Investigating The Healthiness of Online Recipes in Norway Compared to the UK and the US

Andira Aranandita

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Department of Clinical Medicine

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Information Science & Media Studies Department

University of Bergen

Norway

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Andira Aranandita

ABSTRACT

This research compares the nutritional value of internet meal recipes from Norway, the United Kingdom, and the United States. Recent research in Norway reveals that around 25% of adult males and 21% of adult women are obese. In the US, an average of 35% of adult men and 37% of women are obese. In the UK, in 2016, approximately 27.8% of adults were obese. Online recipes available from popular Norwegian online stores (Aperitif, Klikk, Kolonialen, and Tine) were collected. Each data source included 100 recipes with only warm and main dishes. Recipe nutrients have been calculated via kostholdsplanleggeren.no, which allows investigating seven macronutrients used in the WHO standards and four macronutrients from Food Standard Agency (FSA) in the UK. I In addition, the proportion of each meal's energy obtained from macronutrients was determined. Version 4.2.0 of R studio was used to analyze and analyse the data. Using the Mann-Whitney and 2 tests, the differences between the data sources were compared.. This study shows that several recipes and macronutrients from the four Norwegian websites do not meet all of the WHO criteria; only two recipes [CT1] meet five criteria. Of the 100 randomly selected recipes, only sugar has the most significant percentage in the WHO range (93%-100%), while the other six macronutrients have a percentage of <32% in the WHO range. Using the FSA traffic light scheme, fat and saturated fat are at the medium level, sugar is at a safe limit, and salt exceeds a predetermined safe limit. None of the recipes and macronutrients of the three countries (Norway, the UK, and the US) meet the WHO criteria. Only two recipes from the US and one recipe from the UK met five criteria, while 3 Norwegian recipes were only able to meet up to 4 standards. Of the 100 randomly selected recipes, only sugar accounts for the most significant percentage in the WHO range (73%-96%), while the other six macronutrients have a portion of <33% in the WHO range. Based on the FSA traffic light label from the three countries, fat, saturated fat, and salt exceed the specified safe limits, while sugar is within the safe limits. Recipes selected randomly from the four popular Norwegian websites recipes from Norway, the UK, and the US did not meet the WHO criteria and did not meet the standards set by the FSA. Based on the analysis per macronutrient, recipes from Norway are more relevant to the WHO range and do not exceed the limits set by the FSA, so they are healthier than recipes from the UK and the US.

Keywords: WHO; FSA; Macronutrient; Nutrition; Online Recipes

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Chapter 1

INTRODUCTION

Living things need food to grow and to breed. Macronutrients, nutrients such as carbohydrates, fats, proteins, and fiber, contribute in the form of energy. Therefore, it is necessary to satisfy the requirements for these macronutrients. It has an impact if the macronutrients that enter the body exceed or fall short of the needed quantity. Therefore, it is essential to control the food that enters the digestive system [1]. Consumers tend to associate healthy food that they consume with various definitions. However, further research is required to determine how criteria of healthy eating affect perceptions of food quality. A total of 718 People participated in the online survey revealed that both the "healthy or unhealthy eating" and "mind or body healthy eating" definitions of healthy eating had beneficial impacts on perceived dietary quality. [2]. Consumers may design their own healthy diets by striking a balance between nutritious and less healthy foods. [3][4].

Consumers may believe that an extra intake of fruit or vegetables may balance relatively high-fat products. This is further supported by the "licensing effect," which indicates that customers are more likely to purchase vice (unhealthy) items after eating additional virtue (healthy) ones. [5]. Nutritionist discourse, which places an emphasis on the nutritional and functional properties of food, defines healthy eating by distinguishing between healthy and harmful options. [6][7]. A new Coronavirus was discovered in December of 2019. World Health Organization classified the virus as a pandemic on March 11, 2020, due to its rapid and unprecedented global spread. Due of this, 100 nations across the globe have declared a "lockdown." These occurrences ultimately affected food accessibility.

There are about two billion internet users all over the world. The internet is the main platform for accessing the web, receiving and sending emails, developing networking and social relationships, using audio or video communication, playing a variety of online games, etc. [8]. The IoT (Internet of Things) is essential in helping people work less. In a different examination, it was shown that women's decision-making is influenced by the Internet. regarding all aspects of their pregnancy stages. In times of health and economic crisis, cooking at home may be a method for regaining control over the quality of the food and the family budget, both of which are crucial concerns. However, lack of culinary skills, inventiveness, and passion, as well as high access to and availability of ready-to-eat meals, are obstacles to home cooking. [9][10]. The covid 19 epidemic has had direct effects on public and commercial

activity and has drastically altered connections on a global scale. Not only does wearing a mask and maintaining social distance, greeting people with our eyes, etc. alter our interpersonal interactions, but it also alters our relationship with food. In a short of months, covid 19 has brought about changes in behavior that many nutrition educators consider crucial to public health and sustainability, namely the preparation of meals at home. Consequently, this may result in a rise in obesity in society.

1.1. Problem Statement

A survey of 1,000 people revealed a positive correlation between self-reported healthy eating and the consumption of fresh produce, while finding a negative correlation between it with the intake of soda and fast food. [11]. Another research indicated that teenagers who consider their diet as healthy eat more fruits, vegetables, and milk while consuming less sugary beverages. [12]. Nonetheless, the evaluation of food quality may be skewed when determining the healthiness of an individual's dieting practice. Consumers may feel that consuming more fruits and vegetables may counteract relatively high-fat foods. This is also supported by the "licensing effect," which indicates that customers are more likely to purchase vice (unhealthy) items after adding virtuous (healthy) products to their shopping carts. [5]. Nutritionist discourse, which places an emphasis on food's functionalist and nutritional qualities, has come to dominate the concept of healthy and bad eating.. [6][7].

In contrast, persons sticking to a healthy or poor diet may be less likely to delay dangerous food consumption since they may compensate by consuming more nutritious foods on other times. These days, poor nutrition plays a significant role in half of all death [13]. The lockdown has impacted the psychological and physical well-being of individuals throughout the epidemic, with future repercussions. Due to social separation, store access became limited as a result of shielding and the imposition of lengthy crowds. Thus, it might also affect the decrease in physical activity, for example, going to the supermarket. The current guideline for physical exercise suggests that people should exercise in 150 to 300 minutes per week of moderate-intensity activity. [14]. To accomplish this, people should engage in at least 30 minutes of moderate-intensity physical activity on at least five days each week. There was a surge in the prevalence of obesity during the COVID-19 pandemic. Recommending that healthy people, for example, stay indoors for many days would limit their movement and force them to be physically inactive, increasing the risk of metabolic disease even for a little period. [15]. Other published studies in Troms during 2010-2011 and 2012-2013 on "Fit future" revealed that 20.9% of young women and 28.1% of young men aged 18-20 were overweight or obese. [16].

There has been a dramatic increase in the number of overweight and obese people in Norway during the 1970s. The chance of developing a number of chronic, debilitating diseases increases when your body mass index is more than 30 kg/m2. Obesity might be prevented in the general population with proper nutrition and physical activity. One-quarter of middle-aged males and one-fifth of middle-aged women in Norway were overweight or obese, defined as a body mass index of 30 kg/m2 or above. However, it seems that the proportion of kids who are overweight or obese has leveled out. [17]. Obesity and overweight are usually related with a rise in a number of ongoing illnesses, such as diabetes and several kinds of cancer. [18]. The growth in the prevalence of overweight and obesity in Norway reflects worldwide trends, but estimates are far lower than those seen in the United States and other European nations. [19] Compare the nutrients in two common food types. Prepared main courses that can be reheated in a container, require no further ingredients, and require no additional preparation are compared against recipes provided by well-known UK celebrity chefs and sold at large UK supermarkets, commonly referred to in the United States as "TV dinners." Improper nutrition can lead to increased obesity; in the UK, 27.8% of adults are obese; in the US, 35% of adult men and 37% of women are obese [20] [21]. To determine the healthiness of the recipes, we will use two methods: 1.) with FSA health criteria and 2.) WHO criteria. Food is one of the main concepts that shape how good we feel and how healthy we are. According to the WHO, if common lifestyle risk factors, among other diet-related ones, were eliminated, around 80% of cases of heart disease, stroke and type 2 diabetes and 40% of cancers could be avoided [22].

1.2. Research Question

Based on the defined problems above, the following research questions were formulated as follows:

RQ-1: How healthy are Norwegian online recipes as set by international standards such as the The Food Standards Agency (FSA) or The World Health Organization (WHO)?

RQ2: Are there any differences in the recipes published on the most popular Norwegian online supermarket platforms?

RQ3: How do Norwegian recipes compare to recipes in the UK and the US?

1.3. Thesis Outline

This master thesis is organized into five chapters.

- Chapter 1 presents the problems and research questions of this thesis.
- Chapter 2 reviews related work in the field.
- Chapter 3 describes the materials and methods used in this thesis.
- Chapter 4 shows the results of the study in line with the research questions.
- Finally, chapter 5 discusses the results of the study.

Chapter 2

BACKGROUND

This research investigates the healthiness of online cooking in Norway and compares it with recipes used in the UK and the US. Online recommended recipes are top-rated and effortless to access, thus making the most food interaction online. The popularity of online recipes, of course, can also pay attention to the macronutrient content. Macronutrient imbalances will certainly cause negative impacts on the body. Therefore, each recipe's macronutrient content in this study will be taken randomly. As many as 100 recipes will be analysed. These 100 recipes will later be compared with each other. Therefore, it will be known how healthy the average food is from online recipes so that later this can be one of the health references for maintaining a balanced food intake for the body. This chapter will discuss several things, starting with healthy food, macronutrients in food, the effects when the macronutrients needed by the body are not in accordance with the limits, previous studies on the effects of macronutrients based on several standards such as the FSA by the UK and the WHO by the US, as well as discussing current health conditions. In Norway, who are mainly obese. In the future, this can be a health reference to maintaining a balanced diet for a healthy functioning body.

2.1. Healthy Food

Food is needed for all forms of life, particularly for cell development and reproduction. As energy is required for metabolism, the body need a balanced diet. This may result in an appropriate quantity of nutrients, leading to a healthy lifestyle. The macronutrients, which consist of carbs, lipids, proteins, and fiber, are the nutrients that contribute to energy. Therefore, it is vital to achieve these macronutrient requirements. If the body absorbs less or more macronutrients than the recommended quantity, signs of malnutrition and obesity may develop. Therefore, monitoring the material that enters the body is vital.[1].

Most physicians are at a loss for explanations. It is understood that providing a straightforward response is challenging. Consumers' views on healthy food intake vary widely. However, further research is required to determine how criteria of healthy eating impact perceptions of food quality. According to the results of an online survey of 718 Danish, both the "healthy or unhealthy eating" and the "mind or body healthy eating" definitions of healthy eating positively affected respondents' opinions of the food they ate..[2]. There is a widespread belief that

healthy food is a multidimensional notion that encompasses not just nutritional recommendations but also the various aspects that consumers may associate with healthy eating..

One thousand people were studied, and the results showed a positive correlation between self-perceived healthy eating habits and higher rates of fruit and vegetable consumption, and a negative correlation with soda use and fast food consumption.[11]. According to another research, teenagers who are conscious of their nutrition eat more fruits, vegetables, and milk and less sugary drinks. [12]. In judging the healthiness of an individual's diet, our dietary quality evaluation may continue to be prejudiced.

Due to the fact that consumers may define healthy eating in different ways, three definitions of healthy eating may be prevalent among food consumers::

- Eating healthily or unhealthily
- Mind or body healthful diet
- Guidelines for a healthy diet

Healthy food intake may be conceptualized by consumers as a balance between healthy and unhealthy foods. [3][4]. This statement implies that an unhealthy diet may be balanced by a good one.

Consumers may believe that increasing their consumption of fruits and vegetables may offset their consumption of relatively high-fat items. This phenomenon, also known as the "licensing effect," demonstrates that consumers are more inclined to purchase vice (unhealthy) goods after virtues (healthy) items have been added to their shopping bags. [5]. The idea of healthy eating is more in line with nutritionist discourse, which emphasizes the functionalist and nutritional components of food, when it emphasizes good vs bad eating. [6][7].

Health that is connected to eating is a balance between one's bodily and mental well-being, as described by the mind/body duality. Many customers have the false belief that the physical and mental states are inextricably related. [23] and emotional well-being must be a component of good eating [24][25]. This argument contradicts the traditional conception of the body, the Cartesian mind-body dualism. [26][27], which regards the mind and body as separate beings [23].

A strong correlation exists between consumers' level of interest in healthy eating and their willingness to seek out information on healthy eating criteria and guidelines. This may have a

favorable effect on the healthfulness of their conduct. This is because customers may perceive a greater danger if official criteria are not followed. Furthermore, they may be more likely to seek a link between their interest in healthy eating and their dietary habits. They avoid disconfirming behavior in order to maintain sentiments of consistency between their thoughts (healthy eating standards) and their behavior. [28].

In contrast, those who stick to a healthy or poor diet may be less likely to delay harmful food consumption since they may compensate by consuming more nutritious foods on other times.

However, more importantly, poor eating habits are considered the primary cause of death [13]. Another research demonstrates that if food habits do not change, life expectancy will drop, as has already been shown in the United States. [29].

Due to their abundance and economic affordability, carbohydrate has traditionally been the most significant energy source for much of the world's population. Currently, they can be found in more than three-quarters of global crop production [30]. Carbohydrate-rich foods comprise the backbone of our diets, with the average carbohydrate intake contributing more than half of our calories. This is consistent with the DRIs, which state that carbohydrates account for 45-65 percent of our calories. [31]. Carbohydrates consist of a variety of substances, including starches, sugars, and dietary fiber.

As an organic compound, Carbohydrate which contains carbon, oxygen and hydrogen plays an important role on supplying energy for humans and animals [32]. This stimulates the researchers to study the health implications of dietary carbohydrates. Until recently, dietary recommendations mostly described the proportion of desirable carbohydrate in the diet and classified carbohydrates as complex or simple. [33]. One of the three primary categories of dietary energy sources is carbohydrates. It is composed of monosaccharide units of n carbon atoms (such as hexoses and pentoses, which contain 6 and 5 carbon atoms, respectively), of which n–1 carbon carries an alcohol residue and one carbon carries an aldehyde or ketone residue. [34].

Protein is an essential macronutrient and a critical structural component of many foods. Protein is a dietary macronutrient that plays a wide range of structural and functional roles in the body; without protein intake, we would die. Protein-based ingredients fulfill various technological roles in formulated foods and contribute to texture, color, flavor, and other properties. Food proteins come from a wide variety of sources [35].

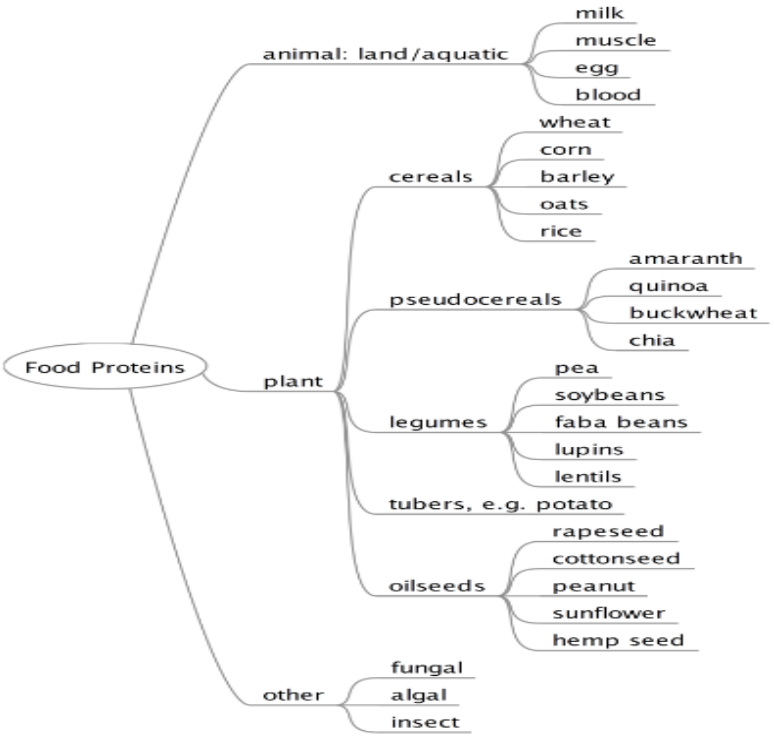


Figure 1. Food Protein [35]**.**

Proteins are nitrogen-containing substances that are formed by amino acids. They serve as the major structural component of muscle and other tissues in the body. In addition, they are used to produce hormones, enzymes, and hemoglobin. Protein can also be used as an energy source but cannot be the primary energy source. The protein used by the body needs to be metabolized into its simplest form, amino acids. There have been 20 amino acids identified that are necessary for human growth and metabolism [36].

Fat is the major source of energy for newborns, and an adequate intake (AI) of 31 g/day is based on the predicted fat consumption of exclusively breastfed infants from 0 to 6 months. The AI (30 g/d) for older babies (7–12 months) is based on predicted human milk and supplemental food consumption. There is no defined need for total fat in humans, and the acceptable macronutrient distribution range (AMDR) for dietary fat is 20–35% of calories. [37].

Dietary fat is an essential source of energy. If insufficient intake (along with inadequate protein and carbohydrate) happens, persons will get into a negative energy balance that might cause losing weight and cannot develop. Individuals may adjust to a broad variety of fat consumption. Higher fat consumption has been connected with a rise in several illnesses, such as obesity, type 2 diabetes, coronary heart disease, and cancer [38].

Sugar is defined as a ubiquitous term. It is hard to define and measure, which may be due in part to both functions as an ingredient and a nutrient [39]. However, the term 'sugar' is conventionally used to describe mono and disaccharides in food [40]. Glucose, fructose, and galactose are the three main monosaccharides and the building blocks of di-, oligo-, and polysaccharides that are found in nature. Free glucose and fructose are found in small amounts in honey and cooked or dried fruit (inverted sugar) and in higher amounts in fruit and berries, which serve as the primary source of energy [41]. Sugars are used in jams, jellies, food preservation, and even sweetener to enhance the flavor of many foods and beverages [40].

While there is some debate over the relationship between dietary sugar consumption and other health outcomes such as obesity, type 2 diabetes, and cardiovascular disease, consuming foods rich in sugar, namely sucrose, is well recognized to be related with dental caries (EFSA). There is no conclusive evidence that dietary sugars are directly linked to diet-related disorders other than as a source of dietary energy, implicated explicitly as a contributor towards positive energy balance, according to scientific publications, advisory organizations, and competent authorities [39].

Saturated fat is found in eggs, cocoa, nuts, and meat and consists mainly of triglycerides containing stearic and palmitic acids. More than 90% of fatty acids are found in the standard American diet, such as palmitic acid (C16:0), stearic acid (C18:0), oleic acid (C18:1), or linoleic acid (18:2) [42].

Fiber is generally described as plant material that resists digestion by human alimentary enzymes. Dietary fiber is a generic term that includes a number of substances with unique chemical structures, characteristic physical properties, and individual physiological effects. With the exception of lignin, all of the materials that we call dietary fiber are carbohydrates in nature, and except for lignin and wood cellulose, all are broken down to some extent by the enzymes of gastrointestinal bacteria. The products of this digestion are hydrogen, methane, carbon dioxide, and short-chain fatty acids-acetic, propionic, and butyric [43].

Fiber is also classified as a component of plant foods that can be found everywhere and includes materials of diverse chemical structures and morphology resistant to the action of human digestive enzymes. In the human digestive tract, fiber forms a matrix with fiber and characteristics. The physicochemical properties of this matrix determine the homeostatic and therapeutic functions of dietary fiber in human nutrition [44].

In the watery medium of the intestinal lumen, fiber enlarges by absorbing water and tiny molecules (Eastwood). The swelling pressure controls the diffusion rate, intestinal smooth muscle responses, and final phobic and dispersion forces. It may also impact the absorption of minerals and steroids [45]. Based on Kay & Truswell (1980), there is also a continuous alteration in a matrix structure and function contingent on changes in the surrounding pH and osmolality and in the fiber matrix itself as colonic bacterial enzymes selectively degrade it. Thus, the effects of fiber in the upper and lower intestine may differ considerably.

Many health organizations suggest a minimal sodium consumption (2.3 g/day, 1 teaspoon) for the general population. [46][47][48]. Sodium is an important nutrient that is necessary for good bodily function and health, and like with other critical electrolytes, it is believed to have a physiologically "healthy" consumption range. [49][50]. The majority of the world's population (95%) consumes between 3 and 6 g of sodium everyday, indicating that the current recommended amounts of less than 2.3 g/day of sodium by whole populations are significantly below the range of what the majority of the world consumes. [51].

Globally, the average salt consumption was estimated to be 3.95 g/day based on a meta-analysis of surveys from 187 countries by the Global Burden of Disease (GBD) collaboration. [51]. Intakes are greatest in Eastern Europe, Central Asia, and East Asia, according to the INTERMAP research [52] (mean intakes exceeding 4.2 g per day). Northern China's Beijing sample had the highest mean intakes, up to 6.9 g/day for males and 5.8 g/day for women. In contrast, the mean salt intakes of eight population samples in the United States varied from 4.1 to 4.4 g/day for males and 3.0 to 3.5 g/day for women. [53].

The emerging COVID-19 epidemic may lead to an increase in the number of persons who are fat. The measures adopted by a regulation, such as not leaving the house for many weeks or even for those who are well, would encourage a sedentary lifestyle and mandate physical inactivity, even for short moments, therefore raising the risk of metabolic diseases. [15].

Statistics on obesity and overweight are gathered in Norway from numerous studies, including Nord-Trndelag (adolescents and adults), the SAMINOR health research Troms Health Studies (adolescents and adults), and the National Service Center for Young Adults' group. People who are overweight have a body mass index (BMI) between 25 and 30, while people who are obese have a BMI of 30 or more. A high BMI causes to around 2,400 deaths annually in Norway, as well as a large number of instances of diabetes, cardiovascular disease, and other chronic illnesses. Body mass index (BMI) is the most used measurement for weight ratios. The BMI is

found by dividing a person's weight in kilograms by their height in meters squared (kg/(m x m)). The following rules apply to adults:

- BMI (18.5-24.9 kg/m2) normal.
- BMI (25 until 29.9 kg/m2) overweight.
- BMI Above of 30 kg/m2 is obese [17].

2.2. Online on Covid Era

In addition, a new Coronavirus was detected in December 2019. The World Health Organization categorized the virus as a pandemic on March 11, 2020, due to its rapid, unprecedented global spread. Due to threats, 100 nations across the globe have declared a "lockdown." These occurrences ultimately affected food accessibility.

There are around two billion internet users globally, according to estimates. Internet is the primary platform for web surfing, social networking, sending and receiving email, playing online games, and audio/video connections, among others. [8]. The Internet of Things (IoT) plays a crucial role in easing human labor. Another research indicated that an overall analysis suggests that the Internet has a significant influence on how pregnant women make decisions about all aspects of the pregnancy process.

The internet's interactive technologies enable additional flexibility for delivering consumer information via a mix of features crucial. Google and other search engines play a key influence in how people decide what to eat and cook: online recipe websites are well-known sources of culinary inspiration and often enable users to review and get recipe recommendations.

During the epidemic, the lockdown damaged the psychological and physical well-being of individuals, with future repercussions in mind, since access to stores was limited by shielding and lengthy lines enforced by social distance.. T It may also influence the reduction of physical activity, such as going to the shop. The current guideline for physical exercise suggests that people should engage in 150-300 minutes per week of moderate-intensity activity. [14]. To accomplish this, people should exercise in at least 30 minutes of moderate-intensity exercise on at least five days each week.

On the other side, research shows an upsurge in sedentary behavior, screen time, and reduced exposure to sunshine as health-related behaviors that changed in several nations during the lockdown. Other study has linked a mother's degree of education to her children's and teens'

greater activity during lockdown. Several studies have shown the combination of dietary modifications, reduced physical activity, and increased sedentary time during the lockdown.

Health Authorities' official definition of food-related health, which we refer to as "healthy eating recommendations," may lead individuals to assume that they are at danger of being unhealthy if they cannot adhere to the rules. In addition, they prefer to articulate the link between health and food in words informed by science and nutrition [54][55]. This concept incorporates research that distinguishes between impulsive food behavior and behavior that is more planned and controlled. [56][57].

Because of the implications of social distance, talks about cooking that occurred during the Covid-19 epidemic have altered the food choices of individuals globally. Cooking is a daily, demanding, and sophisticated task. There are several ways to gather culinary knowledge. The conventional method of accessing the materials is to purchase printed cookbooks. [58] and other resources are available on the website. The access to cooking information is always improved regularly.

Social isolation might be a chance to revitalize home cooking and cultivate culinary skills as a pleasurable, stress-relieving activity [59]. It seems that preparing meals at home is connected with healthy eating [60][61]. Consequently, an intervention to improve culinary abilities may promote healthy eating [62, 63].

In times of health and economic crisis, cooking at home may be a method for regaining control over dietary quality and family finances, both of which are crucial issues. However, lack of culinary skills, inventiveness, and passion, as well as high access to and availability of ready-to-eat meals, are obstacles to home cooking. [9][10]. According to a qualitative research conducted by the NUPPRE group at the Brazilian University, social isolation and working from home stimulate the desire to test new recipes. In addition to the skills acquired during the culinary intervention, excellent accessibility and enhanced self-assurance are advantageous to home cooking. However, there are still obstacles to home cooking, including a lack of room, equipment, cooking tools, and recipes. [64].

According to a previous research conducted at a Brazilian university, social media networks have promoted the recovery of culinary skills in the current environment of social alienation, although it remains a difficulty [64]. For some people, cooking at home may be a pleasurable pastime that promotes autonomy, self-care, and healthy eating habits. This does not, however,

negate obstacles such as a lack of culinary skills, unemployment, social vulnerability, and in certain cases, lack of access to basic sanitation.

Recipes consist of the heading, title, statement of purpose, and preparation. The title usually depicts the cookbook's repository. It may include the name of the dish or the main ingredient used for its preparation [65]. [66] recipes are the best everyday examples of operational definitions "…if you follow recipes, you produce the dish it defines". Other authors said that the recipe is a written set of instructions. The recipe is a set of goal-oriented behavioral rules in the general class of immediately directive technical texts.

In addition to conventional methods, another frequent source of inspiration for cooking is the internet and cookbooks. The food website, which at the time of writing, claims to be the world's largest food-focused social network, is Allrecipes.com. The site has a 40 million home cook community accessing 3 billion pages annually across 19 sites in 24 countries, with recipes available in 13 languages.

The British version of Allrecipes.com was named as the Daily Mail's top pick for a healthy eating website highlighting the "sophisticated search engine" and claiming that "…… diabetic, coeliacs and even those specifically wanting to increase their fiber intake – are all catered for. Norwegian has more than one website to inspire the consumer with cooking. However, Norwegian sources for online recipes do not display the nutritional value of their recipes. This study compiles recipes from Aperitif.no, Klikk.no, Kolonial.no, and Tine.no. Those five sources for online recipes are the most Klikkable based on Alexa Rank.

To determine the healthiness of the recipes, we will use two methods: 1.) with FSA health criteria [67] and 2.) WHO criteria [68]. The WHO has identified 15 macronutrient ranges that should be included into a regular diet. In the preceding research, only the seven important macronutrients (proteins, carbs, sugars, salt, lipids, saturated fats, and fibers) were selected [19]. The score for the FSA traffic light labeling system is similarly based on a similar methodology. The FSA score is influenced by only four factors (sugar, sodium, fat, and saturated fat). The colors on the scale are green (healthy), yellow (moderately healthy), and red (unhealthy) [67]. Food is one of the main concepts that shape how good we feel and how healthy we are. According to the WHO, if common lifestyle risk factors, among other diet-related ones, were eliminated, around 80% of cases of heart disease, stroke and type 2 diabetes and also 40% of cancers could be avoided [22].

2.3. Other Studies of Food Selection

Another Spanish study During the lockdown, people were told to stay home and work from home, and they were only allowed to move around very little. Staying at home, working from home, or isolating yourself can change how you eat and how you live. Less physical activity (PA) and more stress, fear, sadness, and anxiety, as well as more people who are overweight. This information suggests that changes in food consumption due to the pandemic may be caused by more than just practical reasons. They may also be caused by psychological and physiological factors. [69].

[19] Compare the nutritional qualities of two popular food sources. They compare recipes provided by well-known UK celebrity chefs with top UK supermarket ready meals, also known as "TV dinners" in the United States, which are reheatable main dishes that require no additional ingredients and no preparation. In the United Kingdom, 27.8% of adults are fat, whereas in the United States, 35% of adult males and 37% of adult women are obese [20] [21].

2.4. Healthiness of Norway

Another study in Spanish During the lockdown, severe mobility restrictions were applied, and people were encouraged to stay at home and work remotely, with only minimal movements being allowed. Staying at home, working from home, and self-isolation can affect dietary habits and lifestyle-related behaviors. A reduction in physical activity (PA) levels, increased stress, fear, sadness, anxiety, and increased obesity rates. This research suggests that changes in diet in response to a pandemic may be driven by psychological and physical motivations and pragmatic. [69].

[19] Examine the nutritional qualities of two popular food sources. They compare recipes released by well-known celebrity chefs in the United Kingdom with prominent supermarket-prepared meals in the United Kingdom. It is more commonly known as “TV dinners” in the United States. It prepares main courses that can be reheated in a container, requires no additional ingredients, and only minimal preparation before consumption. Improper nutrition can lead to increased obesity; in the UK, 27.8% of adults are obese; in the US, 35% of adult men and 37% of women are obese [20] [21].

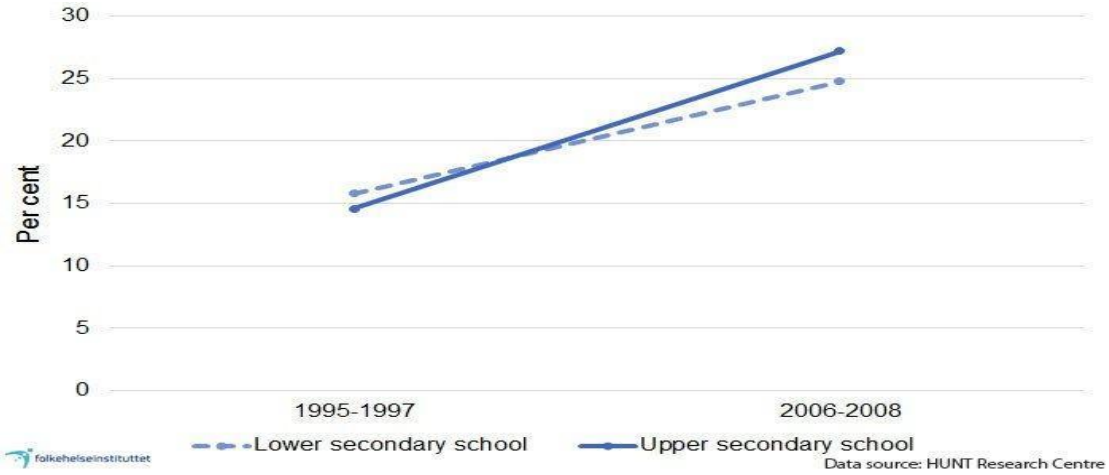


Figure 2. average weight and the number of adolescents that are overweight or obese [17].

In Troms, another study called "Fit Future" was done in 2010-2011 and 2012-2013. It found that 20.9% of young women and 28.1% of young men aged 18-20 were overweight or obese. [16].

Other Trømso research and the health study in Nord- Trøndelag reveals that most individuals are either overweight or obese, while the minority have normal weigh. The current crisis and the need for self-isolation are prompting many to rely on processed foods with longer shelf life instead of fresh and canned food with higher quantities of sodium, and we might see an increase in weight if this persists for a longer period of time.

The covid 19 outbreak has had dramatic effects on public and economic health and has profoundly altered global ties. Not only does wearing a mask, social distance, the way we greet others with our gaze, etc. modify our personal interactions as humans, but it also alters our relationship with food. In a couple of months, covid 19 has brought about a shift in behavior that many nutrition educators regard as crucial to public health and sustainability: the increased preparation of meals at home. Thus, it might lead to a rise in obesity rates in society.

Norway has a high prevalence of overweight and obesity. Since the 1970s, the incidence of overweight and obesity has increased significantly. Multiple non-communicable illnesses are connected with a body mass index in excess of 30 kg/m2. A good diet and regular exercise may avoid obesity in the general population. One out of every five middle-aged men and women in Norway had a body mass index of 30 kg/m2 or more. But the number of overweight or obese children seems to have stayed the same. [17].

More than half of respondents to a recent Hunter study claimed they were cooking more now than before the outbreak. Three-quarters of respondents reported more confidence in the kitchen, and fifty-one percent stated they would continue to cook more once the crisis ends. Cooking at home is a way to acquire control over dietary quality and family finances. However, a lack of culinary skills, inventiveness, and passion, as well as easy access to and availability of ready-to-eat meals, are obstacles to home cooking.

Obesity and overweight are always related with a higher risk of several chronic illnesses, diabetes, and some cancers [18]. The growth in the prevalence of overweight and obesity in Norway mirrors worldwide trends, despite estimates being far lower than those found in the United States and other European nations.

I In Norway, the majority of adults are presently overweight (50%) or obese (23%). We predicted an equal prevalence of overweight but a higher prevalence of obesity in the future, for example, at 41% (overweight) and 31% (obesity) for women and 54% (overweight) and 29% (obesity) for men aged 50 to 59 y. Future projections based on recent secular trends from 1980 to the 2000s have given us the intuition of a dramatic increase in the prevalence of obesity observed during the past decades. Another research revealed a considerable rise in BMI, with the exception of the oldest age group (67 years and older). The younger people (18-34 years) saw the greatest BMI change. [70]. Men had higher average BMI at all ages than women.

Table 2.1: BMI by gender and age in Oslo and Lofoten between 1990 and 2001 [70]**.**

		1990 BMI mean (sd)				2001 BMI mean (sd)			Change 1990–2001
	n	overall	Lofoten	Oslo	*n*	overall	Lofoten	Oslo	*p*-value
Men									
18–34	328	23.8 (2.9)	23.9 (2.9)	23.8 (3.0)	145	25.6 (3.9)	25.2 (3.1)	25.9 (5.1)	
35–49	275	25.1 (2.9)	25.7 (2.6)	24.7 (3.0)	289	26.0 (3.4)	26.1 (3.3)	26.1 (3.7)	
50–66	178	25.4 (3.1)	25.7 (2.9)	25.0 (3.5)	233	26.8 (3.5)	26.7 (3.4)	26.9 (3.7))	
67+	143	25.1 (3.0)	25.2 (3.1)	24.2 (2.0)	119	25.4 (3.3)	25.4 (3.4)	25.5 (3.2)	
Total	924	24.7 (3.0)	25.0 (3.0)	24.3 (3.0)	786	26.1 (3.6)	25.9 (3.4)	26.4 (3.9)	
Weighted by age		24.7 (95%CI 24.5–24.9)				26.0 (95%CI 25.7–26.3)			<0.001
Women									
18–34	401	21.7 (3.2)	21.8 (3.0)	21.7 (3.2)	142	23.6 (3.6)	23.7 (3.9)	23.6 (3.0)	
35–49	284	23.1 (3.3)	23.7 (3.7)	22.7 (2.9)	367	24.2 (4.0)	25.0 (4.1)	23.5 (3.7)	
50–66	175	24.0 (3.9)	24.5 (4.2)	23.1 (3.1)	218	25.5 (4.7)	26.1 (5.2)	24.3 (3.6)	
67+	141	24.7 (3.0)	25.0 (3.5)	23.1 (4.0)	116	25.0 (3.3)	25.2 (4.3)	24.0 (3.2)	
Total	1001	22.9 (3.4)	23.7 (3.9)	22.2 (3.2)	841	24.6 (4.1)	25.1 (4.5)	23.8 (3.5)	
Weighted by age		23.2 (95% CI 22.9–23.4)				24.5 (95% CI 24.2–24.8)			<0.001

Not only could the pandemic affect costs for society and the economy, but lifestyle diseases like diabetes and obesity could also have a big impact. [71]. Dietary habits, especially those heavy in sugar, carbs, and fat and low in fiber, are one of the most significant contributors to these disorders. There have been a lot of scientific studies and practical steps taken to improve nutrition options.. [71].

One of these measures has been promoting home cooking [19]. Through the Choose4life and ChooseMyPlate programs, the United Kingdom and United States governments support home cooking. We are unaware of any platform in Norway that encourages individuals to improve their cooking talents.

Nordic Nutrition Recommendations (NNR) serve as the scientific foundation for developing food-based dietary recommendations in Nordic countries. [72]. T The NNR is especially useful for groups of healthy people who do different amounts of exercise (excluding competitive athletes). The suggested doses are inappropriate for the treatment of persistent infections, malabsorption, and certain metabolic diseases, as well as persons with inferior nutritional state. They are designed for use in disease prevention rather than disease therapy or diagnosis.

In the 1980s, the Nordic Nutrition Recommendations (NNR) were created for planning reasons exclusively. The NNR is now a compilation of Nordic dietary reference values based on empirically documented links between nutrient intakes and adequacy indicators, the promotion and maintenance of good health, and the avoidance of diet-related lifestyle illnesses in the general population. The Nordic region has changed these concepts. The NNR was created in response to the growing demand for quantitative values for a variety of purposes inclusding: dietary intake measurement, dietary planning, food and nutrition policy, nutrition information and education, and food product development.

Some Nordic nations' dietary fat content has grown in recent years. Saturated fatty acid (SFA) concentration has followed the same trend as total fat. Recent research indicate that the amount of saturated fatty acids in Nordic nations exceeds the guidelines, although the ratio of unsaturated to saturated fatty acids falls below the limitations. Since the 1990s, the consumption of trans fatty acids (TFA) in all Nordic nations has dropped, mostly due to a fall in the usage of partly hydrogenated fats (below 1 E%) in food manufacturing. From the 1960s to the 1980s, cis-polyunsaturated fatty acid (PUFA) consumption increased and stayed relatively stable.

Table 2.1: The average dietary intake (E%) of total fat and fatty acid sub-categories in the Nordic countries in 2003-2012 [72]**.**

	Denmark	Finland	Iceland	Norway	Sweden
	2003–08	2012*	2010- 2011	2010–2011	2010–11
Total fat	35	36.1/35.5	36.2	34	34
SFA	14	15.1/15.0	14.5	13	13
TFA	0.6	0.5/0.5	0.8	<1.0**	0.5***
MUFA	12	14.0/13.5	11.6	12	13
PUFA	4.9	6.7/6.7	5.9	6.2	5.6

* Men/Women.
** Household Consumption Survey 2005–2009.
*** Market Baskets 2010.

Spreads, butter, and oil, milk and milk products, meat and animal products, and milk and milk products are the primary sources of fat. SFA are found mostly in dairy products, butter, butter-based spreads, meat products, sweet baked goods, and sweets. Animal products and dairy are the primary sources of trans fatty acids (TFA). Fish, soft margarine, and vegetable oil are the principal sources of polyunsaturated fatty acids (PUFA). The current NNR does not specify a maximum cholesterol consumption limit. Dietary guidelines supporting an increase in the consumption of vegetables and discouraging an excessive consumption of fatty dairy and meat products would lower cholesterol intake for the purpose of prevention.

The energy content of food available for metabolism is determined by the energy content of the food as determined in the laboratory by measuring the heat created when its organic components are completely oxidized. Not all of the energy in food is used by humans. Its energy content must be adjusted to account for losses resulting from partial oxidation and urea in urine. In the NNR, the calorie value of a mixed meal is determined using 17 kcal per gram of protein and accessible (glycemic) carbs, as well as 37 kcal per gram of fat. Alcohol (ethanol) has around 29 kJ per gram. Four kilocalories per gram of protein and carbohydrates, nine kilocalories per gram of fat, and seven kilocalories per gram of alcohol are common factors. However, an average value of eight KJ (2 kcal)/g has been suggested (). In the NNR [72], fiber's energy content is assumed to be zero, and fiber is not considered to contribute to the diet's metabolically active energy. [72].

2.5. Summary & Differences to Previous Work

Investigation of healthy food is crucial to know the quality of macronutrients that enter the body so that the health of a population can be improved. The analysis used in previous research was to investigate based on recipes taken from television chef recipes and supermarket-ready meals conducted by Simon based on parameters set by WHO and FSA [19]. A similar study was also conducted by Trattner, who compared health based on internet recipes, TV chef recipes, and ready meals using the Mann-Whitney test method. In this study, the macronutrient parameters were also based on the provisions of the WHO and the FSA [73].

This study has similarities with the research conducted by Simon and Trattner, namely investigating health based on recipes that refer to guidelines set by WHO and the FSA. The method used is the Mann-Whitney test, as research has been conducted by Trattner [19] [73]. The difference in this study is that the recipe source used was taken from 3 countries, namely Norway, the UK, and the US. Recipes taken from the three countries will be analyzed for their health level based on the macronutrient content set by WHO and the FSA.

Chapter 3

METHOD

This chapter will describe the data and methods used in this study and is divided into five sections. Section 3.1 will explain the Data Collection. Section 3.2 explains the Inclusion Criteria. This section will describe how to determine macronutrients from recipes that have been taken before. Section 3.3 describes the analytical method that refers to the guidelines the FSA and WHO set. Section 3.4 describes the statistical method, which will explain how the method is used to analyze the data obtained statistically. Finally, section 3.5 is statistical data. Data that has been processed in section 3.4 will be displayed in the form of a table. This describes the distribution of recipes and the macronutrient content of each recipe that has been taken.

3.1 Data Collection

The study required a comparable sample of four popular websites from Norway that needs to be compared with the existing data in the literature found in the UK and the US. According to benchmark research, the most validly comparable sample can be generated by comparing data from different representative sample of two populations – ready meals and celebrity meals [19]. In this project, these two research were undertaken.

Study 1: The recipes gathered from 4 Norwegian websites were evaluated and compared in the first study : Tine.no, Kolonial.no, Klik.no, Aperitif.no

Study 2: Four data nutrition from Norway were compared to those from the United Kingdom and the United States. The data from the United States and the United Kingdom are available from a prior research [73]. Using a normal Web crawler, the recipe and nutritional information were extracted from the Internet. In addition, the crawler retrieved 15,258 recipes from these four online recipe sources : Aperitif 6500 datasets, Klikk: 3000 datasets, Kolonialen: 520 datasets, Tine: 5000 datasets

Each of the four websites had data nutrition, which was acquired during the first scan.

Using Alexa.com, online recipes from Norwegian websites are selected for the first study. This pick was based on the number of clicks and length of time individuals spent

on these websites. Four websites, namely Aperitif, Klikk, Kolonial, and Tine.no, dominate the Norwegian internet recipe market.

At the time of writing, the Norwegian Online recipe sources were determined using the site analytics firm Alexa.com. In addition, this selection prioritized the number of Klikks and the length of time individuals spend on a website. In addition, it was discovered that Aperitif, Klikk, Kolonial, and Tine.no were the four websites with the most traffic to the Norwegian online recipes.

The data set for Study 2 was collected from the previous research and obtained from the three leading supermarkets for ready-made meals in the United Kingdom: Tesco, ASDA, and Sainsbury's. Amazon UK's best-selling celebrity recipe books were River Cottage every day (Hugh), 30 Meals (Jamie Olivier), Kitchen (Nigella), Ministry of food (Jamie Olivier), and Baking Made Easy (Jamie Olivier) (Lorraine).

The data set discovered in the United States was extracted from the most popular culinary community website, Allrecipes.com, as was done in prior research [73].

Selection of Nutritional Content of Included Internet Recipes

Seven nutrients were added in accordance with [19]: protein, carbs, sugars, salt, lipids, saturated fats, and fibers.

3.2 Method

Method for Study 1:

Based on the following limits and criteria, each recipe on the websites was selected: [19]:

1.The dish must be classified as a major dish.

2.The recipe should not be described as menus for special occasions or events.

3.The dish must be presented and consumed when hot.

4.The recipe must include at least two main components from Eatwell's food groups.

5. The recipe must suggest a minimum serving weight of 225 grams (by weight of raw ingredients)..

6. The recipe should not include soup or breakfast foods.

All recipes from each website that met this inclusion criterion were entered into a Microsoft Excel spreadsheet before the nutrition value was calculated. Then, 100 recipes were chosen at random from each source of data.

The nutritional value of selected meals was established by entering the list of ingredients into Kostholdplanleggerene.no, a Norwegian nutrition calculator designed for food products in Norway. This site contains the four service providers.

Before entering the recipe, the outcome of the computation was explicitly specified. The output consists of mass, energy (kilojoules), calories (kilocalories), fat (grams), saturated fat (grams), carbohydrates (grams), added sugar (grams), fiber (milligrams), protein (grams), and sodium (Na).

The input and result of the computation are in English, translated from a source written in Norwegian using Google Translate.

On the Nutritional Calculator, the nutritional value of each component was determined individually (Kostholdplanleggerene.no) which a Norwegian nutritional calculator.

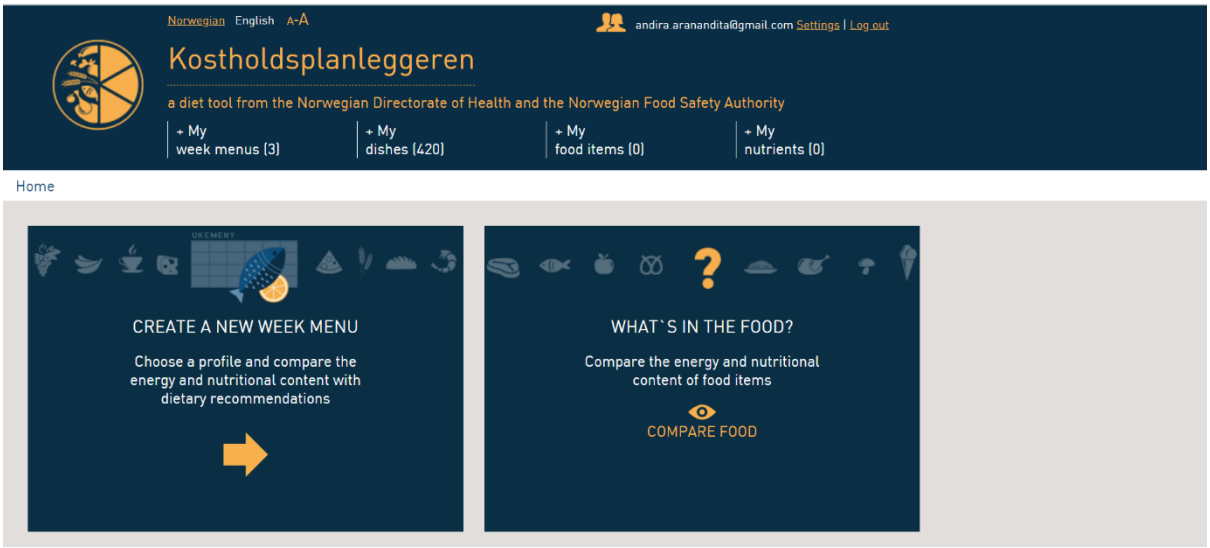


Figure 3. Nutritional Calculator (Kostholdplanleggerene.no).

Some of the products were unavailable from the database. Those exact products were substituted with the closest available replacement [19]; for instance, the recipe for the meal called for lemongrass. The absence of lemongrass in the database necessitated the substitution of a similar product, such as lemon zest or lemon juice. Adjusting the amount of ingredients is also necessary to achieve consistency with the original recipes.

The recipe requested a shrimp paste (Asian paste comprised of little shrimp that have been fermented), but the ingredient was missing in the database. Therefore, soy sauce was employed as a replacement since it was the closest ingredient accessible. It is not shrimp in terms of taste, and it may have different nutritional value; nonetheless, according to the cooking instructions (found on Google from several sources), this substitute gives a similar flavor.

Where things were not indicated in grams (e.g., "1 bulging"), weight data was collected from other credible sources by searching online for legitimate items and analyzing their official website for the exact weight. Where estimated amounts (such as "a pinch") were indicated, Kostholdplanleggerene.no provided a pinch-to-gram conversion based on the University of North Carolina's Dictionary of Units of Measurement.

In this research, when a choice of ingredients was offered, only the first listed component was included. Each recipe was modified to include 100 grams.

The following information was entered into a spreadsheet: The titles of the recipes (selected meals), Portion, Ingredients, The total amount of energy, protein, carbohydrates, sugar, salt, fat, and fiber in the raw components in the dish.

Methods for Second Study:

In contrast to the datasets from the United Kingdom and the United States, the datasets for study 2 include online recipes from four Norwegian websites. The datasets for the United Kingdom were acquired from television shows, five best-selling celebrity chef cookbooks, and a sample of 100 standard-range ready meals randomly selected from three supermarkets. The US datasets were obtained from Allrecipes.com, as was done in prior studies. Following what was done in prior research (similar to study 1), each recipe on the website was evaluated based on the inclusion criteria listed below. Each recipe was matched with the constraint [19] and assessed from applied for the USA datasets.

The recipe: must be identified as the main course, need not be described as suitable only

for special occasions; must be designed to be eaten hot; must contain major components from at least two of Eatwell's food groups; must have a recommended serving size of at least 225g (by weight of raw ingredients), is neither a soup nor a breakfast recipe; and must contain major components from at least two of the "Eatwell" food groups.

The representative sample for ready-to-eat meals was determined based on market popularity to ensure the generalizability of the study. Three supermarkets control 63.2% of the grocery market in the United Kingdom: Tesco (30.6%), Asda (16.9%). Sainsbury's (15.7%)

Due to commercial sensitivity, precise statistics on the sales of ready-to-eat meals in supermarkets are available to the public. This information indicates that ready-to-eat foods are the most often purchased items in supermarkets.

Each of these supermarkets offers a vast array of meals, including their own brand, branded items, frozen and refrigerated alternatives. For this research, the sample consisted of the most popular selection: chilled standard-range own-brand goods from the three major supermarket chains in terms of food market share in the United Kingdom:

Tesco, Asda, and Sainsbury's.

In the United Kingdom, the most popular recipe books were chosen in the same manner as supermarkets prepare meals based on their popularity. The earlier research used Amazon UK's best-selling book data due to the lack of retailer-specific bestseller book data. For the study 2, we will compare three datasets and investigate each dataset in a similar manner :

1. Norway: 15.020 dataset.
2. UK: 200 dataset, 3
3. US: 5238 datasets

Each of these studies strives to be generalizable, with all data set being normalized for 100 gram and randomly chosen to get 100 datasets. For this study, in total, 400 datasets were used.

3.3 Analytical Method

This study utilized Microsoft Excel and R studio (4.2.0) gg plot2, which is a programming language for statistical computation and visuals, to create an appendix.

Two internationally recognized measurement standards were used in this research to assess the nutritional value of food items.

1. Guidelines from the World Health Organization (WHO) [68].
2. FSA (Food Standard Agency) "traffic light" labeling scheme for British foods [67].

According to the Recommended Dietary Allowance (RDA), the three most important macronutrients for a daily diet are carbs, protein, and fat. These macronutrients are interchangeable key sources of energy for the organism. In both research, Howard et al[19] .'s methodology was utilized. This is due to the presence of the 7 most necessary macronutrients out of the 15 macronutrients recommended by the WHO, which are:

1. Protein
2. Carbohydrates
3. Sugars
4. Sodium,
5. Fats
6. Saturated lipids
7. Fibres

The so-called WHO health score might then be derived by calculating the associated ranges. The scale spans from 0 to 7, where 0 indicates that none of the WHO ranges are satisfied and 7 indicates that all WHO requirements have been met.

A meal or diet plan presented online is deemed to be exceptionally healthy if it earns a score of seven macronutrients and extremely unhealthy if it receives a score of zero. The range of nutrient intake goals suggested by WHO food health guidelines is shown in the table below.

Table 3.1: Range of population nutrient intake goals based on WHO guidelines [68]**.**

Dietary factor	Goal (% of total energy, unless otherwise stated)
Total fat	**15-30%**
Saturated fatty acid	**<10%**
Polyunsaturated fatty acids (PUFAs)	6-10%
n-6 polyunsaturated fatty acids (PUFAs)	5-8%
n-3 Polyunsaturated fatty acids (PUFAs)	1-2%
Trans fatty acids	<1%
Monounsaturated fatty acids (MUFAs)	By difference
Total carbohydrate	**55-75%**
Free sugars	**<10%**
Protein	**10-15%**
Cholesterol	<300 mg per day
Sodium chloride (sodium)	**<5 g per day (<2 g per day)**
Fruits and vegetables	≥ 400 g per day
Total dietary fibre	**From foods**
Non-starch polysaccharides (NSP)	From foods

The second measurement metric used was the FSA's "traffic light" requirement. This measurement applies to just 4 macronutrients (sugar, sodium, fat, and saturated fat). The nutritional information from each recipe in each group of data sets was compared to the FSA's classification standards to determine if it was classed as High in fat, salt, or sugar (HFFS).

Table 3.2: Criteria for 100g of food by FSA ranges [67].

Text	LOW[8]	MEDIUM	HIGH	
Colour code	Green	Amber	Red	
			>25% of RIs	>30% of RIs
Fat	≤ 3.0g/100g	> 3.0g to ≤ 17.5g/100g	> 17.5g/100g	> 21g/portion
Saturates	≤ 1.5g/100g	> 1.5g to ≤ 5.0g/100g	> 5.0g/100g	> 6.0g/portion
(Total) Sugars	≤ 5.0g/100g	> 5.0g to ≤ 22.5g /100g	> 22.5g/100g	> 27g/portion
Salt	≤ 0.3g/100g	> 0.3g to ≤ 1.5g/100g	>1.5g/100g	>1.8g/portion

The scale is colored green for healthy, yellow for caution, and red for hazard. Red indicates that the food is high in fat, sugar, or salt, although occasional intake is OK. Amber hues indicate a modest quantity of fat, sugar, or salt. The final color, green, indicates that the meal is low in fat, sugar, and sodium; according to Howard et altechnique, .'s by dividing the overall value by the number of servings, the nutritional value per serving was calculated. [19]. Using the Mann-Whitney test, we compare the overall content per serving of Internet recipes from four Norwegian websites, Internet recipes and ready-made meals, and Internet recipes from television chefs.

The Mann-Whitney test was used to compare the proportion of energy generated from each macronutrient across all groups and recipes. The Chi-square test was then used to compare the proportion of energy generated from macronutrients in each recipe. The results are then compared to the WHO-recommended nutrient intake goals for the prevention of diet-related chronic diseases.

In each of these investigations, we applied the traffic light color system for the four selected macronutrients: fat, saturated fat, sugar, and salt, in accordance with FSA requirements for its labeling scheme, to each dish from each of the different groups.

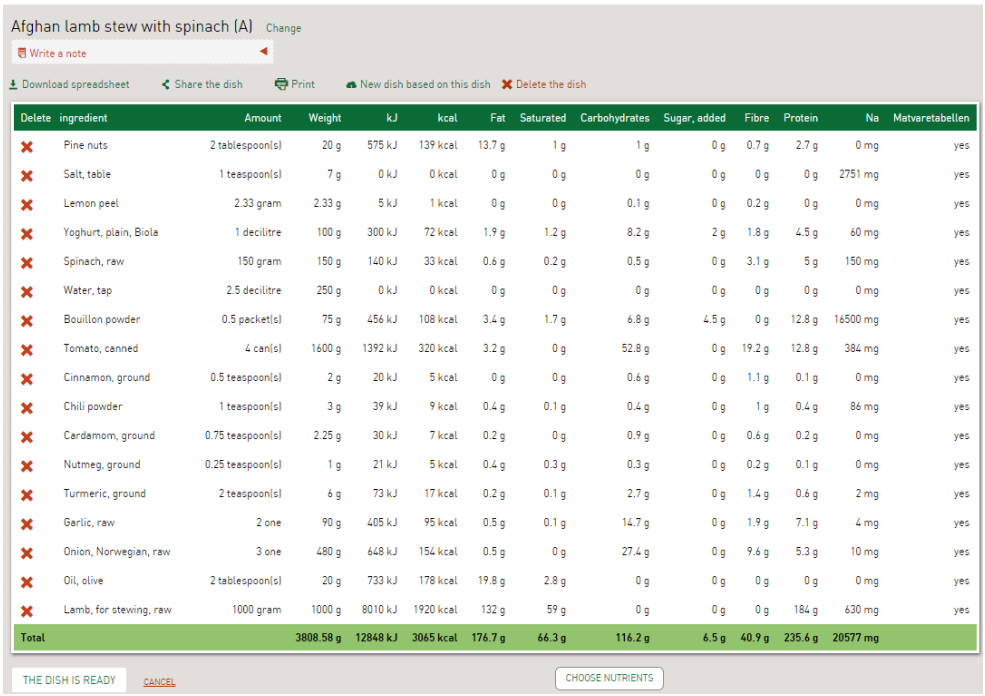
The purpose of the FSA's traffic light standards is to assist and guide consumers in making healthier dietary choices. The traffic light guidelines make it easier for consumers to examine information regarding the fat, saturated fat, sugar, and salt levels of a meal.

3.4 Statistical Method

Data Handling

After randomly choosing 100 online recipes from each dataset and examining them on their individual websites, we discovered that some were inaccessible. Google was used to translate the data from the Norwegian recipes, which are written in Norwegian, prior to registering the recipes.

We manually calculated the nutritional content of the Kostholdplanlegene.no recipe components one by one. We entered the complete recipe and its associated nutritional information into Microsoft Excel. The image below depicts the dish after all the ingredients from the appetizer recipe "Afghan lamb stew with spinach (A)" from the Apperitif.no at Kostholdplanlegene.no.



Afghan lamb stew with spinach (A) Change

Write a note

Download spreadsheet | Share the dish | Print | New dish based on this dish | Delete the dish

Delete	ingredient	Amount	Weight	kJ	kcal	Fat	Saturated	Carbohydrates	Sugar, added	Fibre	Protein	Na	Matvaretabellen
✖	Pine nuts	2 tablespoon(s)	20 g	575 kJ	139 kcal	13.7 g	1 g	1 g	0 g	0.7 g	2.7 g	0 mg	yes
✖	Salt, table	1 teaspoon(s)	7 g	0 kJ	0 kcal	0 g	0 g	0 g	0 g	0 g	0 g	2751 mg	yes
✖	Lemon peel	2.33 gram	2.33 g	5 kJ	1 kcal	0 g	0 g	0.1 g	0 g	0.2 g	0 g	0 mg	yes
✖	Yoghurt, plain, Biola	1 decilitre	100 g	300 kJ	72 kcal	1.9 g	1.2 g	8.2 g	2 g	1.8 g	4.5 g	60 mg	yes
✖	Spinach, raw	150 gram	150 g	140 kJ	33 kcal	0.6 g	0.2 g	0.5 g	0 g	3.1 g	5 g	150 mg	yes
✖	Water, tap	2.5 decilitre	250 g	0 kJ	0 kcal	0 g	0 g	0 g	0 g	0 g	0 g	0 mg	yes
✖	Bouillon powder	0.5 packet(s)	75 g	456 kJ	108 kcal	3.4 g	1.7 g	6.8 g	4.5 g	0 g	12.8 g	16500 mg	yes
✖	Tomato, canned	4 can(s)	1600 g	1392 kJ	320 kcal	3.2 g	0 g	52.8 g	0 g	19.2 g	12.8 g	384 mg	yes
✖	Cinnamon, ground	0.5 teaspoon(s)	2 g	20 kJ	5 kcal	0 g	0 g	0.6 g	0 g	1.1 g	0.1 g	0 mg	yes
✖	Chili powder	1 teaspoon(s)	3 g	39 kJ	9 kcal	0.4 g	0.1 g	0.4 g	0 g	1 g	0.4 g	86 mg	yes
✖	Cardamom, ground	0.75 teaspoon(s)	2.25 g	30 kJ	7 kcal	0.2 g	0 g	0.9 g	0 g	0.6 g	0.2 g	0 mg	yes
✖	Nutmeg, ground	0.25 teaspoon(s)	1 g	21 kJ	5 kcal	0.4 g	0.3 g	0.3 g	0 g	0.2 g	0.1 g	0 mg	yes
✖	Turmeric, ground	2 teaspoon(s)	6 g	73 kJ	17 kcal	0.2 g	0.1 g	2.7 g	0 g	1.4 g	0.6 g	2 mg	yes
✖	Garlic, raw	2 one	90 g	405 kJ	95 kcal	0.5 g	0.1 g	14.7 g	0 g	1.9 g	7.1 g	4 mg	yes
✖	Onion, Norwegian, raw	3 one	480 g	648 kJ	154 kcal	0.5 g	0 g	27.4 g	0 g	9.6 g	5.3 g	10 mg	yes
✖	Oil, olive	2 tablespoon(s)	20 g	733 kJ	178 kcal	19.8 g	2.8 g	0 g	0 g	0 g	0 g	0 mg	yes
✖	Lamb, for stewing, raw	1000 gram	1000 g	8010 kJ	1920 kcal	132 g	59 g	0 g	0 g	0 g	184 g	630 mg	yes
Total			**3808.58 g**	**12848 kJ**	**3065 kcal**	**176.7 g**	**66.3 g**	**116.2 g**	**6.5 g**	**40.9 g**	**235.6 g**	**20577 mg**	

THE DISH IS READY | CANCEL | CHOOSE NUTRIENTS

Figure 3. Afghan lamb stew with spinach interface.

The total nutritional content of all the ingredients in the recipes is exported to the Excel (CSV file)

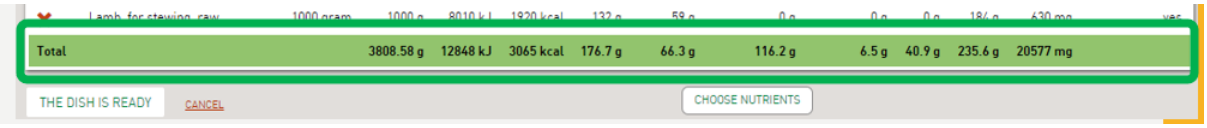


Figure 4. The total nutritional content of all the ingredients.

Nr. Of meal:				
Selected Meals	**Nr. Of portion**	**Ingredients**	**Per Serving**	
Afghan lamb stew with spinach	4	1 Kg lamb stew with bone 2 tablespoon olive oil 3 onions 2 pieces of garlic 2 teaspoons turmeric 0.25 tb malt nutmeg 0.26 tbsp malt cardamom 1 teaspoon chili powder 0.5 tsp ground cinnamon 4 pieces of canned tomatoes in pieces without liquid 2.5 dl lamb or both 150 g fresh spinach 1 dl yogurt natural 1 tablespoon grated lemon peel 1 teaspoon salt 2 tablespoons of roasted pine kernels	Weight	3,808.58
			kJ	12,848
			kcal	3,065
			Fat	176.7
			Saturated	66.3
			Carbohydrate	116.2
			Sugar	6.5
			Fibre	40.9
			Protein	235.6
			Natrium	20,577

Figure 5. For each meal, information was collected on the recommended number of servings.

For each meal, the suggested serving size (the lower limit of any stated range), weight, energy (kJ), calories (kcal), fat, saturated fat, carbs, added sugar, fiber, protein, and salt (Na) content were recorded.

We also recorded the weight of each meal, and used the total weight of the raw components for recipes and the entire weight of the product as sold for ready-to-eat meals.

Using the programming capabilities of R studio, the nutrition values from each recipe dataset were compared. For each dataset, the mean, median, minimum, and maximum values were determined using R studio. The P-value was determined by means of a Mann-Whitney test (Wilcox Test). Analysis of Variance (ANOVA), which does the Tuckey multiple pairwise comparisons between the mean value of groups, was used to analyze 700 datasets by analyzing eight nutritional values and six comparisons [19].

As mentioned above that the FSA "traffic light" was used according to the guidelines to indicate the HFFS for the recipes; in every recipe for, all natrium content from data sources will be times 2,5 for FSA (Natrium to Salt). This mirror the previous research done [19].

3.5 Statistical data

Study 1: Investigating the Nutritional Value from Norwegian Online Recipes

Tables (3.3), (3.4), (3.5), and (3.6) indicate the main statistic for study 1 and the effect of different filters on the number of assessed recipes.

The data for the other categories (recipes from television chefs and ready-to-eat meals from supermarkets) were obtained by the main author of a previous research; their study contains the inclusion and exclusion criteria and sampling techniques for these meals may be found in their work [19]. Since there were no human participants in this research, ethical approval was not necessary, and all of the materials were publically accessible. This is the most important statistic for each dataset from studies 1 and 2.

Table 3.3 shows the information got from Aperitif, which has 6,500 recipes with a 100 percent success rate. One-fifth (1.54%) of the 6,500 created recipes will be examined using 100 randomly chosen recipes. Each dish from the chosen recipes weighs at least 225 grams.

Table 3.3: Total Online Recipe from Aperitif.

Basic statistics of the Internet recipes dataset obtained from Aperitif for study #1: Comparison between Online Recipes in Norway		
	Number of recipes	**Percentage of recipes**
Total published main dish recipes	6500	100
Randomized dishes in the study	100	1.54
Has at least 225 g per serve	100	100

Table 3.4 shows there are as many as 3000 recipes with a 100 percent success rate in the Klikk data. Of the 3000 recipes gathered, 100 will be picked at random for further investigation with a 3,33 % probability. From the gathered recipes, at least one has a serving size of 225 grams per serving.

Table 3.4: Total Online Recipe from Klikk.

Basic Internet recipe dataset statistics gathered from Klikk for study #1: comparing online recipes in Norway. for study #1: Comparison between Online Recipes in Norway		
	Number of recipes	**Percentage of recipes**
Total published main dish recipes	3000	100
Randomized dishes in the study	100	3.33
Has at least 225 g per serve	100	100

Table 3.5 presents the information gathered by Kolonial, including 520 recipes with a 100 percent success rate. Using a ratio of 19.23%, 100 of the 520 collected recipes will be studied in the future. From the gathered recipes, each dish has a minimum 225g weight.

Table 3.5: Total Online Recipe from Kolonial.

Basic Internet recipe dataset statistics collected from Basic Internet recipe dataset statistics obtained from Kolonial. for study #1: Comparison between Online Recipes in Norway		
	Number of recipes	**Percentage Of recipes**
Total published main dish recipes	520	100
Randomized dishes in the study	100	19.23
Has at least 225 g per serve	100	100

Table 3.6 illustrates the data generated from Tine, and there are 5000 recipes with a percentage of 100%. Of the 5000 recipes obtained, 100 randomly selected recipes will later be analyzed with a percentage of 2%. Each serving has at least a 225g weight from the selected recipes.

Table 3.6: Total Online Recipe from Tine.

Basic statistics of the Internet recipes dataset drived from Tine for study #1: Comparison between Online Recipes in Norway		
	Number of recipes	**Percentage of recipes**
Total published main dish recipes	5000	100
Randomized dishes in the study	100	2.00
Has at least 225 g per serve	100	100

Study 2: Investigating the Healthiness of Online Recipes from Norway, UK, and US

Table 3.7 provides Norwegian-generated data. There are 1,520 recipes with a 100 percent success rate. 100 at-random-selected recipes, representing 0.666% of the total number of recipes collected (1,520), will be examined. Each serving in the selected recipes weighs at least 225g.

Table 3.7: Total Online Recipe from Norway.

Basic Internet recipe dataset statistics derived from Norway Recipes for study #2: Comparison between Online Recipe in Norway, UK, and the US		
	Number of recipes	**Percentage of recipes**
Total published main dish recipes	15020	100
Randomized dishes in the study	100	0.666
Has at least 225 g per serve	100	100

Table 3.8 shows data from 200 British recipes with a proportion of 100 percent. Of the 200 obtained recipes, 100 will be picked at random and evaluated with a percentage of 50%. From the obtained recipes, at least 225 g are picked for each dish.

Table 3.8: Total Online Recipe from UK.

Basic Internet recipe dataset statistics derived from UK recipes for study #2: Comparison of Online Recipes in Norway, the UK, and the US		
	Number of recipes	**Percentage of recipes**
Total published main dish recipes	200	100
Randomized dishes in the study	100	50
Has at least 225 g per serve	100	100

Table 3.9 depicts data (5,238 recipes) created entirely in the United States. 100 randomly selected recipes from the total of 5238 will be assessed using a percentage of 1.91 percent. Each dish from the chosen recipes weighs 225g.

Table 3.9: Total Online Recipe from the US.

Basic Internet recipes dataset statistics derived from US recipes for study #2: Comparison between Online Recipe in Norway, the UK, and the US		
	Number of recipes	**Percentage of recipes**
Total published main dish recipes	5238	100
Randomized dishes in the study	100	1.91
Has at least 225 g per serve	100	100

Chapter 4

RESULTS

This chapter will discuss the data that was previously obtained from chapter 3. The focus of this chapter is to analyze the data that has been obtained to answer the research questions that have been determined in section 1.2. The results will be interrelated with the RQs that have been determined. Therefore, the data obtained will be explained in detail.

Study 1: Investigating the Healthiness of Online Recipes from Norway

4.1 Comparison of Norway website's Nutritional Value

Recipes taken from each website will then be matched with the provisions of WHO and FSA using simulation R shown in Figure A is the distribution of recipes after being analyzed with international regulations, and Figure B is the difference in average and standard deviation of P value < 0,05 can conclude that there are significant differences between the groups.

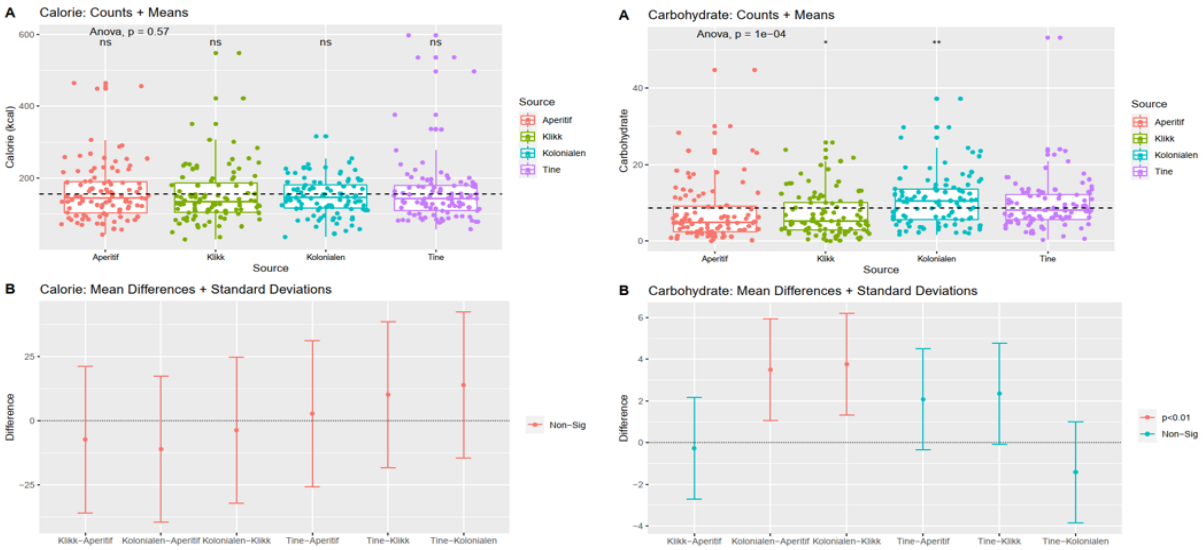


Figure 6. R simulation for calories and carbohydrates from 4 Norway websites.

According to Figure 6, 100 recipes have been selected from each website for Part A of the calorie area. It indicates that the caloric content of 100 randomly selected dishes is within the international dietary recommendation range. Some do not fall inside the predefined range from which the ANOVA p-value (0.57) is derived. The significance of the recipes received from each source, as well as their standard deviation and mean disparities, are discussed in section B. Regarding section B on calories, all criteria are insignificant, as all groups had P values more than 0.05 Regarding carbohydrates in section A, 100 recipes from each website were selected. The data indicates that the carbohydrate content of 100 randomly selected recipes is within the

range prescribed by international standards, with the exception of a few that do not fall within the predetermined value where the value is established (ANOVA p = 0.0001) Regarding carbohydrates in section B, four groups (Klikk-Aperitif, Tine-Aperitif, Tine-Klikk, and Tine-Kolonialen) with P values greater than 0.05 are judged insignificant. In contrast, the P value for the two groups (Colonial-Aperitif and Colonial-Klikk) is less than 0.05, showing a significant difference between these groups.

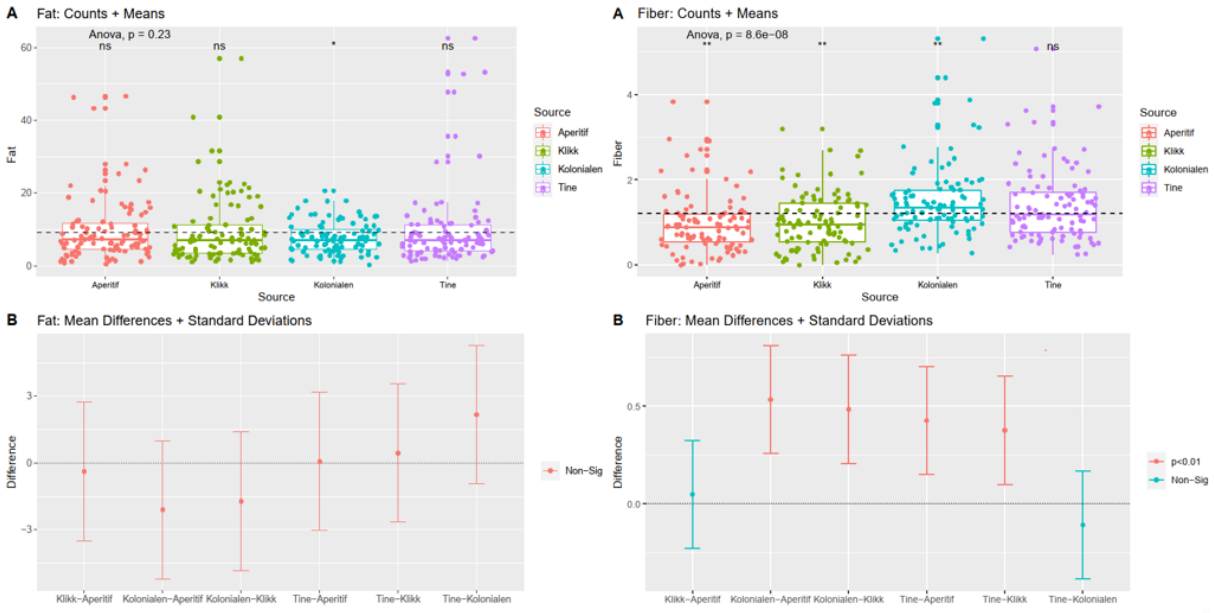


Figure 7. R simulation for Fat and Fibre from 4 Norway websites.

Based on Figure 7 for fat part A, 100 recipes from each website were chosen. It can be shown that the fat content of 100 randomly selected recipes falls within the range established by international standards, although some do not (ANOVA p = 0.23). According to section B on fat, all parameters are non-significant because all groups have a P value greater than 0.05. In fiber section A, 100 recipes from each website have been picked. ANOVA p 0.05 demonstrates that the fiber content of 100 randomly selected recipes fits within the range established by international standards, with the exception of a few that fall beyond the range (0.000000086). Two groups in fiber section B, Klikk-Aperitif and Tine-Kolonialen, are insignificant since their P values are more than 0.05. Four groups, including Kolonialen-Aperitif, Tine-Aperitif, Tine-Klikk, and Kolonialen-Klikk, had P values 0.05, therefore these two groups are statistically significant.

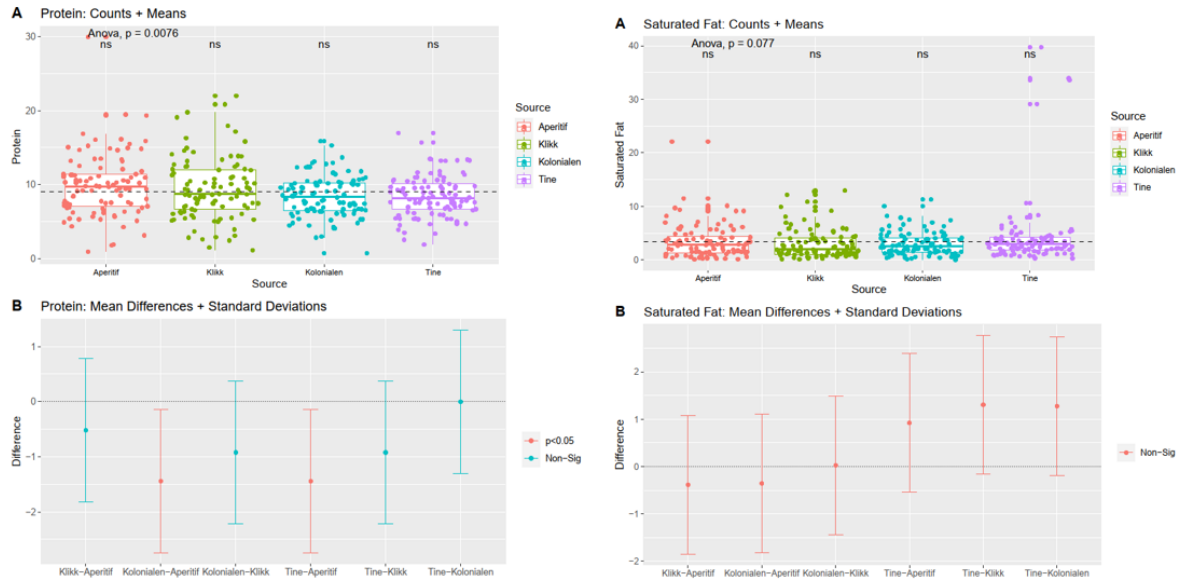


Figure 8. R simulation for Protein and Saturated Fat from 4 Norway websites.

Based on Figure 8 for protein section A, 100 recipes from each website were chosen. The protein content of 100 randomly selected recipes fits within the range established by international standards, with the exception of a few that exceed the determined value. Where p-value for ANOVA is (0.0076). Based on section B on proteins, there are four non-significant groupings, including Klikk-Aperitif, Kolonial-Klikk, Tine-Klikk, and Tine-Kolonial, with P values greater than 0.05. However, the P value for two groups (Kolonial-Aperitif and Tine-Aperitif) is less than 0.05, hence these two groups are statistically significant. Part A of the saturated fat section includes 100 recipes from each website. It demonstrates that the amount of saturated fat in 100 randomly selected recipes is within the worldwide standard range. A few do not fall inside the predefined value, as established by the ANOVA p-value (0.077). All groups in the saturated fat section B had P values greater than 0.05, hence none of the parameters are statistically significant.

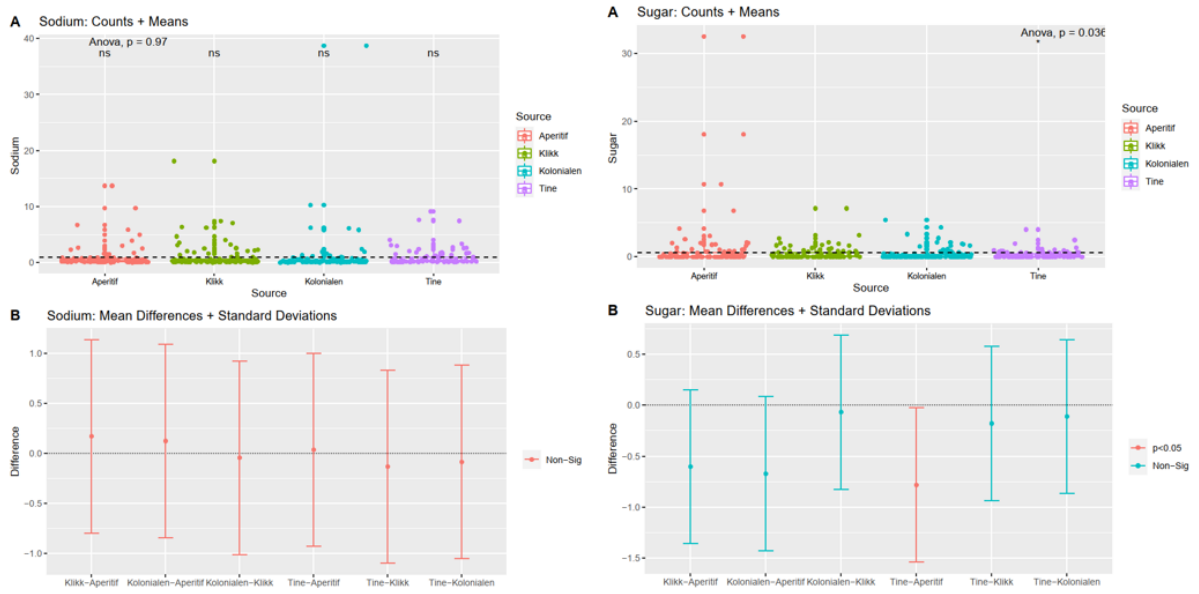


Figure 9. R simulation for Sodium and Sugar from 4 Norway websites.

The sodium amount of 100 randomly selected recipes from each website falls within the range established by international standards, as shown in Figure 9 for sodium component A, which contains 100 recipes from each website. Some sodium above the threshold value at which the ANOVA p value (0.97) is calculated. According to section B on sodium, all parameters are non-significant because all groups have a P value greater than 0.05. In sugar section A, 100 recipes from each website have been picked. The sugar content of 100 randomly selected recipes falls within the range established by international standards, with the exception of a few that do not fall within the fixed value from which the value is derived. ANOVA p (0.036). Five groups in section B (Klikk-Aperitif, Kolonial-Aperitif, Kolonial-Klikk, Tine-Klikk, and Tine-Kolonial) are non-significant in terms of sugar since their P values are greater than 0.05. Comparatively, one group, such as Tine-Aperitif, has a P value of less than 0.05, hence these two groups are statistically significant.

This table compares the nutritional values per serving of internet-based recipes for the first research. The Kolonial includes more calories (145.19 kcal v 143.62 (Aperitif) v 142.62 (Tine) v 134.25 (Klikk)), more fiber (1.35 g v 1.19 (Tine) v 0.96 (Klikk) v 0.88 (Aperitif)) and more protein (10.46 g v 8.05 (Tine) v 5.16 (Klikk) v 4.93 (Aperitif)). The Aperitif has more fat (7.34 g) than the other websites, while Klikk has more sugar (0.04 g) than the other websites. Tine has higher saturated fat (3.02 g v 2.85 (Aperitif) v 2.55 (Kolonial) v 1.93 (Klikk) and more sodium (0.34 g v 0.26 (Klikk) v 0,27 (Aperitif) v 0,21 (Kolonial)).

Table 4.1: Nutritional content per portion of internet recipes.

Nutritional content per portion of Internet recipes created by users				
Nutritional content	**Median (interquartile range)**			
	Aperitif	**Klikk**	**Kolonial**	**Tine**
	N = 100	**N = 100**	**N = 100**	**N = 100**
Calorie (kcal)	143.62 (42.29 - 464.62)	134.25 (28.91 - 548.51)	**146.19 (35.44 - 315.55)**	142.62 (57.03 - 598.09)
Protein (g)	**9.76 (0.9 - 29.95)**	8.7 (1.1 - 22.01)	8.34 (0.7 - 15.86)	8.19 (1.86 - 16.97)
Carbohydrates (g)	4.93 (0 - 44.73)	5.16 (0 - 25.75)	**10.46 (1.65 - 37.18)**	8.05 (0.32 - 53.2)
Sugar (g)	0 (0 - 32.55)	**0.04 (0 - 7.13)**	0 (0 - 5.43)	0 (0 - 4.01)
Fat (g)	**7.34 (0.47 - 46.63)**	7.03 (1.02 - 56.98)	7.15 (0.25 - 20.64)	7.06 (1.24 - 62.55)
Saturated (g)	2.84 (0.09 - 22.1)	1.93 (0.12 - 12.95)	2.55 (0.04 - 11.29)	**3.02 (0.3 - 39.72)**
Fiber (g)	0.88 (0 - 3.83)	0.96 (0 - 3.19)	**1.35 (0.28 - 5.32)**	1.19 (0.25 - 5.07)
Sodium (g)	0.27 (0 - 13.7)	0.26 (0.02 - 18.11)	0.21 (0 - 38.75)	**0.34 (0.04 - 9.13)**

There are significant differences between Aperitif v Kolonial in terms of sugar, fat and saturated fat ($p < 0.01$), significant differences between Aperitif v Tine in terms of sugar and fat ($P<0,01$), significant differences between Klikk v Kolonial in terms of sugar and fat, same goes to Klikk v Tine that significantly different in terms of sugar and fat also found a significantly different between Kolonial v Tine in terms of sodium.

Table 4.2: Nutritional content per portion (P-value).

P value[a] Aperitif - Klikk	P value[b] Aperitif - Kolonial	P value[c] Aperitif - Tine	P value[d] Klikk - Kolonial	P value[e] Klikk - Tine	P value[f] Kolonial - Tine
0.725	0.588	0.659	0.862	0.960	0.732
0.821	0.281	0.214	0.333	0.172	1.000
0.539	0.488	0.567	0.691	0.064	0.383
0.639	<0.01	<0.01	<0.01	<0.01	0.208
0.897	<0.01	<0.01	<0.01	<0.01	0.094
0.372	<0.01	0.020	0.082	0.080	0.830
0.819	0.085	0.769	0.254	0.769	0.782
0.938	0.176	0.186	0.198	0.480	<0.01

4.2 Comparison of Norway Nutrition Distributions

This section will provide the summary, as shown in Table 4.3 and figure (10) of the proportion of each group that meets the criteria which are set by the WHO regarding individual nutritional content. The data shows that none of the recipes meet all seven criteria.

Table 4.3: Comparison of nutrition distributions from internet recipes for WHO criteria.

Comparison of the nutrient distributions of online recipes from Aperitif, Klikk, Kolonial, and Tine for the number of WHO criteria met as of February 2021.

Amount of WHO criteria met	Percentage (total)			
	Aperitif N = 100	**Klikk** N = 100	**Kolonial** N = 100	**Tine** N = 100
0	33	19	32	29
1	48	46	36	44
2	13	25	24	19
3	5	10	5	7
4	1	0	1	1
5	0	0	2	0
6	0	0	0	0
7	0	0	0	0

The data shows that none of the sample from 4 website within Norway (study #1) meet all the WHO 7 criteria. Only two recipes from the Kolonial website that fulfilled 5 out of 7 range WHO criteria.

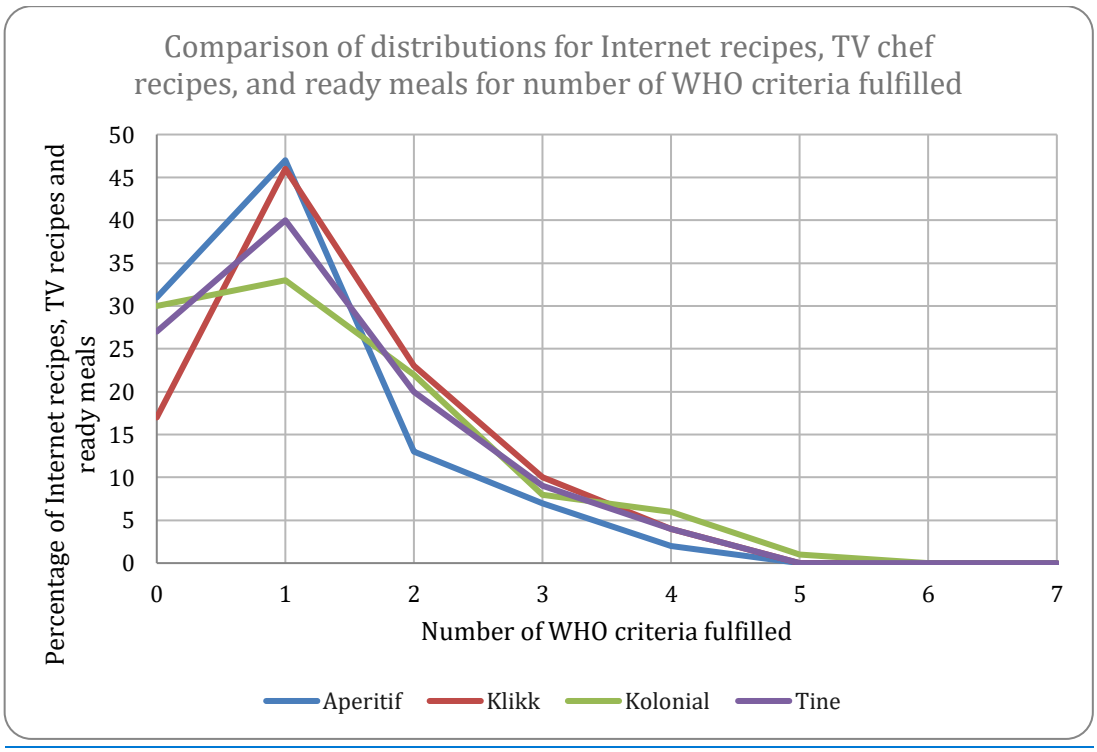


Figure 10. Comparison of distribution internet recipes from Norway for WHO criteria fulfilled.

Based on Figure 10, it can be seen the distribution of the graphs from the four websites that have been taken. After being analyzed and compared with WHO criteria, many recipes did not

meet the WHO criteria (criterion 0). Aperitifs were 33 recipes, Klikk was 19 recipes, Kolonial was 32 recipes, and Tine was 29. On each website, there are also many recipes that only meet one criterion from WHO, such as Aperitif as many as 48 recipes, Klikk as many as 46 recipes, Kolonial as many as 36 recipes, and Tine as many as 44 recipes. In addition, all websites meet 2 WHO criteria, namely Aperitif with 13 recipes, Klikk with 25 recipes, Kolonial with 24 recipes, and Tine with 19 recipes. The higher the criteria, the fewer recipes that meet these criteria, the 3 WHO Aperitif criteria only meet five recipes, Klikk 10 recipes, Kolonial 5 recipes, and Tine 1 prescription. One recipe from Aperitif, Koloniala, and Tine met the four criteria, even though none of the recipes from Klikk met these criteria. Only two recipes on Kolonial were able to meet the five criteria, while none of the recipes from other websites met these criteria, and none of the recipes from the four websites met the criteria up to 6 and 7.

The quantity and percentage of each type of meal that satisfied each WHO objective for a particular nutrient are shown in the table below.

Table 4.4: Quantity and proportion of online recipes that met each WHO nutritional goal.

Nutritional content	Aperitif N = 100		Klikk N = 100		Kolonial N = 100		Tine N = 100		
Macronutrient (% energy)	Median (interquartile range)	% within WHO range	Median (interquartile range)	% within WHO range	Median (interquartile range)	% within WHO range	Median (interquartile range)	% within WHO range	WHO Range
Protein (g)	11.97 (10.61 - 14.97)	4	12.03 (10.56 - 14.47)	9	**12.9 (11.17 - 14.59)**	9	12.7 (10.58 - 14.86)	10	10-15
Carbohydrates (g)	**66.71 (61.55 - 71.87)**	2	63.83 (57.2 - 70.46)	2	60.17 (57.97 - 62.17)	3	64.06 (62.36 - 65.76)	2	55-75
Sugar (g)	1.54 (0.01 - 9.26)	93	**1.69 (0.03 - 8.94)**	99	1.02 (0.07 - 9.49)	98	1.61 (0.04 - 7.18)	100	<10
Fat (g)	24.9 (17.58 - 29.53)	14	25.13 (16.28 - 29.24)	15	**25.19 (15.79 - 29.65)**	19	22.92 (15.53 - 29.33)	17	15-30
Saturated Fat (g)	4.98 (1.18 - 9.92)	25	7.71 (0.84 - 9.97)	39	**8.26 (0.62 - 9.51)**	26	8.01 (2.09 - 9.72)	17	<10
Fiber (g)	3.85 (3.05 - 8.39)	15	**3.99 (3.1 - 11.08)**	20	3.83 (3.01 - 12.9)	29	3.77 (3.03 - 10.66)	31	>3.0
Sodium (g)	0 (0 - 0)	6	0 (0 - 0)	10	**0.05 (0.04 - 0.06)**	11	0 (0 - 0)	0	<0.2

Based on the seven specific nutrients set by WHO on protein, only 4% of recipes from Aperitif meet WHO standards, 9% of recipes from Klikk, 9% of recipes from Kolonial, and 10% of recipes from Tine. Regarding carbs, just 2% of Aperitif, Klikk, and Tine dishes and 3% of Kolonial recipes fulfill WHO guidelines. Based on sugar, 93% of recipes from Aperitif meets WHO standards, 99% from Klikk, 98% from Kolonial, and 100% from Tine. For Fat that meets WHO standards, only 14% of recipes are from the Aperitif website, 15% are recipes from Klikk, 19% are from Kolonial, and 17% are from Tine. On Saturated Fat, 25% of recipes from the Aperitif website meet WHO standards, 39% from Klikk, 26% from Kolonial, and 17% from Tine. The fiber that meets the WHO standards reaches 31% of recipes from Tine, 29% from Kolonial, 20% from Klikk, and 15% from Aperitif. For Sodium which meets WHO standards,

only 6% of recipes are from Aperitif, 10% are from Klikk, 3% are from Colonial, and 0% are from Tine.

4.3 Traffic Light FSA for Norway Websites

In addition to the analysis of 100 recipes with FSA standards, they will also be analyzed with the standards set by the FSA. In the FSA standard, there are only four criteria, namely Fat, Saturated Fat, Sugars, and Salt, each of which has its own Limit, which is calculated in the form of per 100g and per serving which can be seen in the method section.

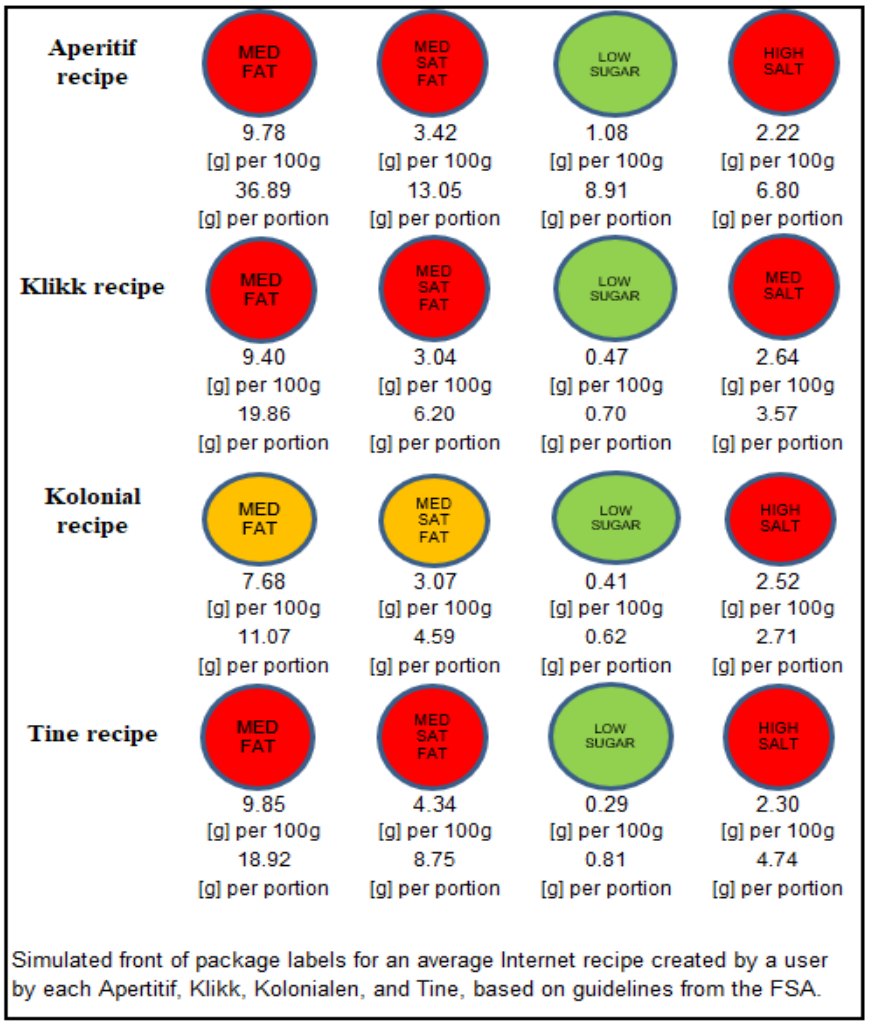


Figure 11. Comparison of distribution internet recipes from Norway for FSA method.

Based on Figure 11, it can be seen the average nutritional content contained in the recipes available from the four websites from Norway. The nutrients in the recipes of each website will be matched with the provisions of the FSA, and results are displayed in Figure 2.

On the Aperitif website, it can be seen that the fat content in a 100g serving is 9,782g and 36,885g for each serving, the 100g fat content on this website is still at the medium limit while

the content per portion exceeds the limit. The saturated fat content in a serving per 100g is 3,422g and 13,050g per serving, and the 100g saturated fat content on this website is still within the medium limit while the content per portion exceeds the limit. The sugar content in a serving per 100g is 1,078g and 8,909g per serving, the 100g sugar content on this website is still at the low limit while the content per portion is below the threshold. The salt content in a serving per 100g is 2.219g, and 6.796g per serving, the 100g salt content on this website is at the high limit, while the content per serving has exceeded the limit.

On the Klikk website, it can be seen that the fat content in a 100g serving is 9.402g and 19,859g for each portion, the 100g fat content on this website is still at the medium limit while the content per portion exceeds the limit. The saturated fat content in a serving per 100g is 3.037g and 6.2g per serving, and the 100g saturated fat content on this website is still within the medium limit while the content per serving exceeds the limit. The sugar content in a serving per 100g is 0.475g, and 0.702g per serving, the 100g sugar content on this website is still at the low limit while the content per portion is below the threshold. The salt content in a serving per 100g is 2,639g, and 3,574g per serving, the 100g salt content on this website is at the medium limit while the content per portion has exceeded the limit.

On the Kolonial website, it can be seen that the fat content in a serving per 100g is 7.681g and 11.073g for each portion, the fat content of 100g on this website is still at the medium limit while the content per portion does not exceed the threshold. The saturated fat content in a serving per 100g is 3,065g and 4,588g per serving, and the 100g saturated fat content on this website is still within the medium limit, while the content per portion does not exceed the threshold. The sugar content in a serving per 100g is 0.406g and 0.619g per serving, the 100g sugar content on this website is still at the low limit while the content per portion is below the threshold. The salt content in a serving per 100g is 2,522g, and 2,706g per serving, the 100g salt content on this website is at the high limit, while the content per portion has exceeded the limit.

On the Tine website, it can be seen that the fat content in a serving per 100g is 9.847g and 18.924g for each serving, the fat content of 100g on this website is still at the medium limit while the content per portion exceeds the limit. The saturated fat content per 100g is 4,340g and 8,750g per serving. The 100g saturated fat content on this website is still within the medium limit, while the content per portion exceeds the limit. The sugar content in a serving per 100g is 0.294g and 0.806g per serving, the 100g sugar content on this website is still at the low limit while the content per portion is below the threshold. The salt content in a serving per 100g is

2.303g, and 4.7446g per serving, the 100g salt content on this website is at the high limit while the content per serving has exceeded the limit.

Based on FSA Traffic Light, the average content of the recipes on the four websites and the threshold according to the provisions of the FSA can be seen. The following pictures will explain the limits the FSA has determined in more detail based on the four nutrients used as parameters.

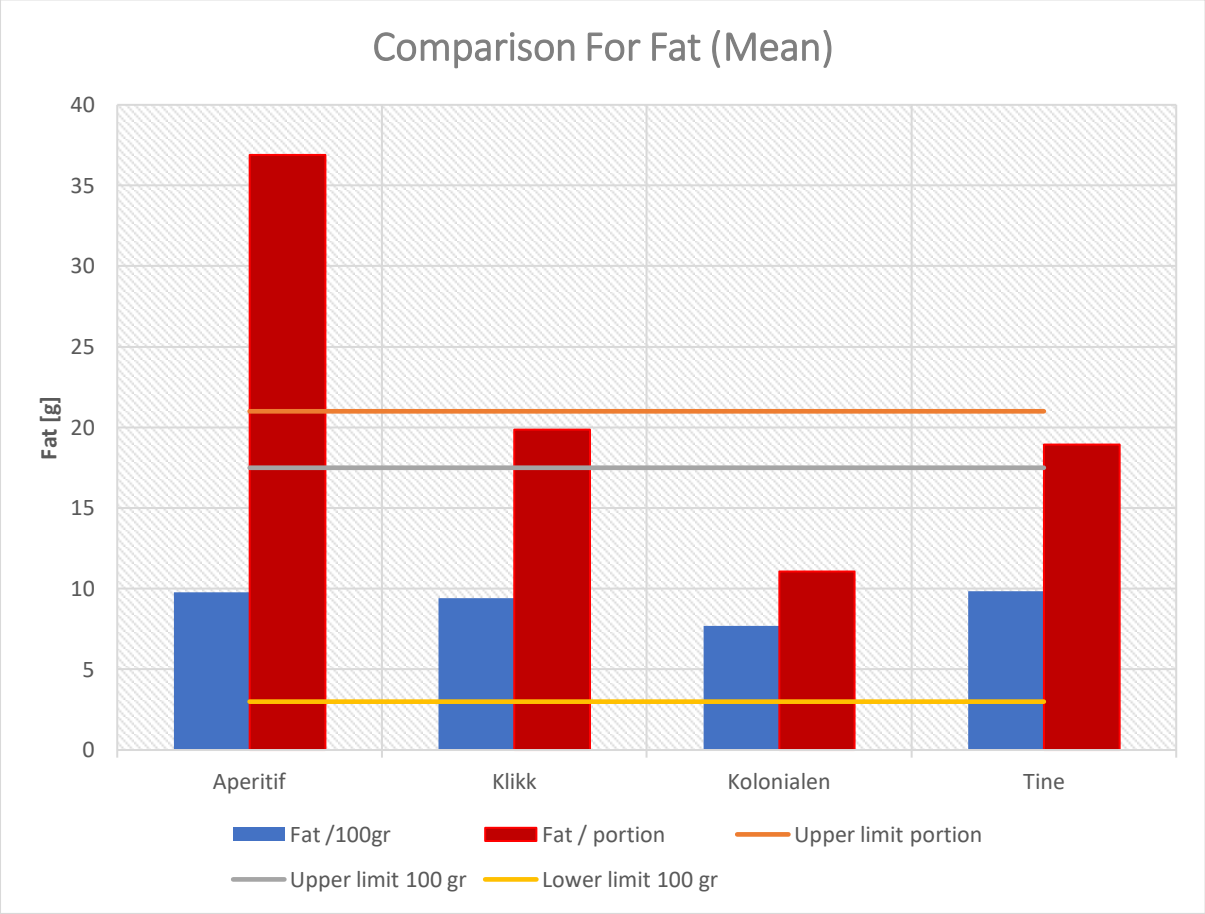


Figure 12. Comparison of Internet Recipes from Norway for Fat (FSA).

Figure 12 represents the Fat content of the average recipes of the four websites. In terms of fat content per 100gr, all websites are above the lower limit (≤3g/100g) and below the upper limit (≥17.5g/100g). This indicates that in each serving per 100 grams, the average recipe provided by the Norwegian website is at the limit. Safe. In servings per serving on three websites such as Klikk, Kolonial, and Tine, the average recipe is still below the upper limit portion (>21g/portion), while aperitif exceeds the upper limit portion set by the FSA.

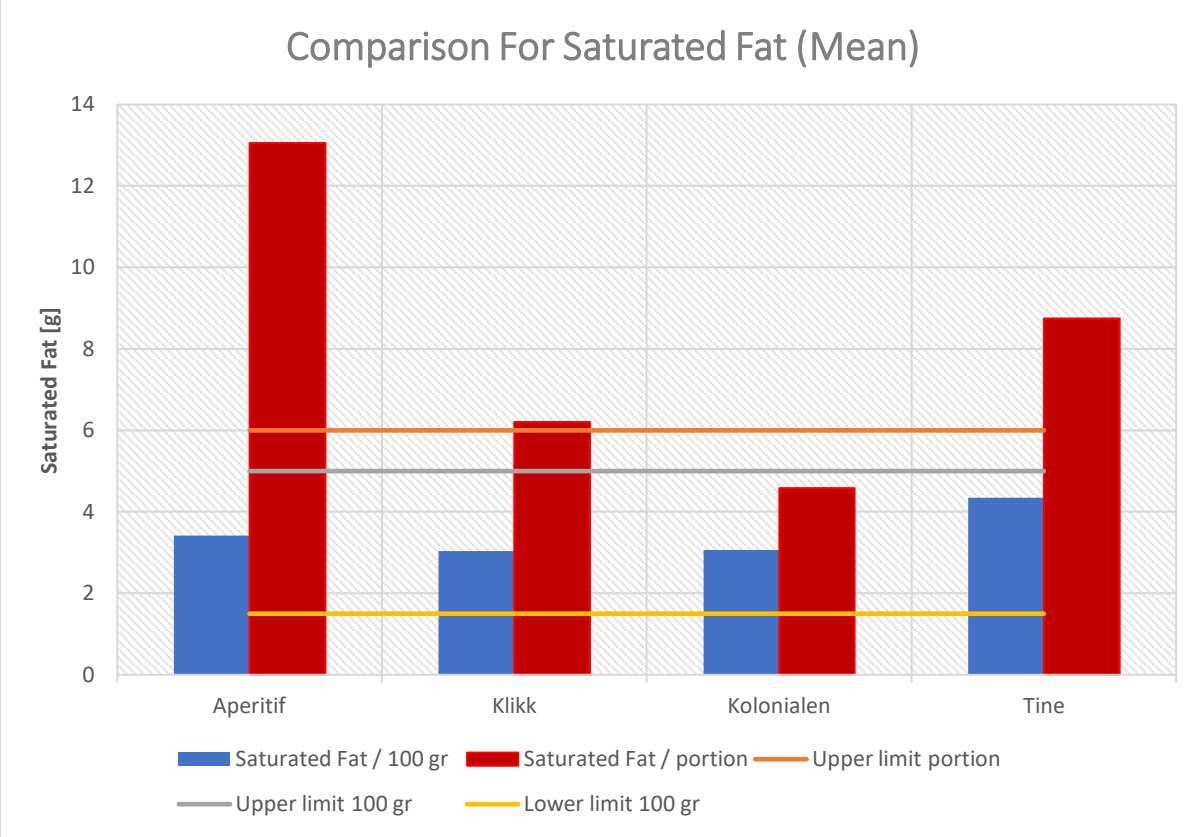


Figure 13. Comparison of Internet Recipes from Norway for Saturated Fat (FSA).

Figure 13 represents the Saturated Fat content of the average recipes of the four websites. On the fat content per 100gr, all websites are above the lower limit (≤1.5g/100g) and below the upper limit (≥5g/100g). This indicates that in each serving per 100 grams, the average recipe provided by the Norwegian website is at the limit. Safe. In servings per serving on three websites such as Klikk, Aperitif, and Tine, the average recipe is above the upper limit portion (>6g/portion), while only Kolonial, whose average recipe does not exceed the upper limit portion set by the FSA.

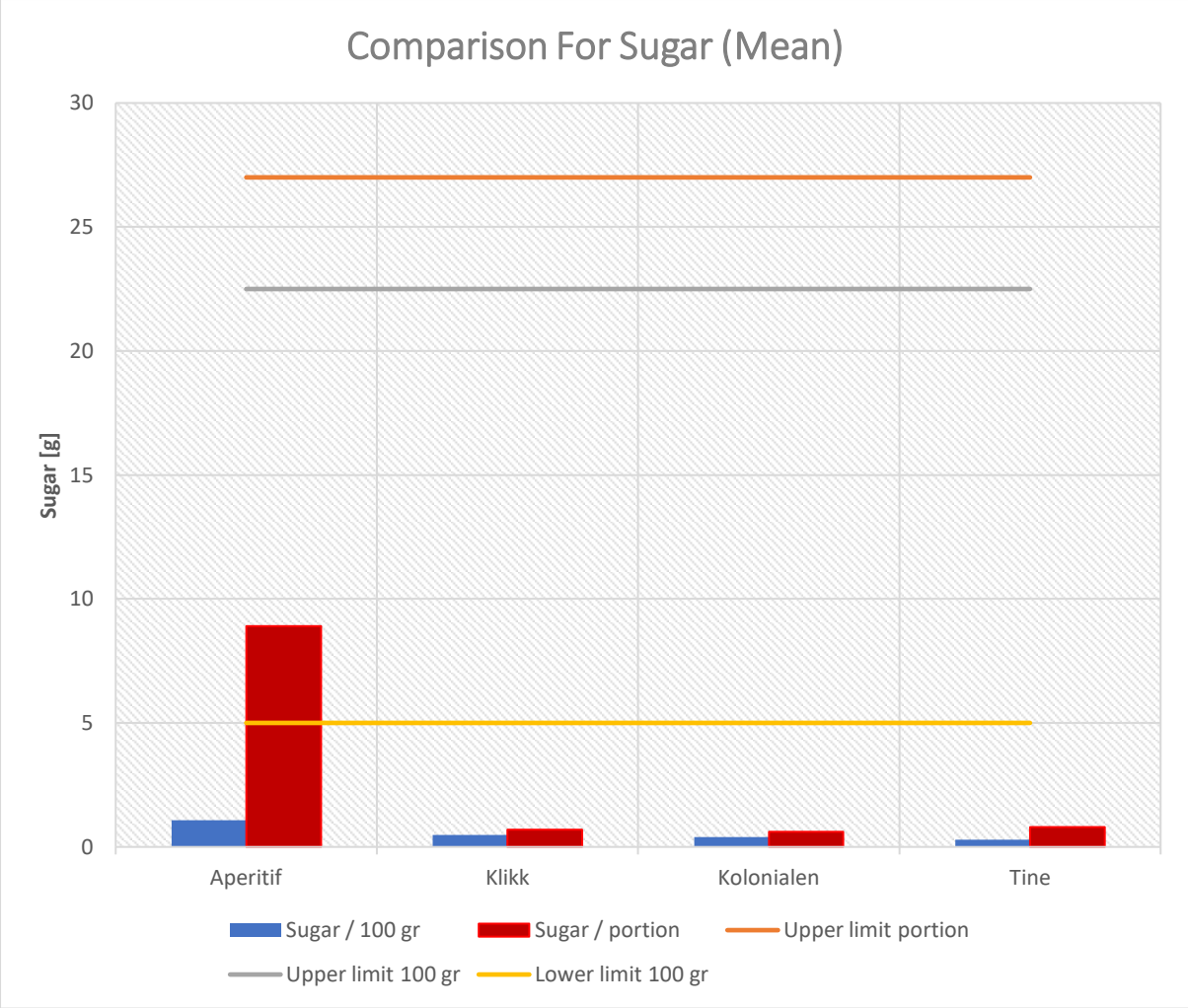


Figure 14. Comparison of Internet Recipes from Norway for Sugar (FSA).

Figure 14 represents the Sugar content of the average recipes of the four websites. In the fat content per 100gr, only Aperitifs are above the lower limit (≤5g/100g), and all of them are still below the upper limit (≥22.5g/100g), this indicates that in each serving per 100 grams the average recipe provided by the website Norway is in the safe limit although several recipes from the three websites do not meet the standards because they are below the lower limit. In servings per serving, all websites such as Kolonial, Klikk, Aperitif, and Tine, the average recipe is below the upper limit portion (>27g/portion) which the average recipe does not exceed the upper limit portion set by the FSA.

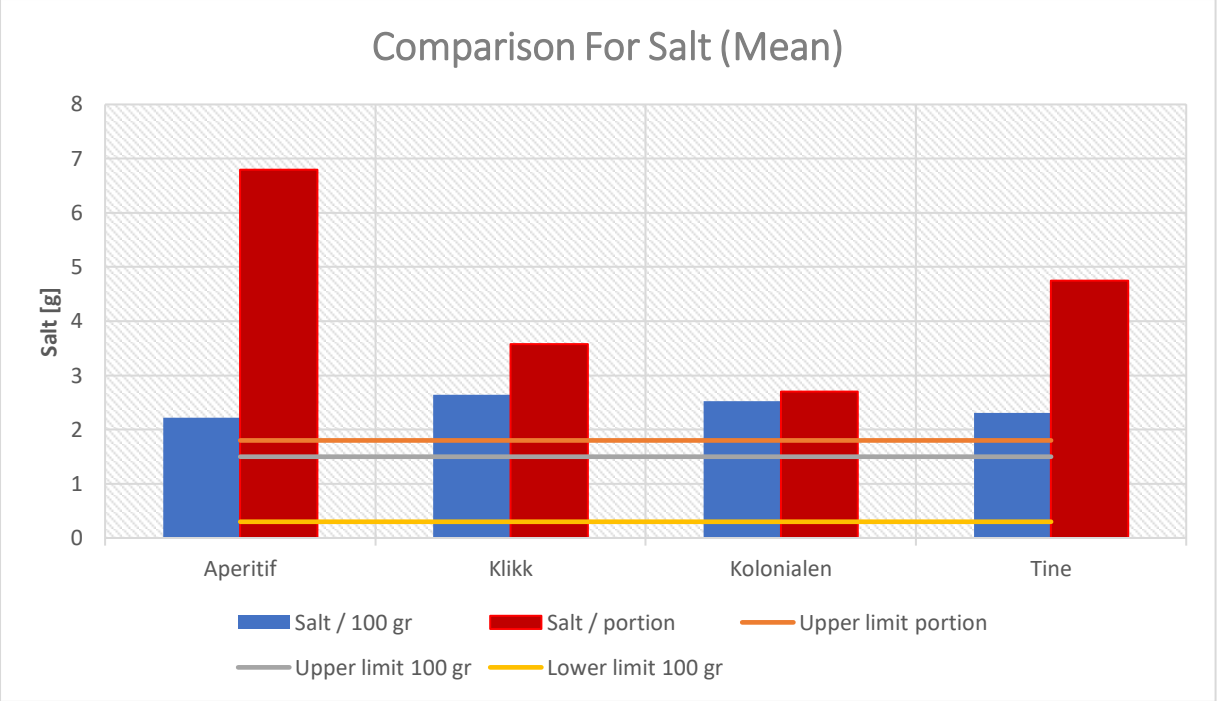


Figure 15. Comparison of Internet Recipes from Norway for Salt (FSA).

Figure 15 represents the Salt content of the average recipes of the four websites. In terms of fat content per 100gr, all websites are above the lower limit (≤0.3g/100g), and all are above the upper limit (≥1.5g/100g). This indicates that in each serving per 100 grams, the average recipe provided by the Norwegian website exceeds the safe limit. On servings per serving on all websites, such as Kolonial, Klikk, Aperitif, and Tine, the average recipe is above the upper limit portion (>1.8g/portion). This means that the average recipe exceeds the upper limit portion set by the FSA.

Traffic light study based on revised Food Standards Agency standards for 5,237 Internet recipes, compared to 100 recipes per website; Aperitif, Klikk, Kolonial, and Tine meals as of December 2010. (Lower limit per 100gr, upper limit per 100gr or per portion).

Table 4.5 shows the percentage of recipes from the Aperitif and Klikk websites. If you look at the nutrition based on the provisions made by the FSA.

Table 4.5: Percentage of Internet Recipe from Aperitif and Klikk within for FSA range.

FSA label	Aperitif recipes% within FSA range			Klikk recipes% within FSA range		
	Red	Amber	Green	Red	Amber	Green
Fat [g]	14	72	14	16	67	17
Saturated Fat [g]	22	50	28	19	40	41
Sugar [g]	2	2	96	0	1	99
Salt [g]	29	50	21	30	47	23
Totals	17% (67)	44% (174)	40% (159)	16% (65)	39% (155)	45% (180)

Based on table 4.5 describes the Aperitif website after analyzing the nutritional content of the recipe with the provisions of the FSA. In Fat, 14 recipes are on the red criteria, 72 are on the Amber criteria, and 14 are on the green criteria. In Saturated Fat, there are 22 recipes that are on the red criteria, 50 are on the Amber criteria, and 28 are on the green criteria. In sugar, two recipes are on the red standards, two are on the Amber criteria, and 96 are on the green criteria. In salt, 29 recipes are on the red criteria, 50 are on the Amber criteria, and 21 are on the green criteria.

Based on table 9, it is also explained the Klikk website after analyzing the nutritional content of the recipe with the provisions of the FSA. In Fat, 16 recipes are on the red criteria, 67 recipes are on the Amber criteria, and 17 recipes are on the green criteria. In Saturated Fat, 19 recipes are on the red criteria, 40 recipes are on the Amber criteria, and 41 recipes are on the green criteria. In sugar, 0 recipes are on the red criteria, one is on the Amber criteria, and 99 are on the green criteria. In salt, 30 recipes are on the red criteria, 47 recipes are on the Amber criteria, and 23 recipes are on the green criteria.

Table 4.6 shows the percentage of recipes from the Kolonial and Tine websites if it is found in the nutrition based on the provisions made by the FSA.

Table 4.6: Percentage of Internet Recipe from Kolonial and Tine within for FSA range.

FSA label	Kolonialen recipes% within FSA			Tine recipes% within FSA range		
	Red	Amber	Green	Red	Amber	Green
Fat [g]	4	80	16	8	75	17
Saturated Fat [g]	18	55	27	18	62	20
Sugar [g]	0	1	99	1	0	99
Salt [g]	21	51	28	29	0	0
Totals	11% (43)	47% (187)	43% (170)	14% (56)	34% (137)	34% (136)

Based on table 4.6 explaining the Kolonial website after analyzing the nutritional content of the recipe with the provisions of the FSA, in Fat, four recipes are on the red criteria, 80 recipes are on the Amber criteria, and 16 recipes are on the green criteria. In Saturated Fat, there are 18 recipes that are on the red criteria, 55 are on the Amber criteria, and 27 are on the green criteria. In sugar, there are 0 recipes on the red criteria, one on the Amber criteria, and 99 on the green criteria. In salt, there are 21 recipes that are on the red criteria, 51 are on the Amber criteria, and 28 are on the green criteria.

Based on table 4.6, it is also explained by the Tine website after analyzing the nutritional content of the recipe with the provisions of the FSA. In Fat, eight recipes are on the red criteria, 75 are on the Amber criteria, and 17 are on the green criteria. In Saturated Fat, there are 18

recipes that are on the red criteria, 62 are on the Amber criteria, and 20 are on the green criteria. In sugar, one recipe is on the red criteria, 0 are on the Amber criteria, and 99 are on the green criteria. In salt, there are 29 recipes that are on the red criteria, 0 are on the Amber criteria, and 0 are on the green criteria.

4.4 Comparison of 3 Countries Nutritional Value

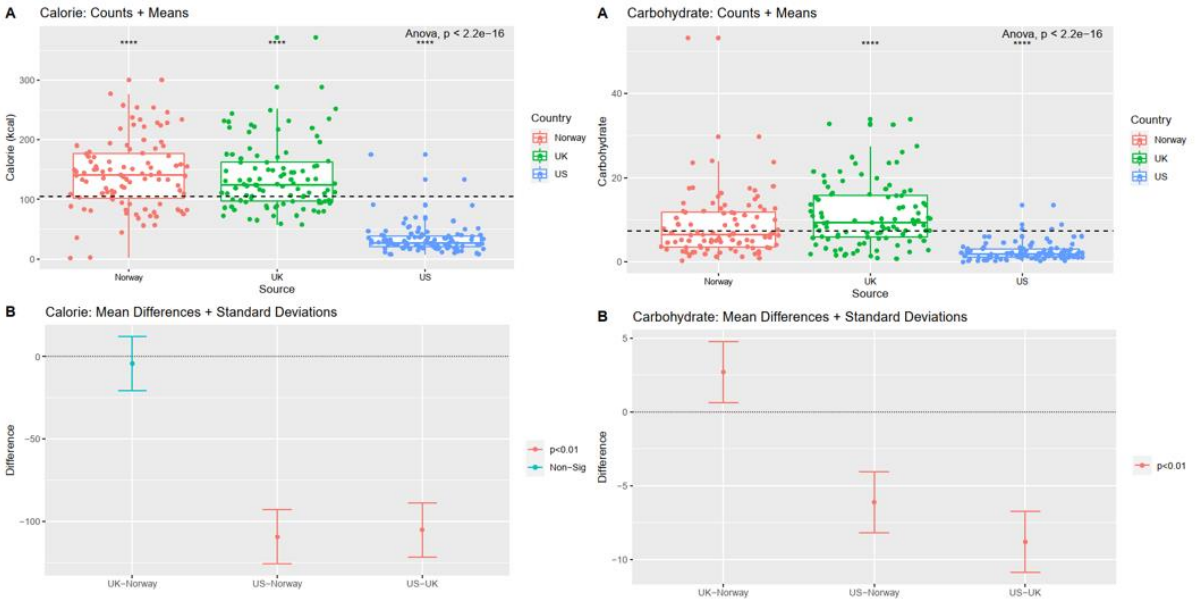


Figure 16. R simulation for calories and carbohydrates for Norway, the UK, and the US.

Figure 16 for calorie portion A (100 selected recipes from the three nations) demonstrates that the calorie content of 100 randomly selected dishes falls within the range established by international standards, but some do not (ANOVA p-value = 0.0000000000000022) The relevance of the recipes obtained from the three countries is illustrated by the Mean differences and standard deviation in section B of the calorie table. According to section B, UK-Norway calorie is in the non-significant range since this group's P value is greater than 0.05, whereas the remaining two groups (US-Norway and US-the UK) are in the significance range because their P values are less than 0.05. In the section on carbohydrates, section A includes over 100 recipes from three countries. The carbohydrate content of 100 randomly chosen recipes fits within the range established by international guidelines. Some do not fall inside the predefined range from which the ANOVA p-value is calculated. (0.0000000000000022). In carbohydrate

section B, three groups (the UK-Norway, the US-Norway, and the US-the UK) had a P value 0.05, meaning these three groups are statistically significant..

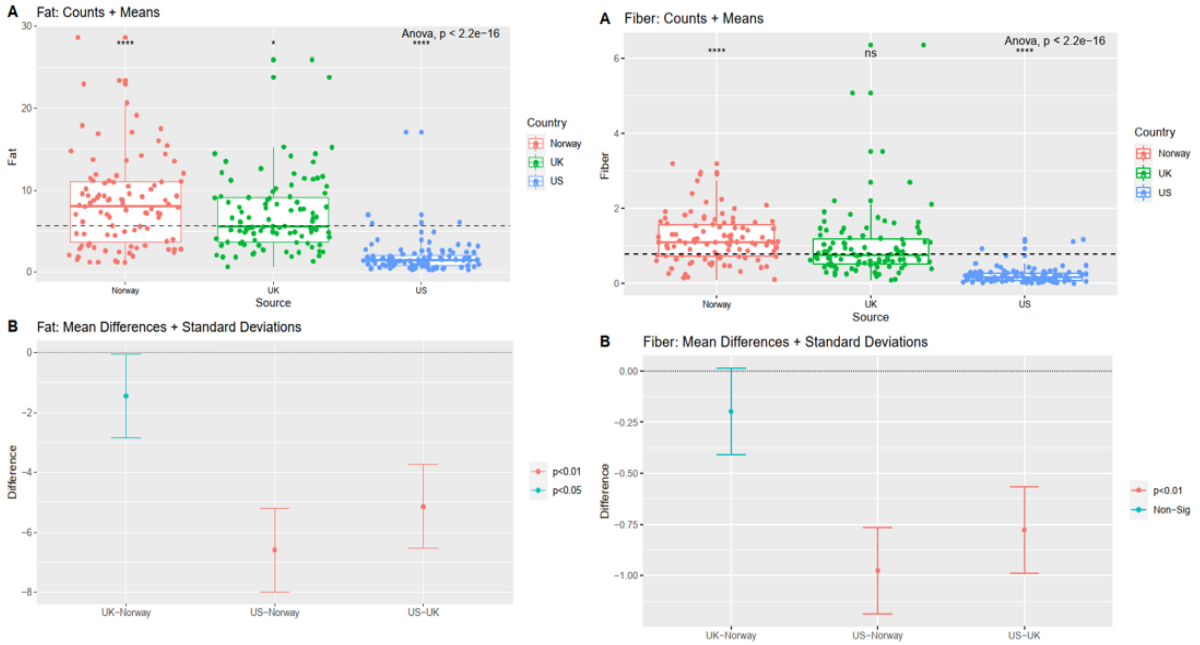


Figure 17. R simulation for Fat and Fibre for Norway, UK, and US.

On the basis of Figure 17 for fat component A (100 selected recipes from the three nations), it can be observed that the fat content of 100 randomly selected recipes falls within the range established by international standards, with the exception of a few that do not fall within this range, as indicated by the ANOVA p-value (0.0000000000000022). According to section B, three fat groups, including UK-Norway, US-Norway, and US-UK, are significant because their P values are less than 0.05, which is statistically significant between these three groups. 100 dishes from the three nations have been selected for fiber section A. According to the statistics, the fiber content of 100 randomly selected recipes falls within the international standard range. Some do not fall under the specified value at which the ANOVA p-value is calculated (0.0000000000000022). In fiber section B, the US-Norway and US-UK groups are significant since their P values are less than 0.05. These two groups are significant, whereas the UK-Norway group is not significant because their P value is more than 0.05.

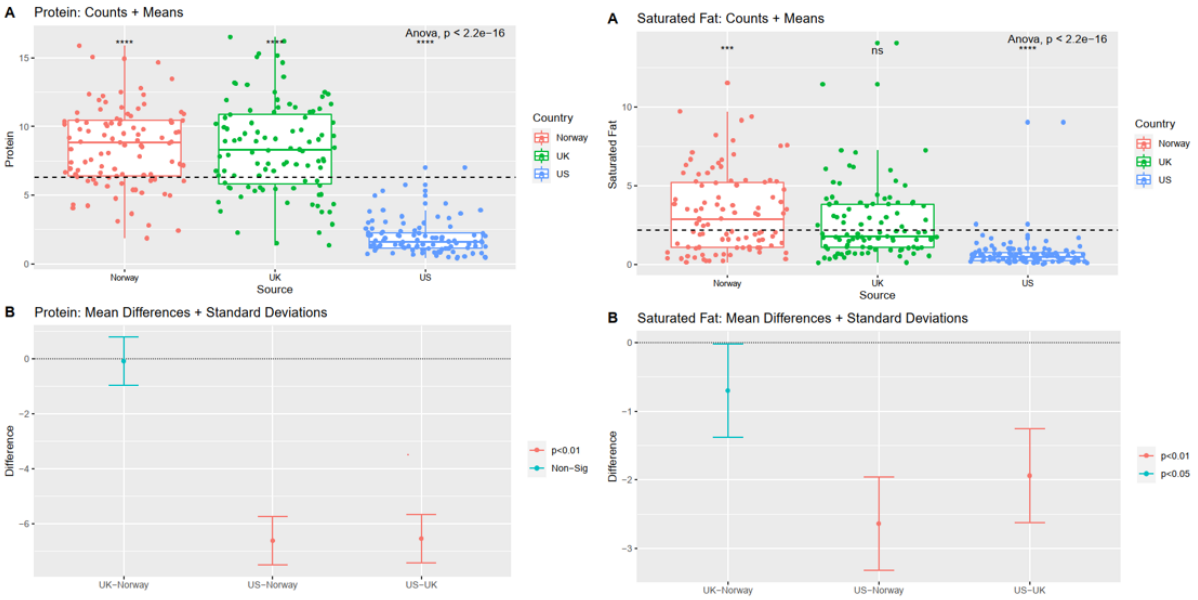


Figure 18. R simulation for Protein and Saturated Fat for Norway, UK, and US.

The protein content of 100 randomly selected recipes from the three countries fits within the range established by international standards, as shown in Figure 18 for the distribution of protein component A across 100 dishes from the three countries. ANOVA p-values derived from the preset value obtained do not apply to all of them (0.0000000000000022). Based on section B, UK-Norway protein is in the non-significance range since its P value is >0.05, whereas US-Norway and US-UK proteins are insignificant because their P values are <0.05. In part A of the distribution of saturated fat over 100 selected recipes from the three countries, it is obvious that the saturated fat level of i100 randomly selected recipes falls within the range defined by international standards. ANOVA p(0.0000000000000022) indicates that some do not fall within it. In the saturated fat section B, the P value for all three groups (UK-Norway, US-Norway, and US-UK) is less than 0.05, indicating these three groups are significant.

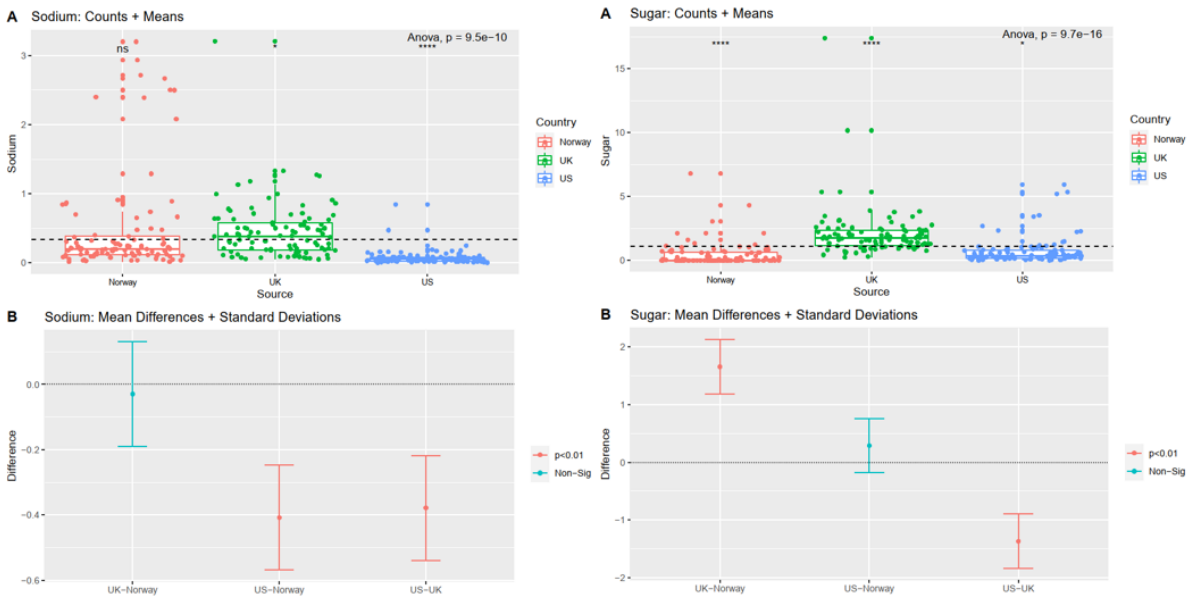


Figure 19. R simulation for Sodium and Sugar for Norway, the UK, and the US.

In accordance with Figure 19 for sodium portion A, it is evident that the sodium content of over one hundred selected recipes from the three nations meets the international norms. In addition, some do not fall inside the predefined value where the derived ANOVA p-value is significant (0.0000000095). According to section B, the UK-Norway sodium range is not statistically significant since its P value is greater than 0.05, whereas the US-Norway and US-UK sodium ranges are significant because their P values are less than 0.05. In the sugar portion, which is distributed throughout 100 randomly selected recipes from the three nations, it can be observed that the sugar level of 100 randomly selected dishes falls within the range established by international guidelines. Some do not fall inside the predefined range from which the ANOVA p-value is derived (0.0000000000000097). In sugar part B, two groups, UK-Norway and US-UK, are significant because their P values are less than 0.05, indicating that there is a significant number between these two groups, however the US-Norway group is not significant because its P value is more than 0.05.

This chart describes the nutritional information per serving for Internet recipes used in Study #2, compared to each other. Norwegian recipes consist of more calories (140.76 kcal v 124.67 (UK) v 26.8 (US)) and more protein (8.82 g v 8.3 (UK) v 1.63 (US)) and more fat (8.06 g v 5.52 (UK) v 1.42 (US)) and more saturated fat (2.86g v 1.76 (UK) v 0.46g (US) and also more fiber (1.1g v 0.76g (UK) v 0.17 (US)). UK recipes contain more carbohydrates (9.34 g v 6.42 g (Norway) v 1.85 g (US)) and more sugar (1.76 g v 0.37 g (US) v 0 g (Norway)) and also more sodium (0.39 g v 0.2 g (Norway) v 0.06 g (US)).

Table 4.7: Nutritional value per serving for US, UK, and Norwegian recipes obtained from the internet.

Nutritional value per serving of recipes from the Internet			
Nutritional content	**Median (interquartile range)**		
	Norway N = 100	**UK N = 100**	**US N = 100**
Calorie (kcal)	**140.76 (1.68 - 300.38)**	124.67 (57.37 - 372.17)	26.8 (7.5 - 175.33)
Protein (g)	**8.82 (1.87 - 15.89)**	8.3 (1.35 - 16.53)	1.63 (0.41 - 7.02)
Carbohydrates (g)	6.42 (0.32 - 53.2)	**9.34 (0.75 - 33.89)**	1.84 (0 - 13.46)
Sugar (g)	0 (0 - 6.79)	**1.76 (0.22 - 17.39)**	0.37 (0 - 5.94)
Fat (g)	**8.06 (1.17 - 28.63)**	5.52 (0.63 - 25.91)	1.42 (0.26 - 17.08)
Saturated (g)	**2.86 (0.13 - 11.5)**	1.76 (0.11 - 14.05)	0.46 (0.03 - 9.02)
Fibre (g)	**1.1 (0.1 - 3.19)**	0.76 (0.08 - 6.36)	0.17 (0 - 1.17)
Sodium (g)	0.2 (0.02 - 3.2)	**0.39 (0.05 - 3.21)**	0.06 (0 - 0.85)

There are significant differences between Norway and v UK in terms of sugar, fat and saturated fat ($p < 0.01$), significant differences between Norway and v US in terms of all nutritional content ($P<0.01$), significantly differences between the UK v US also in terms of all nutritional content ($P<0.01$).

Table 4.8. Norwegian, UK, and recipes from the internet's nutritional content per serving (P Value).

Nutritional value per serving of user-created recipes from the Internet			
Nutritional content			
	P value NO - UK	**P value NO - US**	**P value[S] UK - US**
Calorie (kcal)	0.446	<0.01	<0.01
Protein (g)	0.032	<0.01	<0.01
Carbohydrates (g)	0.032	<0.01	<0.01
Sugar (g)	<0.01	<0.01	<0.01
Fat (g)	<0.01	<0.01	<0.01

Saturated (g)	<0.01	<0.01	<0.01
Fibre (g)	0.814	<0.01	<0.01
Sodium (g)	0.085	<0.01	<0.01

4.5 Comparison of 3 Countries' Nutrition Distributions

This section will give a summary of the percentages of each group that meet the WHO's requirements for the individual nutritional content, as shown in Table 4.12 and Figure 20. According to the data, none of the recipes satisfy all seven requirements. The percentage of different types of recipes and meals that meet the WHO's standards for specific nutritional properties is summarized in Table 16 and Figure 7. The values in this instance are normalized in relation to the overall caloric content of one serving. According to the data, just 6 (0.11%) of the 5,237 Internet recipes and none of the sampled ready-made meals or TV chef dishes matched all seven criteria. 5.9% of recipes from the Internet, 7% of recipes from TV chefs, and 1% of ready-to-eat recipes each fall short of all three criteria. However, the majority of all three types of recipes satisfy one or both requirements. Compared to 42% of recipes from television chefs and 27% of ready-made meals, 46% of internet recipes fulfill one criterion.

As the number of requirements increases, the proportion of Internet recipes that fulfill these criteria decrease at a quicker pace than for other types of meals. Figure 1 demonstrates that a comparable mean number of WHO criteria were met by Internet and TV chef recipes (1.76 and 1.77, respectively; SDs 1.17 and 1.10, respectively). On average, the provided items met 2.37 criteria (SD 1.21). While ready-made meals fulfilled WHO requirements much better than Internet recipes ($p = 0.01$), there was no statistically significant difference between the minor difference between Internet recipes and TV chef dishes ($p = 0.64$).

Table 4.9 compares nutrition distributions from Norway, UK, and US for WHO criteria.

Comparison of nutrition distributions for US, UK, and Norwegian internet recipes that meet several WHO criteria.

Number of WHO criteria fulfilled	Percentage (total)		
	NO	**UK**	**US**
	N = 100	N = 100	N = 100
0	28	8	10
1	37	47	58
2	21	25	13
3	11	13	13

4	3	6	4
5	0	1	2
6	0	0	0
7	0	0	0

The data shows that none of the samples from 3 countries within Norway, the US, and the UK (study #2) meet all the WHO 7 criteria. Only One recipe from the UK and two recipes from the US fulfilled 5 out of 7 range WHO criteria.

Figure 7 shows that the Aperitif recipes and Klikk recipes met the SIMILAR AMOUNT of the criteria number of WHO criteria.

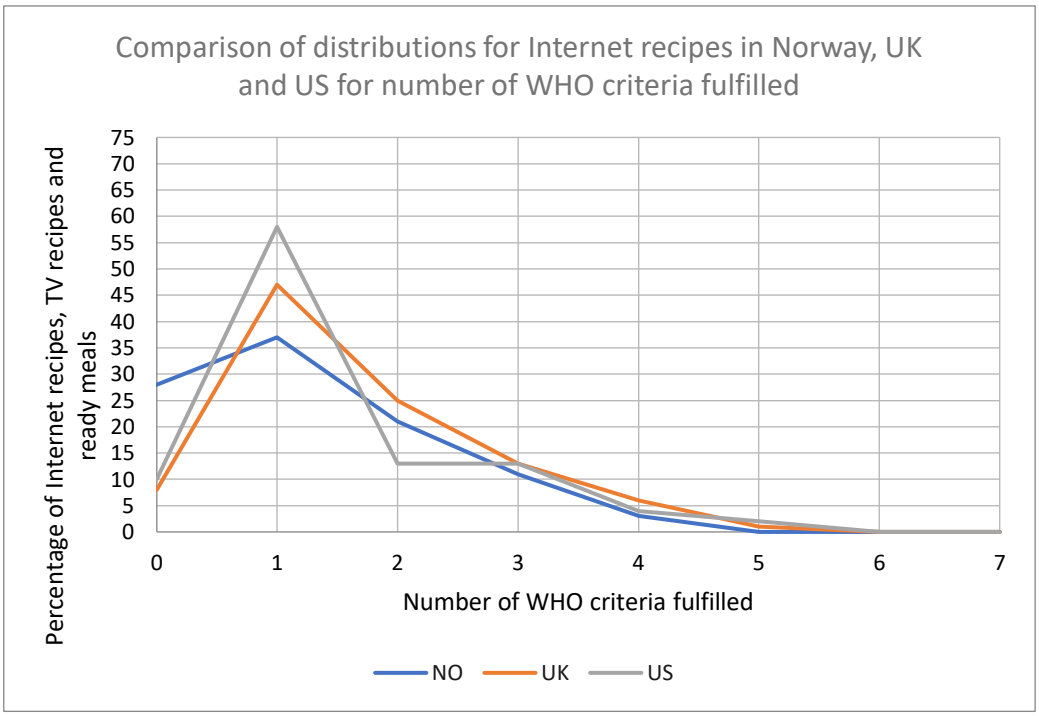


Figure 20. Comparison of distribution recipes from Norway, the UK, and the US for WHO criteria fulfilled.

Based on Figure 20, it can be seen the distribution of the graphs from the three countries that have been taken. After being analyzed and compared with WHO criteria, many recipes did not meet the WHO criteria (criterion 0); Norway had 28 recipes, the UK had eight recipes, and the US had ten recipes. In each country, many recipes meet only a criterion set by WHO, such as Norway with 37 recipes, the UK with 47 recipes, and the US with 58 recipes. In addition, all countries meet 2 WHO criteria: Norway with 21 recipes, the UK with 25 recipes, and the US with 13 recipes. The higher the criteria, the fewer recipes that meet these criteria; in the three criteria of WHO, Norway only meets 11, UK 13 recipes and US 13 recipes. Of the three countries, fewer and fewer meet the four criteria, namely Norway with three recipes, UK 6 recipes and US 4 recipes. Only two recipes from the US and one from the UK were able to

meet the five criteria, while none of the recipes from Norway met these criteria, and none of the recipes from the three countries met criteria up to 6 and 7.

Table 4.10 displays the amount and percentage of each meal type that fulfilled each WHO-specific nutritional guideline.

Table 4.10: The number and percentage of each meal type in Norway, the UK, and the US that met each nutrient-specific WHO guideline.

Nutritional content	Norway N = 100		UK N = 100		US N = 100		
Macronutrient (% energy)	**Median (interquartile range)**	**% within WHO range**	**Median (interquartile range)**	**% within WHO range**	**Median (interquartile range)**	**% within WHO range**	**WHO Range**
Protein (g)	12.58 (11.17 - 14.59)	10	11.08 (10.51 - 13.38)	7	**12.89 (10.75 - 14.68)**	9	10-15
Carbohydrates (g)	**67.11 (62.36 - 71.87)**	2	58.91 (55.38 - 68.25)	8	58.7 (55.87 - 71.83)	8	55-75
Sugar (g)	1.61 (0.01 - 6.39)	96	**4.55 (0.45 - 9.59)**	80	4.09 (0.38 - 9.8)	73	<10
Fat (g)	**22.76 (16.09 - 29.65)**	14	27.19 (15.4 - 29.77)	22	25.26 (15.72 - 29.52)	16	15-30
Saturated Fat (g)	6.05 (2.09 - 9.92)	30	6.63 (0.79 - 9.77)	32	**7.01 (1.6 - 9.93)**	28	<10
Fiber (g)	3.78 (3.01 - 173.56)	24	**3.86 (3.01 - 11.88)**	16	3.7 (3.03 - 6.73)	17	>3.0
Sodium (g)	0 (0 - 0)	8	0 (0 - 0)	0	0 (0 - 0)	1	<0.2

Based on the seven specific nutrients specified by WHO on protein, only 10% of recipes from Norway meet WHO standards, 7% of recipes from the UK, and 9% of recipes from the US. With regard to carbohydrates, only 2% of recipes from Norway and 8% of recipes from the UK and the US meet WHO standards. Based on sugar there are 96% of recipes from Norway meet WHO standards, 80% of recipes from the UK, and 73% of recipes from the US. In Fat that meets WHO standards, only 14% of recipes are from Norway, 22% are recipes from the UK, and 16% are recipes from the US. At Saturated Fat, 30% of recipes from Norway meet WHO standards, 32% of medicines from the UK, and 28% from the US. The fiber that meets WHO standards reach 24% of recipes from Norway, 16% from the UK, and 17% from the US. For Sodium which meets WHO standards, only 8% of recipes are from Norway, 0% are recipes from the UK, and 1% are recipes from the US.

4.6 Traffic Light FSA for 3 Countries

In addition to the analysis of 100 recipes with FSA standards, they will also be analyzed with the standards set by the FSA. In the FSA standard, there are only four criteria, namely Fat, Saturated Fat, Sugars, and Salt, each of which has its own Limit, which is calculated in the form of per 100g and per serving which can be seen in the method section.

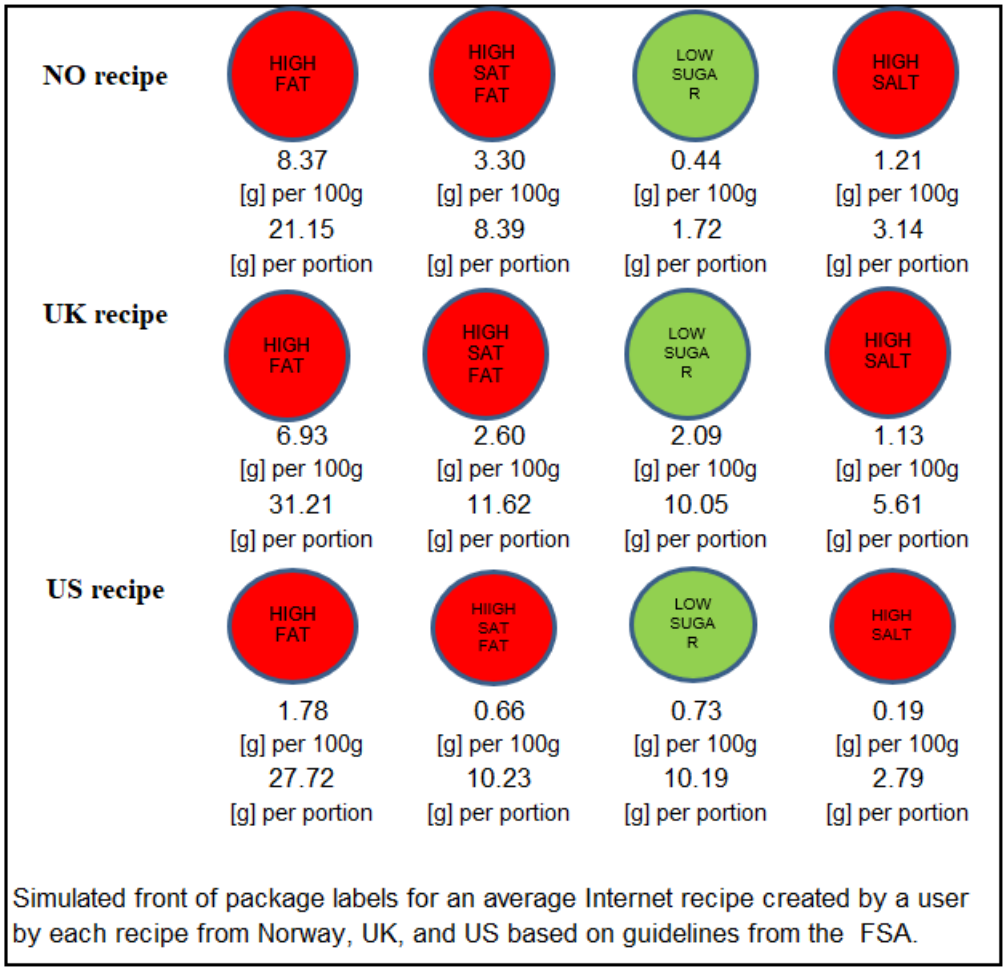


Figure 21. Comparison of distribution recipes from Norway, the UK, and the US for the FSA method.

Based on Figure 21, it can be seen the average nutritional content contained in the recipes available from the three countries, namely Norway, the UK, and the US. The nutrients contained in the recipes of each website will be matched with the provisions of the FSA so that the results are as shown in Figure 2.

In Norway, the fat content of a serving per 100g is 8.373g and 21,149g for each serving, at 100g the fat content is at the high limit while the content per serving exceeds the limit. The saturated fat content in a serving per 100g is 3,298g and 8,329g per serving, the saturated fat content of 100g is in the medium limit while the content per portion exceeds the limit. The sugar content in a serving per 100g is 0.437g and 1.723g per serving, the sugar content of 100g

is at the low limit while the content per serving is below the threshold. The salt content in a serving per 100g is 1,206g, and 3,141g per serving, the salt content of 100g is at the high limit while the content per serving has exceeded the limit.

In the UK, the fat content in a serving per 100g is 6.928g, and 31,207g for each serving, the fat content of 100g is at the high limit while the content per serving exceeds the limit. The saturated fat content per 100g serving is 2,599g and 11,624g per serving. The 100g saturated fat content is at the high limit, while the content per serving exceeds the limit. The sugar content in a serving per 100g is 2,094g, and 10,047g per serving, the sugar content of 100g is at the low limit while the content per portion is below the threshold. The salt content in a serving per 100g is 1,133g and 5,608g per serving; at 100g, the salt content is within the medium limit, while the content per portion has exceeded the limit.

In the US, the fat content in a serving per 100g is 1.783g, and 27,722g for each serving, the fat content of 100g is at the high limit while the content per serving exceeds the threshold. The saturated fat content in a serving per 100g is 0.659g, and 10.225g per serving, the saturated fat content of 100g is at the high limit while the content per serving exceeds the threshold. The sugar content in a serving per 100g is 0.727g, and 10,194g per serving, the sugar content of 100g is at the low limit while the content per portion is below the threshold. The salt content in a serving per 100g is 0.186g, and 2.785g per serving, the salt content of 100g is at the high limit while the content per serving has exceeded the limit.

Based on FSA Traffic Light, it can be seen the average content of recipes in the three countries and their thresholds according to the provisions of the FSA. The following pictures will explain the limits the FSA has determined in more detail based on the four nutrients used as parameters.

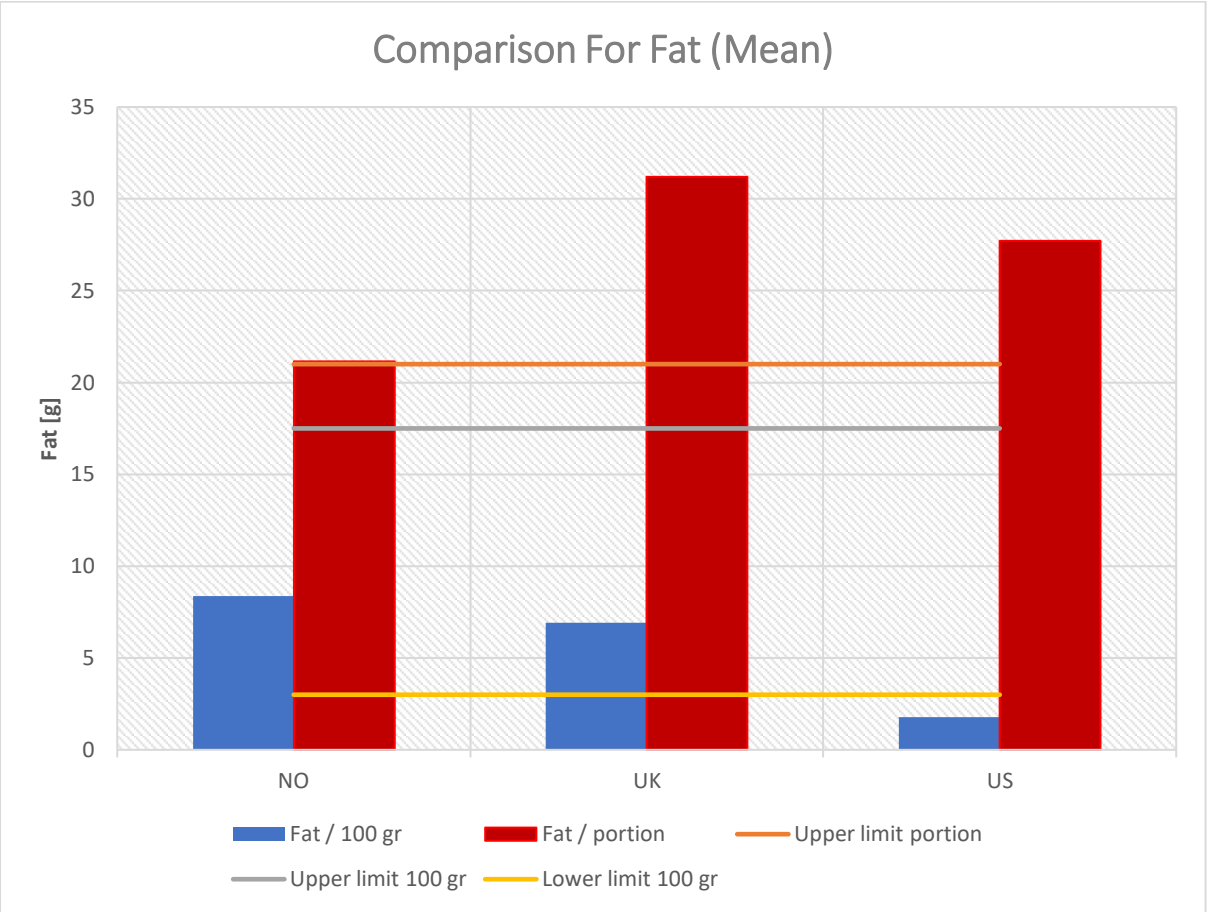


Figure 22. Comparison Recipes from Norway, UK, and US for Fat (FSA).

Figure 22 represents the Fat content of the average recipes of the three countries. On the fat content per 100gr, Norway and the UK are above the lower limit (≤3g/100g), while the US is below the lower limit. On the other hand, all countries are below the upper limit (≥17.5g/100g). This means that in each serving per 100 grams, the average prescription provided by Norway and the UK is within the safe limit except for the US because it is below the threshold. In Norwegian serving per serving, the average recipe is still below the upper limit portion (>21g/portion), while the US and UK exceed the upper limit portion set by the FSA.

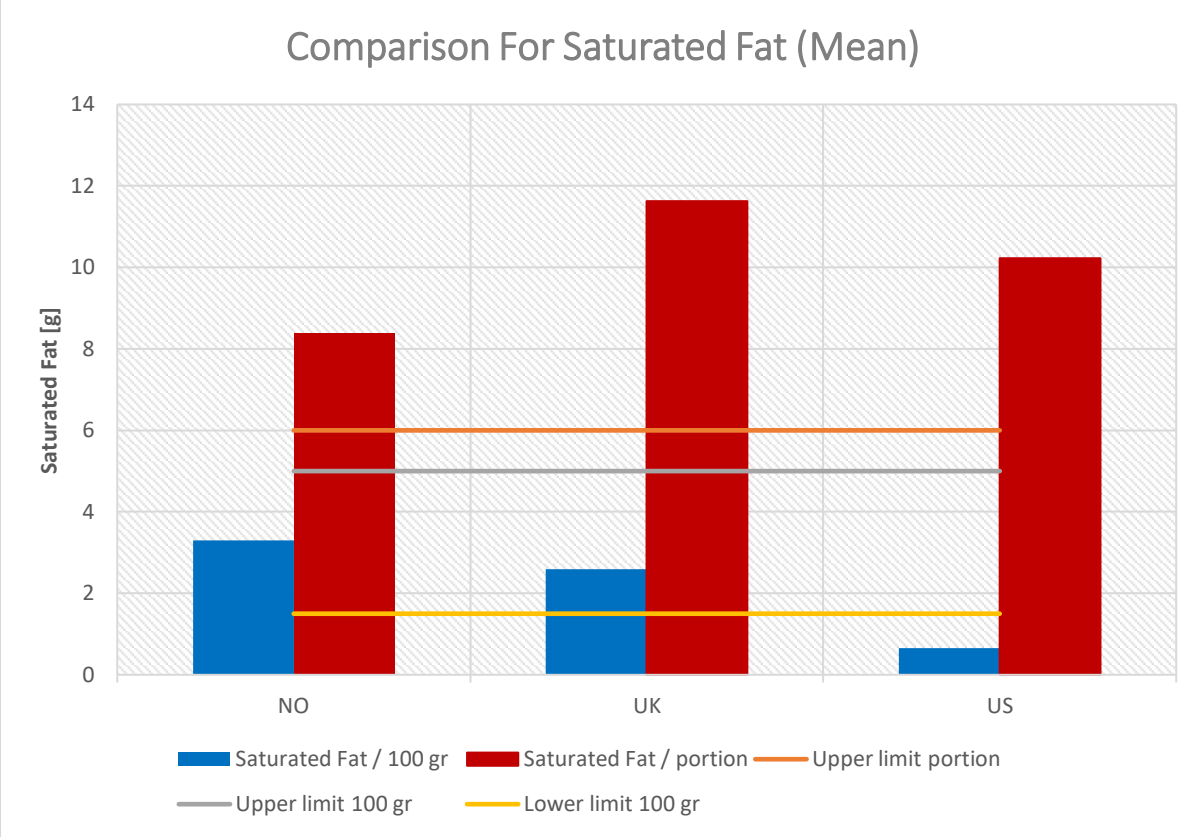


Figure 23. Comparison Recipes from Norway, UK, and US for Fat (FSA).

Figure 23 represents the Saturated Fat content of the average recipes of the three countries. In terms of saturated fat content per 100gr, Norway and the UK are above the lower limit (≤1.5g/100g), while the US is below the lower limit. On the other hand, all countries are below the upper limit (≥5g/100g). This indicates that in every serving per 100, the average gram of prescription provided by Norway and the UK is within the safe limit except for the US because it is below the threshold. In servings per serving in all countries, the average recipe is above the upper limit portion (>6g/portion) set by the FSA.

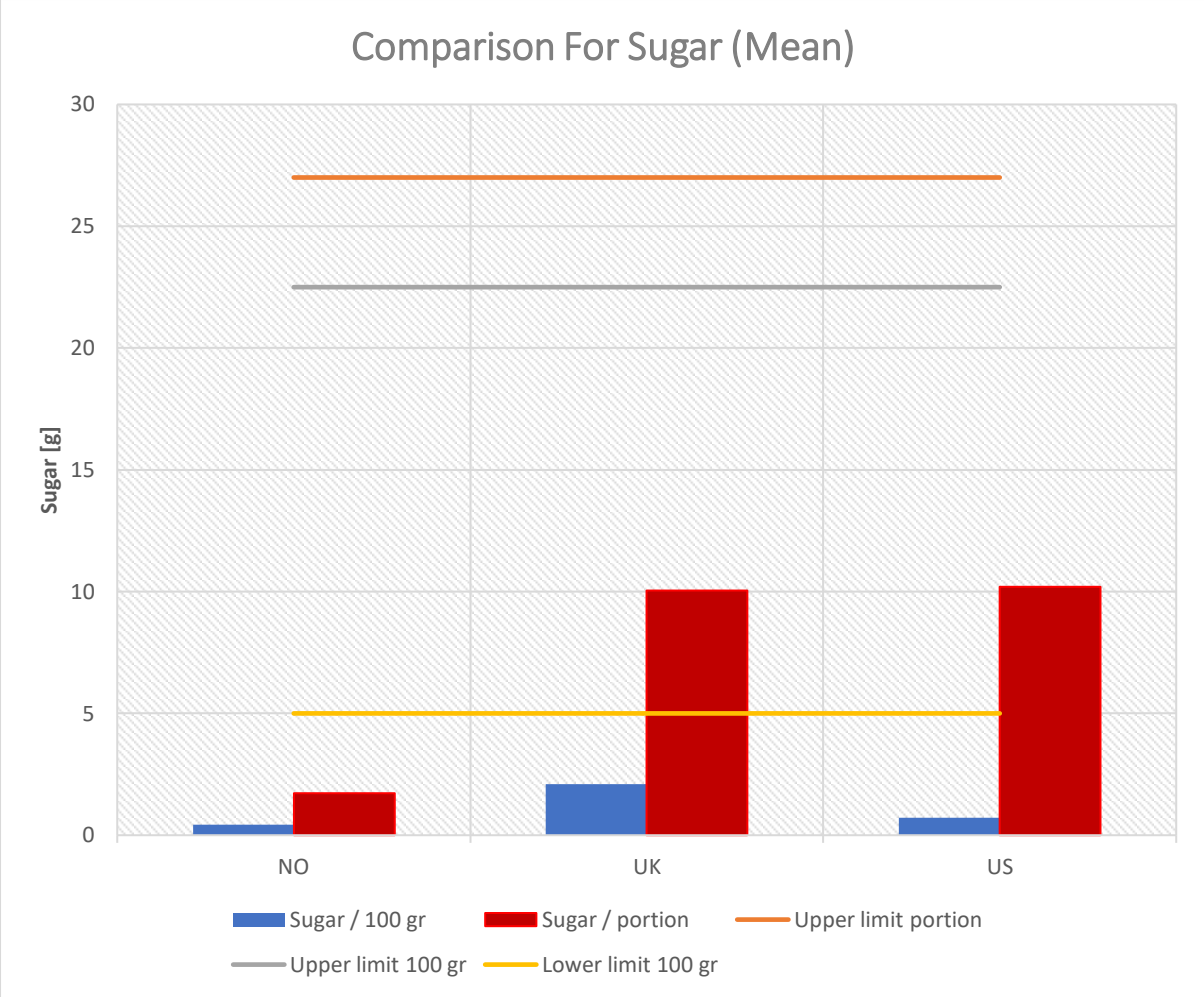


Figure 24. Comparison Recipes from Norway, UK, and US for Fat (FSA).

Figure 24 represents the Sugar content of the average recipes of the three countries. The sugar content per 100gr of the three countries is below the lower limit (≤5g/100g), and the three countries are below the upper limit (≥22.5g/100g). This indicates that in each serving per 100 grams, the average recipe provided by Norway and UK is not in the safe limit because it is below the threshold. In servings per serving in all countries, the average recipe is below the upper limit portion (>27g/portion) set by the FSA.

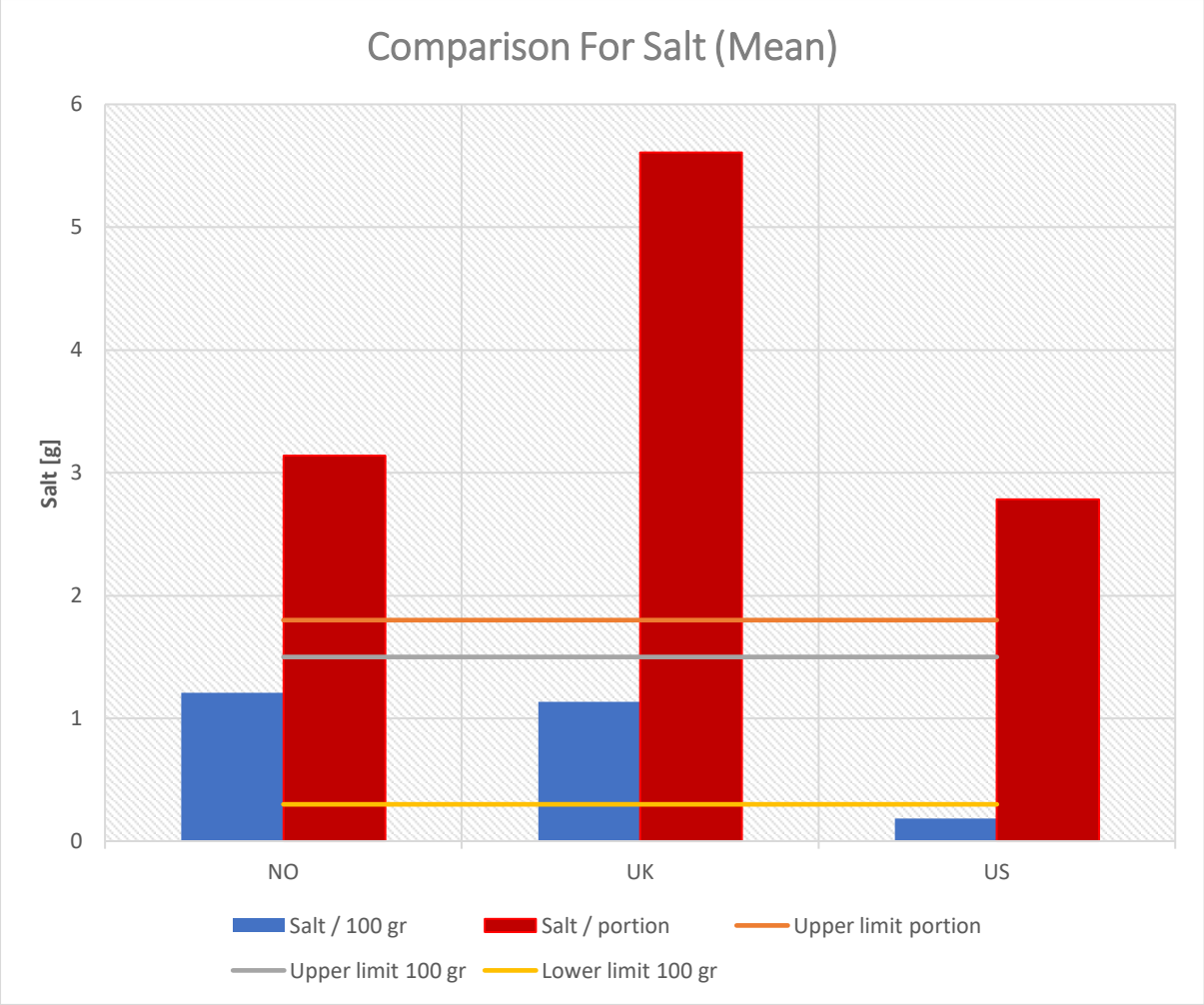


Figure 25. Comparison Recipes from Norway, UK, and US for Fat (FSA).

Figure 25 represents the Salt content of the average recipes of the three countries. On the saturated fat content per 100gr, Norway and UK are above the lower limit (≤0.3g/100g), while the US is below the lower limit; on the other hand, all countries are below the upper limit (≥1.5g/100g). This indicates that each serving per 100 grams (the average recipe provided by Norway and the UK) is within the safe limit, except for the US, because it is below the threshold. In servings per serving in all countries, the average recipe is above the upper limit portion (>1.8g/portion) set by the FSA.

Table 4.11 shows the percentage of recipes from the three countries, namely Norway, the UK, and the US after the nutritional analysis was carried out based on the provisions made by the FSA.

Table 4.11: Percentage of Recipe from Norway, UK, and US within for FSA range

FSA label	Norwegian internet recipes% within			UK internet recipes% within FSA			US internet recipes% within FSA		
	Red	Amber	Green	Red	Amber	Green	Red	Amber	Green
Fat [g]	7	73	20	6	79	15	58	0	42
Saturated Fat [g]	27	43	30	14	0	29	61	0	39
Sugar [g]	2	0	98	0	4	96	8	0	92
Salt [g]	21	54	25	28	55	17	67	0	33
Totals	14% (57)	43% (170)	43% (173)	12% (48)	35% (138)	39% (157)	49% (194)	0% (0)	52% (206)

Looking at Norway, on the Fat label, there are seven recipes in the red criteria, 73 recipes in the Amber criteria, and 20 recipes in the green criteria. On the Saturated Fat label, 27 recipes are on the red criteria, 43 recipes are on the Amber criteria, and 30 recipes are on the green criteria. On the sugar label, two recipes are on the red criteria, no recipe is on the Amber criteria, and 98 recipes are on the green criteria. On the salt label, 21 recipes are on the red criteria, 54 are on the Amber criteria, and 25 are on the green criteria.

In the UK, on the Fat label, there are six recipes on the red criteria, 79 recipes on the Amber criteria, and 15 recipes on the green criteria. On the Saturated Fat label, there are 14 recipes on the red standards, 0 recipes on the Amber criteria, and 29 recipes on the green criteria. On the sugar label, there are 0 recipes that are on the red criteria, four are on the Amber criteria, and 96 are on the green criteria. On the salt label, there are 28 recipes that are on the red criteria, 55 recipes are on the Amber criteria, and 17 recipes are on the green criteria.

Regarding the US on the Fat label, 58 recipes are on the red criteria, 0 are on the Amber criteria, and 42 are on the green criteria. On the Saturated Fat label, there are 61 recipes on the red criteria, no recipe on the Amber criteria, and 39 recipes on the green criteria. On the sugar label, eight recipes are on the red criteria, no recipe is on the Amber criteria, and 92 are on the green criteria. On the salt label, there are 67 recipes on the red criteria, no recipe on the Amber criteria, and 33 recipes on the green criteria.

Chapter 5

DISSCUSSION

In this section, the data obtained from the field will be discussed in more detail and analyzed with the previous studies relating to healthy food recipes in Norway and the international standards set By WHO and FSA. The health standards of Norwegian recipes are also discussed and compared with recipes from the UK and the US.

5.1 RQ1: How healthy are Norwegian online recipes as set by international standards such as the The Food Standards Agency (FSA) or The World Health Organization (WHO)?

Based on data that has been obtained from four Norwegian websites such as Aperitif, Klikk, Kolonial, and Tine as a representation of food recipes from Norway. These recipes will be compared with international standards; two international standards are used, namely WHO criteria and FSA, so that it can be seen how healthy the food in Norway is.

Based on WHO criteria, from a total of 100 recipes for each website, many do not meet all of the criteria from WHO. In this case, seven macronutrients from 15 macronutrients are used based on WHO recommendations, according to research conducted [19]. Based on the seven criteria that have been set, many recipes do not even meet the criteria (score of 0), which means the foods are very unhealthy, only a few foods meet several criteria, and not even a single food reaches six criteria so that none of the food is very healthy. These unfulfilled criteria indicate that the food recipes in them do not meet the macronutrient needs needed by humans, whereas if the macronutrients that enter the body are not as recommended, it will affect the body [1].

Based on the standards set by the FSA, four criteria are used as parameters, with each parameter having its limits, which are categorized into two types, namely per 100g and per portion. The four parameters that have been set will be compared with recipes from four Norwegian websites. From 100 recipes, the average amount of nutrient content of the recipe that exceeds this limit is marked in red (unhealthy). However, some nutrients are still within healthy limits (Amber and Green), so according to FSA standards, there are still Norwegian food recipes that cannot be categorized as healthy.

After the recipes from the four websites were analyzed using two international standards, namely the WHO criteria and the FSA, that the recipes in Norway are still not completely healthy, an increase in overweight or obesity indicates this by 21% in young women and 28 percent in young men with a range 18-20 years old [16]. Increased obesity and overweight are

always related with an increased risk of certain chronic diseases, diabetes, certain types of cancer, and other forms of mental illness. [18]. In addition, the reasons for the increase in obesity and its effect on food recipes are primarily due to changes in lifestyle habits. Over the past century, life in most developed countries has become increasingly comfortable, and highly caloric food is primarily readily available and tends to be over-consumed. One recent research suggests that one factor explaining the preference for highly caloric food is the unhealthy taste [74].

5.2 RQ2: Are there any differences in the recipes published on the most popular Norwegian online supermarket platforms?

Each recipe has nutritional content as a parameter based on WHO and FSA standards. WHO uses eight parameters, namely Calories, Protein, Carbohydrates, Sugar, Fat, Saturated Fat, Fiber, and Sodium [19]. The FSA uses four nutritional parameters: fat, Saturated Fat, Sugar, and Salt [67]. Each recipe from four Norway websites has a different nutritional content to be discussed.

Based on the WHO standard criteria from the four websites, each has different results on macronutrients, and it can be ascertained that the recipes from each site have different percentages based on the WHO range. The difference in this range can be a reference to how healthy the recipe from each website is. If it is observed from table 5.8, most of the recipes from each website have a small proportion of protein, carbohydrates, and sodium. The effects of inadequate intake of macronutrients, such as protein, can cause embryonic losses, intra-uterine growth restriction, and reduced postnatal growth. This is due to a deficiency in specific amino acids that are important for cell metabolism and function, and consuming too much can cause intraglomerular hypertension, which may result in kidney hyperfiltration, glomerular injury, and proteinuria. Long-term high protein intake may lead to de novo CKD [75][76]. In terms of carbohydrates, a deficiency can cause weight loss, glycemia, and cardiovascular risk indices, while consuming too many carbohydrates is associated with an increased risk of death [77][78]. Sodium affects blood pressure. When it is deficient, blood pressure decreases and is associated with increased markers of kidney function in individuals with autosomal dominant polycystic kidney disease (ADPKD). When sodium intake is excessive, it is related with an elevated risk of CVD in CKD; in individuals with prehypertension, greater sodium excretion is associated with an increased mortality risk.. [79] [80]. Then all the recipes from the website have met the sugar standard, which can be seen from the considerable percentage, even

reaching 100% on one website, namely Tine. Other macronutrients such as fat, saturated fat, and fiber have neither too high nor too small a percentage on each website.

Based on the standards set by the FSA, each recipe from the website can also be monitored for health based on nutrients. This can be seen from a total of 100 recipes on each website, having different percentages for each nutrient. The health status of food recipes is marked with three colors which have been described in the previous method. Each nutrient has a different percentage. On sugar, all websites have a good percentage of green color, with the smallest percentage of 96% on Aperitif. This indicates that the sugar content in Norwegian recipes is mainly within the safe limit and falls into the healthy category. The average fat and saturated fat content from each website are still in the Amber category, meaning that most recipes with fat and saturated content are still relatively safe. This can be observed from the number of recipes that fall into the green color category more than red. On average, salt is still in the Amber group, but on each website, many recipes are in the red category rather than green. This indicates that there is still much salt content that is not in accordance with FSA provisions, so many are still in the unhealthy category due to the impact of salt. Too high an impact on the cardiovascular system is associated with stroke risk [81].

The representation of the four websites can be analyzed from macronutrients, each site has some macronutrient content that exceeds the limits set by WHO and FSA, so it exceeds the limits of the possibility of an impact on body health. Some of the macronutrients from the four websites are still within safe limits, so the recipe from Norway can be represented as still safe, especially on the sugar content. In the WHO method, it can be seen that many recipes containing macronutrients do not fall into the WHO range. This indicates that many recipes can be categorized as unhealthy from several macronutrients. This is related to the FSA method. In the FSA method, several macronutrients are in the unhealthy category, but some are still within safe limits. Based on the two methods, each website has a difference where at WHO, most macronutrients have a small percentage, which means that most macronutrients do not meet the criteria set by WHO. This is different from the FSA, where each macronutrient from the website, on average, is not in the unhealthy group. This difference is because the standards set are different where the FSA is more focused on recipes that are generally in the UK while the WHO refers to recipes in the US because this difference causes different standards so that when recipes from the four Norwegian websites are analyzed macronutrient content then have different results as well. However, they are still in the healthy group in one macronutrient, namely sugar, both using the FSA method and WHO criteria. For the

Norwegian website itself, it would be better if it followed the provisions set out in the Nordic region, namely Nordic Nutrition Recommendations (NNR) (Nordic co-operation, 2012).

5.3 RQ3: How do Norwegian recipes compare to recipes in the UK and the US?

The recipes in Norway will, of course, also be compared with recipes around the world. In this case, it focuses on two countries, namely the UK and the US. This is because it uses two methods, namely FSA and WHO criteria. In this section, we will find out how healthy the recipes in Norway are compared to the ones in the UK and US based on the two previously selected methods.

Based on data from the WHO criteria, most foods from Norway do not meet the criteria, and none of them can even penetrate five of the seven criteria set by WHO when compared to the UK and the US; of course, there are recipes that still pass five of the seven criteria set by the WHO. On the other hand, on average, recipes from the UK and US meet the criteria (from the first to the fifth criteria) compared to recipes from Norway. If it is analyzed using the WHO criteria, it can be concluded that recipes from Norway are not healthier than the UK and US recipes.

Based on the content of macronutrients according to the provisions set by WHO, recipes from Norway look healthier compared to recipes from the UK and US. This can be seen from 4 criteria as protein, sugar, fiber, and sodium; recipes from Norway have a more significant percentage meaning that more recipes from Norway meet the WHO macronutrient criteria when compared to recipes from the UK and US. Only three macronutrient criteria where UK and US recipes are more than Norway's are Fat, Carbohydrate, and Saturated Fat. This indicates that when viewed from the macronutrient session, recipes from Norway are healthier than recipes from the UK and US.

Based on the provisions set by the FSA, the three countries have three macronutrients included in the unhealthy category because it can be seen that three macronutrients such as fat, saturated fat, and salt, are red, so it can be seen that these three macronutrients exceed the limits set by the FSA. Of the three countries, all of them are still within safe limits when viewed from macronutrients such as sugar, where everything has a green color, which means that this macronutrient does not exceed the limit set by WHO.

If it is analyzed using the standards set by the FSA, each prescription from the three countries can also be observed for health based on nutrients. This can be seen from a total of 100 recipes in each country, having different percentages for each nutrient; the health status of food recipes

is marked with three colors which have been described in the previous method. Each nutrient has a different percentage. In terms of sugar, all countries have a good percentage of green color, with the smallest percentage of 96% in Norway. This indicates that the sugar content in Norwegian recipes is mostly within safe limits and falls into the healthy category compared to the UK and US recipes. For the content of Fat, Saturated Fat, and Salt, it can be seen that recipes from Norway are still safe; this is evidenced by the percentage of Norwegian recipes that are in red; this can be observed from the number of recipes that fall into the green color category more than the red color. In addition, from the FSA method, most recipes that are included in the red group come from the US from all nutrient categories, and recipes originating from the US are always the most included in the red group. The impact of this can be indicated by an average of 35% of adult men and 37% of women in the US who have diabetes [21]. Then when compared to the UK, recipes from Norway are more in the green category, so it can be said that using the FSA method, recipes from Norway are healthier than the UK. This is based on data in 2016, which confirmed that around 27.8% of adults in the UK are obese [20]. Based on these data, Norwegian recipes are healthier than UK and US recipes.

After being compared and analyzed using WHO criteria, many recipes from Norway did not meet the criteria, compared to recipes from the UK and US. However, when it was compared in percentage terms, the macronutrient recipes from Norway were more in the WHO range than those in the UK and the US. On the other hand, by using the provisions of the FSA, each country is in the unhealthy category at three macronutrients and healthy at one nutrient. Additionally, when it was compared based on the percentage per macronutrient, recipes from Norway are mainly in the green category than recipes from the UK and the US. From these two methods, it can be seen that the recipes in Norway are generally healthier compared to those from the UK and US. However, this is not necessarily confirmed due to the setting of different standards. It would be better to compare Norwegian recipes to Nordic Nutrition Recommendations (NNR) since NNR is the scientific basis for planning diets for demographic groups and creating food-based dietary recommendations in Nordic countries. [72].

5.4 Conclusion

(RQ1) Based on the research that has been done, it can be concluded that the healthy food recipes, which are represented by four Norwegian websites, contain many foods that do not meet a total of seven criteria based on WHO standards. Based on the standards set by the FSA, the average food ingredients from Norway exceed the limits set by the FSA, so the average food ingredients are classified as unhealthy.

(RQ2) In detail, when viewed from the macronutrient content of the recipes presented by the four websites based on the standards made by WHO, on average, many recipes do not meet the needs of protein, carbohydrate, and sodium. Macronutrients such as fat, saturated fat, and slightly more fiber meet the criteria, while sugar meets the criteria. Based on the provisions of the FSA, many recipes for macronutrient sugar are at the healthy limit; for salt, most are at the unhealthy limit, and fat and saturated fat are, on average, between healthy and unhealthy.

(RQ3) Generally, recipes found in Norway are healthier than those in the UK and the US. This finding is based on WHO and FSA standards. When macronutrient recipes from Norway were compared with recipes from the UK and the US, on average, recipes from Norway meet more WHO criteria than the UK and the US. According to the FSA macronutrient provisions, Norwegian recipes meet the food standards and are healthier than those found in the UK and the US.

REFERENCES

[1] M. E. Lean, “Principles of human nutrition,” *Med. (United Kingdom)*, vol. 47, no. 3, pp. 140–144, 2019, doi: 10.1016/j.mpmed.2018.12.014.

[2] T. Hansen and T. U. Thomsen, “The influence of consumers’ interest in healthy eating, definitions of healthy eating, and personal values on perceived dietary quality,” *Food Policy*, vol. 80, no. August, pp. 55–67, 2018, doi: 10.1016/j.foodpol.2018.09.002.

[3] H. T. Luomala, R. Paasovaara, and K. Lehtola, “Exploring consumers’ health meaning categories: towards a health consumption meaning model,” *J. Consum. Behav.*, vol. 5, no. 3, pp. 269–279, 2006, doi: 10.1002/cb.178.

[4] C. J. Thompson and M. Troester, “Consumer Value Systems in the Age of Postmodern Fragmentation: The Case of the Natural Health Microculture,” *J. Consum. Res.*, vol. 28, no. 4, pp. 550–571, 2002, doi: 10.1086/338213.

[5] S. K. Hui, E. T. Bradlow, and P. S. Fader, “Testing behavioural hypotheses using an integrated model of grocery store shopping path and purchase behaviour,” *J. Consum. Res.*, vol. 36, no. 3, pp. 478–493, 2009, doi: 10.1086/599046.

[6] F. Claude, *L’homnivore*. Paris: Odile Jacob, 1990.

[7] P. Michael, *In defence of food: The myth of nutrition and the pleasures of eating*. UK: Penguin, 2008.

[8] N. Shahid and S. Aneja, “Internet of Things: Vision, Application Areas and Research Challenges,” *Int. Conf. I-SMAC (IoT Soc. Mobile, Anal. Cloud) (I-SMAC 2017) Internet*, pp. 583–587, 2017, doi: 10.4324/9781315755809-10.

[9] A. C. Mazzonetto, I. S. Le Bourlegat, J. L. Guedes dos Santos, M. Spence, M. Dean, and G. M. R. Fiates, “Finding my own way in the kitchen from maternal influence and beyond – A grounded theory study based on Brazilian women’s life stories,” *Appetite*, vol. 150, no. May 2019, p. 104677, 2020, doi: 10.1016/j.appet.2020.104677.

[10] M. AC, D. M, and F. GMR, “Perceptions of individuals about the act of cooking in the home environment: Integrative review of qualitative studies,” 2020. https://cienciaesaudecoletiva.com.br/artigos/percepcoes-de-individuos-sobre-o-ato-de-cozinhar-no-ambiente-domestico-revisao-integrativa-de-estudos-qualitativos/17196?id=17196&id=17196 (accessed Aug. 12, 2022).

[11] M. Z. Sharif *et al.*, “The association between self-rated eating habits and dietary behaviour in two Latino neighborhoods: Findings from Proyecto MercadoFRESCO,” *Prev. Med. Reports*, vol. 3, pp. 270–275, 2016, doi: 10.1016/j.pmedr.2016.03.002.

[12] K. Cullen, L. Davenport, J. Radcliffe, and T.-A. Chen, “Adolescents who Perceive their Diet as Healthy Consume More Fruits, Vegetables and Milk and Fewer Sweet Drinks,” *Int. J. Child Heal. Nutr.*, vol. 3, no. 3, pp. 124–129, 2014, doi: 10.6000/1929-4247.2014.03.03.2.

[13] E. Frazão, “High costs of poor eating patterns in the United States,” *Hear. Dis.*, vol. 73, pp. 32–1, 1999.

[14] Y. J. Yang, “An Overview of Current Physical Activity Recommendations in Primary Care,” *Korean J. Fam. Med.*, vol. 40, no. 3, pp. 135–142, 2019, doi: 10.4082/kjfm.19.0038.

[15] World Obesity, "Obesity-related conditions seem to worsen the effect of COVID-19; indeed, the Centers for Disease Control and Prevention (CDC) reported that people with heart disease and diabetes are at higher risk of COVID-19 complications." https://www.worldobesity.org/news/statement-coronavirus-covid-19-obesity (accessed Aug. 11, 2022).

[16] E. Evensen, N. Emaus, A. Kokkvoll, T. Wilsgaard, A. S. Furberg, and G. Skeie, "The relation between birthweight, childhood body mass index, and overweight and obesity in late adolescence: A longitudinal cohort study from Norway, the Tromsø Study, Fit Futures," *BMJ Open*, vol. 7, no. 6, 2017, doi: 10.1136/bmjopen-2016-015576.

[17] H. E. Meyer and I. H. Bergh, "Overweight and obesity in Norway," 2017. https://www.fhi.no/en/op/hin/health-disease/overweight-and-obesity-in-norway---/ (accessed Aug. 12, 2022).

[18] A. E. Field *et al.*, "Impact of overweight on the risk of developing common chronic diseases during a 10-year period," *Arch. Intern. Med.*, vol. 161, no. 13, pp. 1581–1586, 2001, doi: 10.1001/archinte.161.13.1581.

[19] S. Howard, J. Adams, and M. White, "Nutritional content of supermarket ready meals and recipes by television chefs in the United Kingdom: Cross sectional study," *BMJ*, vol. 345, no. 7888, pp. 14–17, 2012, doi: 10.1136/bmj.e7607.

[20] P. F. D. Scheelbeek, L. Cornelsen, T. M. Marteau, S. A. Jebb, and R. D. Smith, "Potential impact on prevalence of obesity in the UK of a 20% price increase in high sugar snacks: Modelling study," *BMJ*, vol. 366, pp. 1–10, 2019, doi: 10.1136/bmj.l4786.

[21] S. M. Fruh, "Obesity: Risk factors, complications, and strategies for sustainable long-term weight management," *J. Am. Assoc. Nurse Pract.*, vol. 29, pp. S3–S14, 2017, doi: 10.1002/2327-6924.12510.

[22] EUROPEAN RECOMMENDATION COMMISSION, "on the research joint programming initiative 'A healthy diet for a healthy life' THE," 2010. [Online]. Available: https://era.gv.at/public/documents/884/C20102587final_EN.pdf

[23] M. Forstmann, P. Burgmer, and T. Mussweiler, "'The Mind Is Willing, but the Flesh Is Weak': The Effects of Mind-Body Dualism on Health Behaviour," *Psychol. Sci.*, vol. 23, no. 10, pp. 1239–1245, 2012, doi: 10.1177/0956797612442392.

[24] N. Geeroms, W. Verbeke, and P. Van Kenhove, "Health advertising to promote fruit and vegetable intake: Application of health-related motive segmentation," *Food Qual. Prefer.*, vol. 19, no. 5, pp. 481–497, 2008, doi: 10.1016/j.foodqual.2008.02.004.

[25] N. Geeroms, W. Verbeke, and P. Van Kenhove, "Consumers' health-related motive orientations and ready meal consumption behaviour," *Appetite*, vol. 51, no. 3, pp. 704–712, 2008, doi: 10.1016/j.appet.2008.06.011.

[26] L. Casotti, "Conflicts Between Pleasure, Aesthetics and Health in Food Consumption: An Exploratory Study in Brazil," *J. Mark. Manag.*, vol. 20, no. 5–6, pp. 545–557, 2004, DOI: 10.1362/0267257041323990.

[27] S. Ecks, "Welcome home, descartes! Rethinking the anthropology of the body," *Perspect. Biol. Med.*, vol. 52, no. 1, pp. 153–158, 2009.

[28] P. M. Todd and G. Gigerenzer, "Bounding rationality to the world," *J. Econ. Psychol.*, vol. 24, no. 2, pp. 143–165, 2003, doi: 10.1016/S0167-4870(02)00200-3.

[29] S. Ohlemacher, “US slipping in life expectancy rankings,” 2007.

[30] R. Schulz and J. Slavin, “Perspective: Defining Carbohydrate Quality for Human Health and Environmental Sustainability,” *Adv. Nutr.*, vol. 12, no. 4, pp. 1108–1121, 2021, doi: 10.1093/advances/nmab050.

[31] R. T. Ahnen, R. Mottet, M. Omolo, and J. Slavin, *Carbohydrates*, vol. 18, no. PB. Elsevier Inc., 1983. doi: 10.1016/S0301-4770(08)61301-9.

[32] B. K. KE, L. HN, and J. H, *Carbohydrates and carbohydrate utilization in swine*. Ames: Wiley.

[33] V. Campos, L. Tappy, L. Bally, J. L. Sievenpiper, and K. A. Lê, “Importance of Carbohydrate Quality: What Does It Mean and How to Measure It?,” *J. Nutr.*, vol. 152, no. 5, pp. 1200–1206, 2022, doi: 10.1093/jn/nxac039.

[34] J. H. Cummings *et al.*, “A new look at dietary carbohydrate: Chemistry, physiology and health,” *Eur. J. Clin. Nutr.*, vol. 51, no. 7, pp. 417–423, 1997, doi: 10.1038/sj.ejcn.1600427.

[35] S. M. Loveday, “Food Proteins: Technological, Nutritional, and Sustainability Attributes of Traditional and Emerging Proteins,” *Annu. Rev. Food Sci. Technol.*, vol. 10, no. March 2019, pp. 311–339, 2019, doi: 10.1146/annurev-food-032818-121128.

[36] J. R. Hoffman and M. J. Falvo, “Review article PROTEIN – WHICH IS BEST ?,” *Nutrition*, no. 2004, pp. 118–130, 2005.

[37] C. J. Field and L. Robinson, “Dietary Fats,” *Adv. Nutr.*, vol. 10, no. 4, pp. 722–724, 2019, doi: 10.1093/advances/nmz052.

[38] D. S. Ludwig, W. C. Willett, J. S. Volek, and M. L. Neuhouser, “Dietary fat : From foe to friend ?,” vol. 770, no. November, pp. 764–770, 2018.

[39] J. Walton, H. Bell, R. Re, and A. P. Nugent, “Current perspectives on global sugar consumption: definitions, recommendations, population intakes, challenges and future direction,” *Nutr. Res. Rev.*, pp. 1–22, 2021.

[40] J. H. Cummings and A. M. Stephen, “Carbohydrate terminology and classification,” *Eur. J. Clin. Nutr.*, vol. 61, no. 1, pp. S5–S18, 2007.

[41] B. Holland, I. D. Unwin, and D. H. Buss, *Fruit and nuts: First supplement to the fifth edition of McCance and Widdowson’s The Composition of Foods*, vol. 1. Royal Society of Chemistry, 1992.

[42] V. M. Gershuni, “Saturated fat: part of a healthy diet,” *Curr. Nutr. Rep.*, vol. 7, no. 3, pp. 85–96, 2018.

[43] D. Kritchevsky, M. M. Weber, and D. M. Klurfeld, “Dietary fat versus caloric content in initiation and promotion of 7, 12-dimethylbenz (a) anthracene-induced mammary tumorigenesis in rats,” *Cancer Res.*, vol. 44, no. 8, pp. 3174–3177, 1984.

[44] R. M. Kay and A. S. Truswell, “Dietary fibre: Effects on plasma and biliary lipids in man,” in *Medical aspects of dietary fibre*, Springer, 1980, pp. 153–173.

[45] W. Brown, “Interactions of small molecules with hydrated polymer networks,” in *Dietary Fibres: Chemistry and Nutrition*, Academic Press New York, 1979, pp. 1–13.

[46] P. K. Whelton *et al.*, "2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Pr," *J. Am. Coll. Cardiol.*, vol. 71, no. 19, pp. e127–e248, 2018, doi: 10.1016/j.jacc.2017.11.006.

[47] Organization World Health and World Health Organization, "Guideline: Sodium intake for adults and children," *World Heal. Organ.*, pp. 1–56, 2012, [Online]. Available: http://apps.who.int/iris/handle/10665/77985%5Cnhttp://www.ncbi.nlm.nih.gov/pubmed?term=Sodium%5BTitle%5D AND intake%5BTitle%5D AND adults%5BTitle%5D AND children%5BTitle%5D AND WHO%5BTitle%5D%5Cnhttp://www.ncbi.nlm.nih.gov/pubmed?term=Sodium%255BTitle%255

[48] National Academies of Sciences Engineering and Medicine., *Health and Medicine Division. Food and Nutrtion Board Committee to Review the Dietary Reference Intakes for Sodium and Potassium*. Washington, DC, USA: National Academies Press (US), 2019. [Online]. Available: https://pubmed.ncbi.nlm.nih.gov/30844154/

[49] B. B. Lowell, "The Neuroscience of Drives for Food, Water, and Salt," *N. Engl. J. Med.*, vol. 380, no. 18, p. e33, 2019, doi: 10.1056/nejmc1902946.

[50] R. P. Heaney, "Sodium: How and how not to set a nutrient intake recommendation," *Am. J. Hypertens.*, vol. 26, no. 10, pp. 1194–1197, 2013, doi: 10.1093/ajh/hpt130.

[51] J. Powles *et al.*, "Global, regional and national sodium intakes in 1990 and 2010: A systematic analysis of 24 h urinary sodium excretion and dietary surveys worldwide," *BMJ Open*, vol. 3, no. 12, 2013, doi: 10.1136/bmjopen-2013-003733.

[52] B. Zhou *et al.*, "Nutrient intakes of middle-aged men and women in China, Japan, United Kingdom, and United States in the late 1990s: The INTERMAP Study," *Physiol. Behav.*, vol. 176, no. 3, pp. 139–148, 2019, doi: 10.1038/sj.jhh.1001605.Nutrient.

[53] A. Mente, M. O'donnell, and S. Yusuf, "Sodium intake and health: What should we recommend based on the current evidence?," *Nutrients*, vol. 13, no. 9, pp. 3–13, 2021, doi: 10.3390/nu13093232.

[54] J. Coveney, "A qualitative study exploring socio-economic differences in parental lay knowledge of food and health: implications for public health nutrition," *Public Health Nutr.*, vol. 8, no. 3, pp. 290–297, 2004, doi: 10.1079/phn2004682.

[55] T. Delormier, K. L. Frohlich, and L. Potvin, "Food and eating as social practice - Understanding eating patterns as social phenomena and implications for public health," *Sociol. Heal. Illn.*, vol. 31, no. 2, pp. 215–228, 2009, doi: 10.1111/j.1467-9566.2008.01128.x.

[56] S. A. French, L. H. Epstein, R. W. Jeffery, J. E. Blundell, and J. Wardle, "French SA, Epstein LH, Jeffery RW, Blundell JE, Wardle J. Eating behaviour dimensions: Associations with energy intake and body weight: A review. Appetite. 2012;59(2):541-549.," *Appetite*, vol. 59, no. 2, pp. 541–549, 2012, doi: 10.1016/j.appet.2012.07.001.Eating.

[57] B. Reynolds, A. Ortengren, J. B. Richards, and H. de Wit, "Dimensions of impulsive behaviour: Personality and behavioural measures," *Pers. Individ. Dif.*, vol. 40, no. 2, pp.

305–315, 2006, doi: 10.1016/j.paid.2005.03.024.

[58] C. Y. Teng, Y. R. Lin, and L. A. Adamic, “Recipe recommendation using ingredient networks,” *Proc. 4th Annu. WebSci’12*, vol. volume, pp. 298–307, 2012, doi: 10.1145/2380718.2380757.

[59] World Health Organization, “Food and nutrition tips during self-quarantine,” 2020. https://www.euro.who.int/en/health-topics/health-emergencies/%0Acoronavirus-covid-19/technical-guidance/food-and-nutrition-tips-during-self-quarantine (accessed Aug. 11, 2022).

[60] M. N. Laska, N. I. Larson, D. Neumark-Sztainer, and M. Story, “Does involvement in food preparation track from adolescence to young adulthood and is it associated with better dietary quality? Findings from a ten-year longitudinal study,” *Public Health Nutr.*, vol. 15, no. 7, pp. 1150–1158, 2014, doi: 10.1017/S1368980011003004.Does.

[61] J. A. Wolfson and S. N. Bleich, “Is cooking at home associated with better diet quality or weight-loss intention?,” *Public Health Nutr.*, vol. 18, no. 8, pp. 1397–1406, 2015, doi: 10.1017/S1368980014001943.

[62] M. Reicks, M. Kocher, and J. Reeder, “Impact of Cooking and Home Food Preparation Interventions Among Adults: A Systematic Review (2011–2016),” *J. Nutr. Educ. Behav.*, vol. 50, no. 2, pp. 148-172.e1, 2018, doi: 10.1016/j.jneb.2017.08.004.

[63] B. Hasan *et al.*, “The effect of culinary interventions (cooking classes) on dietary intake and behavioural change: A systematic review and evidence map,” *BMC Nutr.*, vol. 5, no. 1, pp. 1–9, 2019, doi: 10.1186/s40795-019-0293-8.

[64] P. L. UGGIONI, C. M. F. ELPO, A. P. G. GERALDO, A. C. FERNANDES, A. C. MAZZONETTO, and G. L. BERNARDO, “Cooking skills during the Covid-19 Pandemic,” *Rev. Nutr.*, vol. 33, pp. 1–6, 2020, doi: 10.1590/1678-9865202033e200172.

[65] C. Ruth, “The Middle English recipe as a text-type,” *Neuphilol. Mitt.*, vol. 100, no. 1, pp. 27–42, 1999.

[66] S. Hayakawa, *Language in thought and action*. New Yorl, 1972.

[67] UK Food Safety Authority, “Guide to creating a front of pack (FoP) nutrition label for pre-packed products sold through retail outlets,” *Food Stand. Agency*, no. November, p. 27, 2013, [Online]. Available: www.dh.gsi.gov.uk

[68] W. H. Organization, “Diet, nutrition and the prevention of chronic diseases,” *World Heal. Organ. - Tech. Rep. Ser.*, no. 916, 2003, doi: 10.1093/ajcn/60.4.644a.

[69] R. Casas *et al.*, “Changes in Spanish lifestyle and dietary habits during the COVID-19 lockdown,” *Eur. J. Nutr.*, vol. 61, no. 5, pp. 2417–2434, 2022, doi: 10.1007/s00394-022-02814-1.

[70] E. Svensson, J. F. Nygård, D. L. Reas, and I. Sandanger, “Urban—rural differences in BMI, overweight and obesity in Norway (1990 and 2001),” *Scand. J. Public Health*, vol. 35, no. 5, pp. 555–558, 2007, doi: 10.1080/14034940701349217.

[71] M. S. Faith *et al.*, “Effects of contingent television on physical activity and television viewing in obese children,” *Pediatrics*, vol. 107, no. 5, pp. 1043–1048, 2001, doi: 10.1542/peds.107.5.1043.

[72] Nordic Council of Ministers, *Nordic Nutrition Recommendations 2012: Integrating Nutrition and Physical Activity*, 5th ed., vol. 40, no. 4. Nordic Council of Ministers, 2012. [Online]. Available: https://altomkost.dk/fileadmin/user_upload/altomkost.dk/Slet_ikke_filliste/Raad_og_anbefalinger/Nordic_Nutrition_Recommendations_2012.pdf

[73] C. Trattner, D. Elsweiler, and S. Howard, "Estimating the healthiness of internet recipes: A cross-sectional study," *Front. Public Heal.*, vol. 5, no. FEB, 2017, doi: 10.3389/FPUBH.2017.00016.

[74] C. O. C. Werle, O. Trendel, and G. Ardito, "Unhealthy food is not tastier for everybody: The ' healthy=tasty' French intuition," *Food Qual. Prefer.*, vol. 28, no. 1, pp. 116–121, 2013, doi: 10.1016/j.foodqual.2012.07.007.

[75] C. M. Herring, F. W. Bazer, G. A. Johnson, and G. Wu, "Impacts of maternal dietary protein intake on fetal survival, growth, and development," *Exp. Biol. Med.*, vol. 243, no. 6, pp. 525–533, 2018, doi: 10.1177/1535370218758275.

[76] G. J. Ko, C. M. Rhee, K. Kalantar-Zadeh, and S. Joshi, "The effects of high-protein diets on kidney health and longevity," *J. Am. Soc. Nephrol.*, vol. 31, no. 8, pp. 1667–1679, 2020, doi: 10.1681/ASN.2020010028.

[77] J. Wylie-Rosett, K. Aebersold, B. Conlon, C. R. Isasi, and N. W. Ostrovsky, "Health effects of low-carbohydrate diets: Where should new research go?," *Curr. Diab. Rep.*, vol. 13, no. 2, pp. 271–278, 2013, doi: 10.1007/s11892-012-0357-5.

[78] K. Sartorius, B. Sartorius, T. E. Madiba, and C. Stefan, "Does high-carbohydrate intake lead to increased risk of obesity? A systematic review and meta-analysis," *BMJ Open*, vol. 8, no. 2, pp. 1–9, 2018, doi: 10.1136/bmjopen-2017-018449.

[79] M. O'Donnell *et al.*, "Salt and cardiovascular disease: Insufficient evidence to recommend low sodium intake," *Eur. Heart J.*, vol. 41, no. 35, pp. 3363–3373, 2020, doi: 10.1093/eurheartj/ehaa586.

[80] D. Malta *et al.*, "High sodium intake increases blood pressure and risk of kidney disease. From the Science of Salt: A regularly updated systematic review of salt and health outcomes (August 2016 to March 2017)," *J. Clin. Hypertens.*, vol. 20, no. 12, pp. 1654–1665, 2018, doi: 10.1111/jch.13408.

[81] X. Y. Li, X. L. Cai, P. Da Bian, and L. R. Hu, "High salt intake and stroke: Meta-analysis of the epidemiologic evidence," *CNS Neurosci. Ther.*, vol. 18, no. 8, pp. 691–701, 2012, doi: 10.1111/j.1755-5949.2012.00355.x.

APPENDIX