). This is confirmed by the analysis, exhibiting that the labor force is projected to decrease by 2,32% over the long run in Sweden. A reduced labor force decreases aggregate output and ergo impedes economic growth. However, as discussed by Weil (1997), the effects of population aging depend on *how* the increased life expectancy is spent. Meaning, in good or bad health. Barro (2013) suggests that mortality declines increase age-specific morbidity rates, also emphasized by Anekwe and Rahkovsky (2013). On the other hand, the results obtained in section 5 suggest that healthy eating leads to increased healthy life years, reducing both mortality and morbidity (Fadnes et al. 2022). Simultaneously, decreases in consumer goods decrease demand which, for most goods, would decrease supply and therefore aggregate output.

On the contrary, Lock et al. (2010) showed that the consumption of healthy foods would lead to greater labor supply and productivity. This is theorized by Bloom, Prettner and Kuhn (2018),

as well as Barro (2013). The two studies demonstrate a production function where health capital is proved to be a factor of aggregate output. This stimulates greater productivity in dual ways. First, improved health leads to increased productivity among workers, as they experience enhanced physical and cognitive abilities. Second, it contributes to reduced absenteeism, providing a more efficient workforce. The former illustrates the non-quantified indirect benefits (improved productivity) whereas the latter demonstrates the quantified indirect benefits (averted output loss).

The two studies further conclude that decreases in morbidity and non-fatal diseases impact economic growth. By adhering to an optimal diet and preventing DRNCDs, the rates of mortality, morbidity, and non-fatal diseases would reduce. As argued by Bloom, Prettner, and Kuhn (2018) and Barro (2013), it promotes productivity increases and aggregate output. Through that channel, an optimal diet would therefore stimulate economic growth. Except for generating productivity gains, the authors also argue that improved health has a positive effect on education. This implies that better eating habits stimulates human capital investments. Increased investment in human capital would, according to endogenous growth theory, be a further driver for economic growth.

Simultaneously, Bloom, Kuhn, and Prettner (2018) stress that the productivity gains may not be enough to account for the elderly's increased costs. In Table 12, this is found to be untrue, revealing that the averted output loss exceeds the age-related spending (2 430 and 81 billion SEK in the long run, respectively). The change in consumption is, on the other hand, difficult to assess, considering multiple factors, such as demand functions for different age groups, need to be weighed into the equation. However, Weil (2013) showed that by holding production and consumption constant, consumption per capita would ultimately decrease. The analysis shows, in opposition, that productivity is not constant and would change when adopting healthy eating habits. Therefore, healthy eating habits would likely impair consumption but would be offset by productivity gains.

In light of these findings, it is particularly important for policymakers and researchers to consider their implications. As discussed, despite having a positive net effect, there are some significant costs associated with healthy eating that have been unaccounted for. Andersson, Eliasson, and Steen-Carlsson (2022), for example, found that unhealthy eating costs Sweden 53 billion SEK. However, this does not account for the costs of healthy eating. Interventions

based on an inaccurate estimation of the effects can pervert the desired outcome. Therefore, it is imperative that all outcomes of healthy eating habits are considered.

In sum, adherence to healthy eating habits in Sweden yields a dual economic impact. On the one hand, the quantitative analysis finds that an optimal diet would generate a net benefit of 198 and 2 347 billion SEK in the short and long run, respectively. Although not the full sum would manifest as rising aggregate output, a significant amount would. On the other hand, the unquantified effects showed that adopting healthy eating habits promotes population aging, which in turn deters economic growth. Previous research by Anekwe and Rahkovsky (2013) argued that the costs of healthy eating is primarily borne by individuals. The analysis of this thesis shows that this conclusion is deceptive, considering that healthy eating habits can commence population aging, that affects several aspects of the economy and society. At the same time, healthy eating improves public health, incentivizing positive economic fallouts. Ultimately, however, the study concludes that the economic impact of adhering to healthy eating habits is predominantly positive.

7. Conclusion

This thesis aimed to identify and estimate the external socioeconomic costs and benefits of adhering to healthy eating habits in Sweden and review what economic impact they have on the Swedish economy. The importance of this topic is stressed because of the increasing prevalence of diet-related non-communicable diseases in advanced economies, and previous research has shown to have significant economic ramifications. Scholars argued that unhealthy eating posed a great cost to society and that implementing healthy eating habits would generate substantial economic benefits. At the same time, existing studies have neglected that healthy eating habits can instigate costs as well. Therefore, this study tried to fill this gap by accounting for both costs and benefits of healthy eating habits. Sweden is the country of interest where limited research has previously been made on the topic. This was done by answering the following research question:

How do healthy eating habits impact the Swedish economy and society?

An additional sub-question was proposed to guide the research:

What are the external socioeconomic costs and benefits of adhering to healthy eating habits in Sweden?

To attain answers to the research questions, an exploratory sequential mixed method was conducted, including a qualitative content analysis of previous studies to identify the costs and benefits and a quantitative element estimating the observed effects. The mixed method conducted thereby allowed for investigating and establishing the costs and benefits associated with healthy eating habits, answering the sub-question. These findings were thereafter discussed in relation to the theoretical framework on economic growth and improved health to answer the main research question.

In relation to the sub-question, this paper found that the costs and benefits could be divided into direct and indirect, as well as short-term, which was annual effects, and long-term effects, which was after 11,85 years when the expected increase in life expectancy had taken place. Not all were quantified. However, the analysis found that adhering to healthy eating habits in

Sweden would yield a net benefit of 198 billion SEK in the short run and 2 347 billion SEK in the long run. The effects of healthy eating were assumed to be increasing up until 11,85 years of adhering to an optimal diet, and thereafter reach a steady state. The following identifications were made for the direct effects: Increased old-age spending (cost, long-, and short-term); Medical costs averted (benefit, long-, and short-term). The following indirect effects were identified: Population aging (cost, long-term); Output averted (benefit, short-term), and improved health (benefit, long-term).

In relation to the main research question, this paper found that healthy eating affects the Swedish economy and society through multiple channels, which had both positive and negative fallouts. The main finding of the study, however, was that the benefits would nullify the costs and, therefore, would ultimately observe a positive impact on the Swedish economy and society. Particularly, the productivity gains of improved health would counteract the costs associated with population aging.

These findings have implications for policymakers and future researchers. First, it stresses the importance of considering the costs of healthy eating habits when implementing policies. Healthy eating habits have significant implications for the rising old-age dependency ratio, which has repercussions for budget allocations. This thus affirms policymakers' to carefully evaluate policies impacting pensions and expenditures related to old age. The adoption of healthy eating habits emerges as a noteworthy stimulant in reshaping the age distribution within the population of Sweden, therefore necessitating policymakers to strategically plan for this shift. Second, it provides some insight into what diseases are attributable to the dietary risk and can thus incentivize further research on how to prevent them and develop dietary recommendations. The study showed, for example, that diet-related mental health diseases can have significant economic implications, yet none of the Swedish dietary recommendations seem to account for this. A suggestion would thus be to reform the dietary recommendations to better target both somatic and psychological outcomes.

Finally, given that not all effects were quantified in this study, a suggestion for future research could be to engage in a more comprehensive analysis of the long-term indirect effects of healthy eating. A collaborating study integrating economics and nutrition which scrutinizes the synergies between nutrition and economics could obtain interesting results with important implications for the future of the economics of healthy eating.

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Appendix A

Table 14: ICD-10-SE codes used and their associated costs, obtained from the KPP database, 2019, in SEK

Disease	***Cardiovascular diseases***					
Hdiag kapitel (1)	I00-I99		I00-I99		I00-I99	
Hdiag avsnitt (2)	I10-I15		I30-I52		I30-I52	
Hdia (3)	All		All		All	
	Inpatient	***Outpatient***	***Inpatient***	***Outpatient***	***Inpatient***	***Outpatient***
Contacts	3208	33607	80803	306493	80803	306493
Cost	122253688	131994460	5832657255	1403588259	5832657255	1403588259
Cost/Contact	38109	3928	72184	4580	72184	4580
Total Contacts	36815		387296		387296	
Total Cost	254248148		7236245514		7236245514	

Source: KPP database

[1]Coded with MDC (2) and DRG (3) instead of Hdiag kapitel (1) and avsnitt (2)

Cardiovascular diseases cont.							
I00-I99		I00-I99		I00-I99		I00-I99	
I70-I179		I80-I89		I60-I69		I60-I69	
All		All		I61		I63	
Inpatient	***Outpatient***	***Inpatient***	***Outpatient***	***Inpatient***	***Outpatient***	***Inpatient***	***Outpatient***
12379	51576	3280	50056	4148	6956	22002	26662
1772784320	245017127	203301075	230559734	678410694	26694804	2002971404	103194019
143209	4751	61982	4606	163551	3838	91036	3870
63955		53336		11104		48664	
2017801447		433860809		705105498		2106165423	

Cardiovascular diseases cont.							
I00-I99		I00-I99		I00-I99		E00-E90	
I60-I69		I05-I09		I20-I25		E65-E68	
I60		All		All		All	
Inpatient	***Outpatient***	***Inpatient***	***Outpatient***	***Inpatient***	***Outpatient***	***Inpatient***	***Outpatient***
1607	3226	1	13	41549	148125	3755	66686
489545909	14660685	24276	61544	3093724793	536107	223011197	195489179
304633	4545	24276	4734	74460	3619	59390	2931
4833		14		189674		70441	
504206594		85820		3094260900		418500376	

Cardiovascular diseases cont.		***Neoplasms***					
		Tracheal, bronchus, and lung cancer					
E00-E90		C00-D48		C00-D48		C00-D48	
E10-14		C30-C39		C30-C39		C30-C39	
E11		C33		C34		C34	
Inpatient	***Outpatient***	***Inpatient***	***Outpatient***	***Inpatient***	***Outpatient***	***Inpatient***	***Outpatient***
4098	117948	306	2388	5442	54372	5442	54372
282673100	255457	39854449	10733948	613630003	377989150	613630003	377989150
68978	2166	130243	4495	112758	6952	112758	6952
122046		2694		59814		59814	
282928557		50588397		991619153		991619153	

Neoplasms cont.							
Breast cancer		*Esophageal cancer*		*Colon and rectum cancer*			
C15-D48		C15-D48		C15-D48		C15-D48	
C50		C15-C26		C15-C26		C15-C26	
C50		C15		C18		C20	
Inpatient	***Outpatient***	***Inpatient***	***Outpatient***	***Inpatient***	***Outpatient***	***Inpatient***	***Outpatient***
4582	117813	967	7736	5715	36495	2623	25846
299153528	671400052	141583093	42374563	773877035	194429057	440087141	142074446
65289	5699	146415	5478	135412	5328	167780	5497
122395		8703		42210		28469	
970553580		183957656		968306092		582161587	

Neoplasms cont. *Stomach cancer*		***Chronic Kidney Disease***				***Disordered eating (somatic)***	
C15-D48 C15-C26 C16		N00-N99 N00-N08 N03		N00-N99 N17-N19 N18		E00-E90 E40-E46 All	
Inpatient	***Outpatient***	***Inpatient***	***Outpatient***	***Inpatient***	***Outpatient***	***Inpatient***	***Outpatient***
1333	10406	150	5496	4969	92901	364	14434
189271428	53955193	17551892	23633026	501062887	378648452	38514625	31129130
141989	5185	117013	4300	100838	4076	105809	2157
11739		5646		97870		14798	
243226621		41184918		879711339		69643755	

Disordered eating (somatic) cont.							
E00-E90 E50-E64 All		F00-F99 F50-F59 All		F00-F99 F50-F59 All		R00-R99 R50-R69 R63	
Inpatient	***Outpatient***	***Inpatient***	***Outpatient***	***Inpatient***	***Outpatient***	***Inpatient***	***Outpatient***
412	2833	267	2374	267	2374	499	12366
36961138	11046332	25930763	7640736	25930763	7640736	29085194	50471401
89712	3899	97119	3219	97119	3219	58287	4081
3245		2641		2641		12865	
48007470		33571499		33571499		79556595	

Disordered eating (psychological)[1]			
19 T47C		19 T47E	
Inpatient	***Outpatient***	***Inpatient***	***Outpatient***
20	91550	552	783
2162175	293002338	72173314	2646182
108109	3200	130749	3380
-	-	-	-
-	-	-	-

Daycare			
Diabetes	*Obesity*	*Disordered Eating*	
	See codes used for in- and outpatient		
3756	1906	779	34
7809210	5590776	1750998	144635
2079	2933	2248	4254
-	-	-	-
-	-	-	-

Daycare cont.		
Cardiovascular Diseases	*Neoplasms*	*Chronic Kidney Disease*
	See codes used for in-and outpatient	
77859	31623	17758
748131916	142168134	60398571
9609	4496	3401
-	-	-
-	-	-