Fakultet for helse- og sosialvitenskap (HSV)

Exploring the relationship between the prevalence of overweight and obesity among Norwegian adolescents and their daily lifestyle and families social class factors.

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Abstract

Aim

The main aim of this study was to map the prevalence of overweight and obesity among a sample of 253 boys and 307 girls aged 12 and 14-year-old of Norwegian adolescents and related it to physical activity engagement at their leisure time (Leisure time-PA) as well as their relative family affluence (RFA) based on data from a previous Norwegian prospective longitudinal cohort study.

Method

A cross-sectional study caried to study the effect of independent variables (gender, Leisure time-PA in 7-points Likert scale and three categories of RFA: lowest RFA 20%, medium RFA 60% and highest RFA 20%) on dependent variable BMI. Both One-Way and Two-Ways ANOVA with Post Hoc Tests analysis in SPSS program were used in analyses process.

Result

The prevalence of overweight was about 20.5%, 19% boys and 21.5% girls, among the sample size. The results showed a slightly different in BMI between boys and girls (p=0.016). A significant interaction effect on BMI from the combination of the three independent variables (p=0.024). Post Hoc Tests analysis showed a significant difference in BMI when comparing the highest RFA 20% with the lowest 20% RFA group (p = 0.049). Significant association was shown between BMI and adolescents who engage in Leisure time-PA once or twice a month (p = 0.028) or who engage in Leisure time-PA at least once a week (p = 0.046) compared to those who did not have any engagement in Leisure time-PA.

Conclusions and Implications

The results of this study extend the findings of previous studies in Norway and highlight the importance of participating in physical activity in leisure time. On the other hand, it showed a negative relationship between BMI and RFA level. Long-term studies with a large sample size for this age group are required. Strategies and procedures in place must consider age, social and economic differences.

Keywords

Overweight and obesity, Body Mass Index (BMI), Adolescents, Lifestyle, Physical Activities in Leisure time (Leisure time-PA), Social Class and Relative Family Affluence (RFA).

Sammendrag

Hovedmålet

Hovedmålet med denne studien var å kartlegge forekomsten av overvekt og fedme blant et utvalg på 253 gutter og 307 jenter i alderen 12 og 14 år av norske ungdommer og korrelere det med fysisk aktivitetsengasjement på fritiden (Fritid- PA) samt relative familieformuen (RFF) basert på data fra en tidligere norsk prospektiv longitudinell kohortstudie.

Metode

En tverrsnittsstudie hadde til hensikt å studere effekten av uavhengige variabler (kjønn, Fritid-PA i 7-punkts Likert-skala og tre kategorier av RFF: laveste RFF 20 %, middels RFF 60 % og høyeste RFF 20 %) på avhengig variabel KMI. Både One-Way og Two-Ways ANOVA med Post Hoc Tests-analyse i SPSS-programmet ble brukt i analyseprosessen.

Resultat

Prevalensen av overvekt var ca. 20,5 %, 19 % gutter og 21,5 % jenter, blant utvalgsstørrelsen. Resultatene viste noe forskjellig i BMI mellom gutter og jenter (p=0,016). En signifikant interaksjonseffekt på KMI fra kombinasjonen av de tre uavhengige variablene (p=0,024). Post Hoc Tests-analyse viste en signifikant forskjell i KMI når man sammenlignet den høyeste RFF 20 % med den laveste 20 % RFF-gruppen (p = 0,049). Signifikant assosiasjon ble vist mellom KMI og ungdom som deltar i fritids-PA en eller to ganger i måneden (p = 0,028) eller som engasjerer seg i fritids-PA minst én gang i uken (p = 0,046) sammenlignet med de som ikke hadde engasjement i Fritid-PA.

Konklusjoner og implikasjoner

Resultatene av denne studien utvider funnene fra tidligere studier i Norge og synliggjør viktigheten av å delta i fysisk aktivitet i fritiden. På den annen side viste den en negativ sammenheng mellom KMI og RFF-nivå. Langtidsstudier med stor utvalgsstørrelse for denne aldersgruppen er nødvendig. Strategier og prosedyrer på plass må ta hensyn til alder, sosiale og økonomiske forskjeller.

Nøkkelord:

Overvekt og fedme, Kroppsmasseindeks (KMI), Ungdom, Livsstil, Fysiske Aktiviteter i fritiden, Sosial Klasse og Relative Familieformuen.

Chapter One

1. Introduction

During the past three decades at the global level, overweight and obesity began to appear rapidly and began to be considered a global epidemic with serious consequences for public health (GBD 2015 Obesity Collaborators, et al, 2015, p13-27). Results from health surveys conducted in the preceding 40 years have shown that BMI was follow a normal distribution, but the curve has been shifted to the right over the past decade (Meyer, H. E., & Tverdal, A., 2005, p3-7). This dramatic increase in Body Mass Index, BMI, is attributable to fundamental changes that are beginning to appear in the lifestyle and socioeconomic status of families around the world, such as the spread of modern conveniences at home as well as in the workplace (Nyberg, S. T., et al, 2018, e490-e497). Changes in eating habits have also occurred due to the prevalence of ready meals and fast food (Kosti, RI., Panagiotakos, DB., 2006, a3398). The occurrence of disease pandemics such as the Covid-19 pandemic has had a significant impact on the nature of life in society (Di Renzo, L. et al., 2020, p 229; Sacco, V., et al, 2020, e0237799). All these changes in societies have led to the emergence of serious health problems within society and the spread of non-communicable diseases more than communicable diseases in the society (Nyberg, S. T., et al, 2018, e490-e497).

Obesity one of the major risk factors associated with non-communicable and chronic diseases especially in childhood and adolescence, such as cardiovascular diseases and diabetes (Kopelman P., 2007, p13-17). Obesity is also associated with social and psychological problems and contributes to a poor quality of healthy life (Kokkvoll, A., et al, 2012, p 924-928). The prevalence of obesity and overweight in school age has been considered as one of the most important health challenges at the global and national levels (WHO, 2021, 9 June). From 1975 to 2016 an increase of 1.2 kg/m2 in the mean global standard for body mass index was reported for this age group (Abarca-Gómez, L.; et al, 2017, *390*, p 2627–2642). According to a 2016 report by the World Health Organization, more than 340 million children and adolescents between the ages of 5 and 19 were overweight or obese in 2016 (World Health Organization. 2021, 9 June). The prevalence of overweight and obesity among these children and adolescents has increased dramatically from just 4% in 1975 to just over 18% in 2016. This rise similarly occurred among boys and girls where the prevalence was among 18% of girls and among 19% of boys (World Health Organization. 2021, 9 June; World Health Organization Europe, 2007, May).

Adolescents who are obese and overweight may suffer from low self-esteem and exclusion by their peers, which may lead to the emergence of social and emotional problems for them in adolescence that may persist into young adulthood (Dietz W. H. 1998, p518–525). Children and adolescents who are overweight and obese have neurodevelopmental problems at a greater rate than children and adolescents who have normal weight (Kantomaa, M.T, et al, 2013, *110*, p 1917–1922). Overweight adolescents have a higher risk of obesity and have a higher rate of early mortality in the future as a possible population-wide outcome (Ebbeling, C. B., et al, 2002, p 473-482).

Children born in 1980 in Norway were found to have a higher body mass index (BMI) than children born in 1967, and there was a significant increase in BMI ratios over time among adolescents (Bjerkedal, T., Brevik, J., 2001, vol. 121, p 674-7). In addition, there has been a significant increase in weight for height among children and adolescents aged 4-15 years over the past three decades. This deviated the mean of BMI from the normal range and was more pronounced in the pre-adolescent group (Júlíusson, P. B., et al, 2007, p1333–1337).

According to a report issued in 2017, by Norwegian Institute of Public Health (NIPH), one out of every four young people in Norway is overweight or obese. In other words, about 25% of young people are overweight, and there are indications that this percentage will be increased in the future. On the other hand, about one of six adolescents are overweight or obese which mean that between 15% and 20% of them are overweight and there are indications that this percentage is maybe stabilizing in the future (FHI, 2017).

There are two main studies on the prevalence of overweight and obesity among Norwegian population. A study that began in 2008 of Child Growth began as part of the European Childhood Obesity Surveillance Initiative (COSI) in the region of West, South and North Norway and cohort study in North Trøndelag and Tromsø. These studies showed that between 15 and 24 percent of children and adolescents were overweight or obese (Dvergsnes, K., Et al, 2009, p 13-16; Kolle. E, et al, 2009, p 389; NIPH, 2017a, August). At the age of eight to ten years, 14% of girls and 11% of boys are overweight, while 3 percent of girls and 2 percent of boys are obese (National Institute of Health, 2017a; FHI, 2019). Among adolescents aged 15 years, the proportion of those who were overweight or obese increased between 2006 and 2011, and this increase remained relatively stable between 2011 and 2018 (figure 1). In 15-year-old boys, the proportion of overweight and obesity increased from about 12% in 2005/2006 to

about 16% in 2011 to be relatively stable around this percentage to 2018, while the percentage of their obesity decreases from 4% in 2006 to 2% in 2018 (figure 1). While the percentage of girls in the same age group who are overweight or obese has increased from about 16% in 2006 to about 23% in 2011 to range between this percentage and between 21% until 2018, but during this same period, the proportion of girls who were obese doubled from about 2% in 2005/2006 to about 5% in 2018 (figure 1; FHI, 2019).

Andel med overvekt og fedme blant 15-åringer

Kilde: ungKan1, ungKan2 & ungKan3
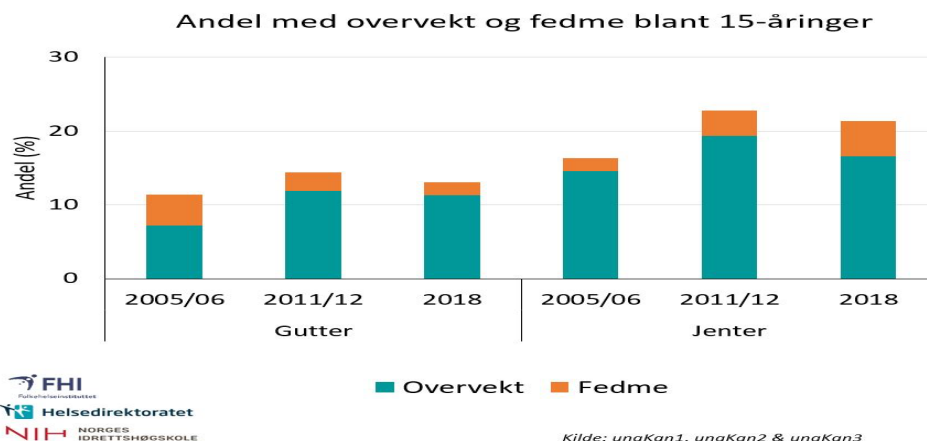
Figure 1. The distribution of overweight and obesity among Proportion of overweight and obese 15-year-old girls and boys in 2005/06, 2011/2012 and 2018 as a percentage. Source: (FHI, 2019).

In the total of the results of previous studies, Norwegian adolescents aged 10-19 years had a recurrence rate of about 25 percent who were overweight or obese (Evensen, E., et al, 2017, e015576). This increase in weight that we have seen among children and adolescents in Norway is part of an international and European trend in which the proportion of overweight or obesity is increasing in many countries (OECD, 2012). However, the prevalence of overweight and obesity in Norway is lower than in many other European countries, but it is still also higher than in several other countries (World Health Organization Europe, 2007, May).

Since 2010, the Norwegian Ministry of Health has recommended the application of common preventive measures at the first level of health care to reduce the risks of overweight and obesity (Norwegian Directorate of Health, 2011). These preventive measures have been implemented at the level of the family, health center, kindergarten, schools, and the local environment. They include an increased focus on physical activity in school, and healthy dietary guidelines for students and their parents who have structural measures in school and kindergarten (Norwegian Directorate of Health, 2011). However, although the application of these measures has resulted

in a relative stabilization of the rate of overweight and obesity among Norwegian children and youth, this proportion is still relatively high compared to other countries and remains a health and material burden on society (FHI, 2017). For this reason, a long-term international research project, began in 2018 and will continue to 2023, was initiated under the leadership of the Norwegian Institute of Public Health and with the participation of many public health organizations (n=14) from nine different countries in investigating the prevalence of overweight among adolescents and also in an attempt to reduce this percentage of prevalence through community assistance for adolescents to choose a healthy diet and an active lifestyle (NIPH, 2018, May).

1.1 Objectives of the study

Several surveys conducted in various countries of the world to determine the factors that are associated with overweight and obesity among children and adolescents have shown that eating fast food, social factors, family lifestyle, lack of activity and the use of modern means of communication are among the most common causes in society of overweight and obesity during childhood and adolescence (Mathieson, A., Koller, T., 2006). At the individual level, household income and socioeconomic disparities have been well-established risk factors for obesity and overweight in children and adolescents (Wang, Y., Lim, H., 2012, *24*, p176–188). But it was very important to focus on the role of leisure time physical activities because many findings from epidemiological and interventional studies have identified the importance of physical activity and fitness for overweight children and adolescents (Wareham, N. J., et all, 2005, p 229-247).

It is clear that there are various individual and structural factors in society that contribute to the continuing spread of obesity among children and adolescents in most societies around the world in general and in Norwegian society in particular. So far, there is a lack of sufficient previous studies to determine most of the factors affecting the BMI of children and adolescents in Norwegian society, and despite the start of a long-term intervention to influence this indicator and consequently a decrease in the prevalence of overweight, there is a need for many scientific research to know the extent of the relationship of overweight and obesity among school age adolescents with individual factors (lifestyle factors) and structural factors (social class factors) and how these factors may combine with each other and affect body mass. There are a huge number of factors that belong to lifestyle or social class, which can affect the prevalence of

weight gain in adolescents, and it is difficult to identify and verify them in one scientific study (Kruger, R., et al., 2005, p 351-358; Kaneria, Y., et al., 2006, 7:133-5). Therefore, the researcher chose in the current study to verify the factor of adolescents' participation in physical activities in leisure time as one of the most important lifestyle factors that previous studies have shown have an impact on the body mass index and also their relative families affluence, which is an indicator of several factors of social class, which will be mentioned later in the research (Mireku, M. O., & Rodriguez, A., 2020, p 428; Sigmundova, D., et all, 2019, June 14; Andersen LF, et al, 2005, Pages 99-106).

"So, the aim of this study is to map the prevalence of overweight and obesity among 12 and 14-year-old Norwegian adolescents and relate it to physical activity engagement at their leisure time as well as their relative family affluence based on data from a Norwegian perspective longitudinal study."

1.2 The study hypothesis

The study hypothesizes that there is a statistically significant relationship between the prevalence of overweight and obesity among Norwegian adolescents, their participation in leisure time physical activity, and the relative wealth affluence of their families.

1.3 The research questions

The data used in the current study, methods of analysis and results will attempt to answer the following two research questions:

1. What is the current prevalence of overweight and obesity among 12–14-year-old Norwegian adolescents?
2. Is there a relationship between overweight and obesity in 12–14-year-old Norwegian adolescents and the leisure time physical activity engagement of these adolescents and their relative family affluence?

1.4 The importance of the study

The importance of the current study is that it deals with one of the important topics in Norwegian society in particular and the international community in general (Grøholt, E.K., et al, 2008, september, p 258-265; Sigmundova, D., et all, 2019, June 14).

The scientific results expected to be reached through the current study will maybe fill some cognitive deficits in other studies related to the public health of adolescents and that be of help to researchers in general in Norwegian and other societies.

Also, the current study is important from the practical aspect, as it deals with a closely related to the life and health of adolescents, who represent a large segment of Norwegian society and are the groups most affected by the circumstances surrounding them. Therefore, the results of this study will contribute to supporting planners in the relevant ministries and those concerned with the health and welfare of citizens in general, and adolescents in particular, to be more based on reality.

Chapter Two

Critical review of the literature and Theoretical framework Purpose

2.1 Critical review of the literature

Review the literatures are to describe the factors associated with overweight and obesity in children and adolescents in different countries to give confirmation and credibility about the validity of the factors of the current study and link them to what is currently known about this global health problem. The literature review will also describe the credibility of the information that the current study will provide for current academic knowledge.

2.1.1 Systematic Literature Search

The steps of systematic literature search in this study were:

a) Google Scholar and PubMed were used as databases.

b) Overweight and obesity, body mass index, adolescents, lifestyle, physical activities in leisure time, social class and relative family affluence in both English and Norwegian languages were used as keywords for the search.

c) The types of studies selected ranged from articles and full essay to abstract and full text.

d) Only quantitative studies that deal with the study sample aged children and adolescents were adopted.

e) Studies conducted in countries that are somewhat similar in their societies and economy situation to Norway have also been approved.

f) Studies conducted prior to 2000 that were not intended to serve the current study were rejected.

g) Only studies that investigate the relationship of the prevalence of overweight or obesity with individual or structural factors were discussed, and studies that apply an intervention to reduce the prevalence of overweight were not discussed.

2.1.2   Literatures search summery

A study done in 2008 (Grøholt, E.K., et al, 2008, september, p 258–265) aimed to investigate overweight and obesity among Norwegian adolescents and related its to various social, economic and cultural factors that can influence prevalence. The study used a sample of 15,966 Norwegian adolescents aged 15-16 years and self-reported data were obtained from school surveys in six counties in Norway during the period 2000-2004. The results of the study showed

that the prevalence of overweight, and obesity was higher among boys and was 11.8% and 2.4%, respectively. Using logistic regression analyses, the study showed that adolescents in the northernmost provinces, Nordland, Tromsø and Finnmark, were 70-90% more likely to be overweight and obese compared to adolescents in the capital, Oslo. The study also showed that the increase in the percentage of overweight and obesity is closely related to inactivity, low educational plans, and poor family economy. As for eating habits, the study found that eating breakfast daily was positively associated with not being overweight/obese.

In a study entitled «Prevalence of overweight and obesity in Norwegian children and determining social and demographic risk factors», 6386 children between the ages of 2 and 19 years were sampled and their body mass index BMI was compared with the International Obesity Task Force (IOTF) cut-off values to estimate the prevalence of overweight. The influence of sociodemographic factors on this prevalence was analyzed using multiple ordinal logistic regression analysis in a subsample of 3793 children. The results of this study showed that the overweight and obesity prevalence was 13.8% in boys and 14.5% in girls. This prevalence in primary school aged (6-11) was 17%. The results of the study also showed that the prevalence of overweight and obesity increases when there are obese siblings and when the parents' education level is low, but the study did not find a relationship to the working status of parents or single-parent families (Júlíusson, P. B., et al, 2010, p 900-905).

Scandinavian validation studies conducted a national survey of Norwegian schoolchildren in fourth and eighth grades (9-14 years old) aimed at investigating the prevalence of overweight and obesity and the changes that occurred in these rates from 1993 to 2000. It also aimed to investigate the factors associated with being overweight. The study used data from cross-sectional dietary surveys, social class, and physical activity on nationally representative samples of fourth- and eighth-grade students in 1993 and 2000. Also, self-reported weight and height data were used for 1,650 eighth-grade students in 1993, 664 in fourth grade and 825 in 8th grade in 2000. The results of the study noted a significant increase in overweight and obesity among Norwegian eighth graders from 1993 to 2000. The results also showed that the prevalence of overweight and obesity in 2000 among fourth graders (9 years old) was 18.5% and 3.5%, respectively, and for eighth graders (12-14 years old) was 11.5% and 1.8%, respectively. The study also showed that the time spent by watching TV or in front of a computer, breakfast frequency and social class were associated with the odds of being

overweight. But the study found an inverse relationship between eating sweets and gaining weight (Andersen, L.F., et al, 2005, p 99-106).

A cross-sectional study conducted in 2008 in Telemark County in Norway with the main aim of mapping the prevalence of overweight and obesity among children in forth class (9-10 years old) based on objective measurements of weight and height and by linking these data to the level of parental education, income, work status, place of residence and marital status. The results of this study showed that the prevalence of overweight and obesity was 0, 5%, 16% and 4%, respectively, and that the prevalence of overweight and obesity were more in children than in parents. It also showed that mothers' education level and work status were more positively related to the prevalence of obesity in children (Oellingrath, IM., et al, 2008).

In a study, entitled Vigorous physical activity in relation to family affluence: time trends in Europe and North America and conducted in 34 countries in Europe and America on adolescents aged 11, 13 and 15 years, aimed to determine the trends of participation in vigorous physical activity (VPA) among adolescents in relation to family wealth. family affluence scale (FAS) was measured using standardized questionnaires and data from the School-Age Health Behavior Study (HBSC) across three self-reported survey cycles in 2006, 2010 and 2014 on VPA were used. Study's results showed a significant increase in VPA in girls with low FAS in four countries and a decrease in three countries. In boys with high FAS, a significant increase in VPA was observed in nine countries and a decrease in two countries. This study concluded that VPA was especially increased in adolescents primarily in the medium and high FAS categories (Sigmundova, D., Sigmund, E., et all, 2019, June 14).

In an international cross-sectional survey conducted between 2001 and 2002 of national samples from schools in 35 countries in Europe and North America of 11-, 13- and 15-year-olds to examine the prevalence of overweight in adolescent and it association with social disparity and with economic environmental factors. The sample size of the study was 162,305 adolescents. The results of the study showed a higher prevalence of overweight among children from less affluent families in the majority of Western European countries (21 out of 24 Western countries) and about half in Central European countries. While in Nordic countries such as Croatia and Finland, children from wealthier families were more likely to be overweight. Girls from less affluent families were overweight. The results also showed that a country's mean income and inequality was associated with prevalence in overweight when all countries were

considered together. The study confirmed that there is a positive relationship between high-income countries and the prevalence of overweight and a negative association between middle-income countries and the prevalence of overweight (Due, P., et al, 2009, p 1084-1093).

A Cross-sectional analysis of the National Diet and Nutrition Survey of 1863 young people aged 4-18 old done in Great Britain and intitled "Prevalence of overweight and obesity among young people in Great Britain". In this study the social class was coded in five groups (group 1group is the highest). The results of this study showed that there was no significant difference between white participants in the prevalence of obesity between girls and boys. Children and adolescents belonging to social groups 4 and 5 are more likely to be obese than those in social classes 1 to 3 ($P = 0.003$). Multiple logistic regression analysis also showed that white people of social groups 4 and 5 who live in Wales and Scotland are three times more likely to be obese than other white children (odds ratio 3.3, 95% confidence interval 1.1-9.8) (Jebb, S. A., Rennie, K. L., & Cole, T. J., 2004, p 461-465).

In a 2004 nationwide study of UK adolescents, data from 11,714 participants aged 14-year-olds were analyzed to investigate whether household income gradients influence the geographical prevalence of overweight and obesity in the UK. In this study, self-reported household income was standardized using the OECD Equivalent Income Scale. The results showed that the prevalence of obesity and overweight was 8.0% and 27.2%, respectively. The risks of overweight and obesity increased with the decreasing quintile household income ($P < 0.001$). After stratification by deprivation, household income gradients in the risk of obesity and adolescent obesity persisted in very rich and very poor neighborhoods but weak to insignificant in middle-class neighborhoods (Mireku, M. O., & Rodriguez, A., 2020, p 428).

A study conducted in Denmark and aimed to discover the relationship between the prevalence of overweight and obesity and social inequality in a nationally representative sample of 1849 children and adolescents aged 4 to 14 years during the period 2000-2008. Data from the Danish National Survey of Diet and Physical Activity in 2000-2002, 2003-2004 and 2005-2008 were used and parents' education was selected as an indicator of children's socioeconomic status. Weight and height were also calculated by the parents and the children were categorized according to the values of BMI percentile for age and sex. Logistic regression was used to analyze the relationship between the variables in the study. A strong inverse social gradient in overweight and obesity for boys and girls was documented over the entire survey period as the

current study showed an increased prevalence of overweight in Danish boys (12.8–21.7%, p = 0.0006), but not among girls (17.6–15.9%, p = 0.56) and particularly boys with fathers with a lower level of education (Matthiessen, J., et al, 2014, p 385-392).

A cross-sectional study was conducted in 2020 in the Czech Republic aimed to investigate whether there is a relationship between children's participation in organized leisure time physical activity, OLTFA, and a lower prevalence of obesity among separated family members. The study was based on 1,493 pairs of parent-child pairs (915were mothers and 578 were fathers and their children aged 4-16 years) from the Czech Republic selected by random sampling with complete data on body weight status and daily physical activity of the children were collected over a regular study weekdays between 2013 and 2019. The study showed that children who participated in OLTPA more than three times a week had a significantly lower prevalence of obesity than children who did not participate in OLTPA ($p < 0.005$). Even children whose parents were overweight when they participated in physical activities three or more times per week had a significantly lower prevalence of overweight and obesity than children who did not participate in any physical activities ($p < 0.002$). The study concluded that the cumulative effect of regular participation in a child's OLTPA is a stronger factor for reducing the risk of overweight or obesity in children than the risk factor for overweight or obesity in children with obese parents (Sigmund, E., & Sigmundová, D, 2020, p 8737).

A schools and general population health survey in England conducted in 2005 and aimed to examining the prevalence of childhood overweight and obesity between 1974 and 2003 and the extent to which this increase correlates with parental social class and family income. This study used data from the 1974, 1984 and 1994 National Health and Growth Survey, and the Health Survey for England, annually from 1996 to 2003. Participants were 14,587 aged 5-10 years. The prevalence of overweight and obesity was calculated using body mass index and socioeconomic status was measured using data registered for national social class and household income. The results of the study showed an increase in the prevalence of obesity among boys from 1.2% in 1984 to 6.0% in 2002-2003. In girls, obesity increased from 1.8% in 1984 to 6.6% in 2002-2003. The study revealed that children from minimum social classes have higher odds of being overweight and obese than children from higher income social classes (Stamatakis, E., et al, 2005, p 999-1004).

A cross-sectional study conducted in France as part of the WHO Collaborative Health Behavior Study for School-Age Children (HBSC) entitled "Socio-demographic and lifestyle factors associated with overweight in a representative sample of 11–15-year-olds in France" a nationally representative sample of 7,154 children aged 11 to 15 years participated. Data were collected on age, height, weight, and social variables by survey worker. Demographics, lifestyle factors, physical activity at two levels of intensity (moderate and vigorous) and sedentary behaviors, as well as patterns of smoking and alcohol consumption were self-reported using standardized HBSC protocols. Multivariate association of overweight with several sociodemographic and lifestyle factors was examined with logistic regression models. The results of the study showed that there was no causal relationship at the individual variable level such as eating food or watching television, only there was a significant association between overweight and breakfast, as well as overweight and physical activity in adolescents. When using the multivariate model, family wealth, breakfast intake, moderate to vigorous physical activity as well as vigorous physical activity were negatively associated with overweight (Dupuy, M., et al, 2011, p 1-11).

A Swedish study entitled " Dietary habits and nutritional status in adolescents over Europe " aimed to give an overview of the dietary habits of adolescents in the Nordic countries (Denmark, Finland, Norway, Sweden), and to know the relationship between dietary habits and factors that are related to lifestyle. The study included a sample of adolescents of ages 13-18 years old. Many adolescents of the study sample neglect breakfast and lunch schoolhouse, whereas most of them when they eat dinner eat very common snacks which are high in calories. The researcher concluded at the end of this study that these unhealthy eating habits will cause overweight and diseases attributable to obesity, and that it will be a huge challenge in the coming decades for both adolescents and other members of society (Samuelson G., 2000, March 1: S21-8).

In a study conducted in 2008 and aimed to verify the existence of a relationship between psychological distress and overweight in adolescents, whether boys or girls, considering social factors and lifestyle. Data for 635 boys and 618 girls aged 13 to 15 years were taken from the Population Health Organization surveys in Scotland conducted in the years 1998, 1999 and 2004. Variables of height, weight, psychological distress, physical activity, smoking, alcohol consumption, and deprivation were studied by region and social class taken from the surveys. Psychological distress was measured from the General Health Questionnaire (GHQ12).

Multilevel logistic regression and univariate and multivariate analysis were used in the analysis process to assess the significance of the association between variance at the adolescent and adult area level. The results of the study showed a strong relationship between overweight and high (GHQ12) score for girls, not boys. The results were still significant for girls (odds ratio = 2.44, 95% confidence interval (CI): 1.33–4.50) and were not significant for boys (odds ratio = 1.31, 95% confidence interval (CI): 0.56–3.05). This study concluded that overweight was associated with psychological distress in adolescent girls, but not in boys. There was no change in outcomes due to influences through social or lifestyle factors (Gray, L., Leyland, A.H., 2008, December, p 616-621).

Cross-sectional study entitled « The timing of the evening meal: how is this associated with weight status in UK children? » and was conducted for two groups of participants ,768 children aged between 4 and 10 years and 852 adolescents aged 11–18 years, by analyzing nutritional data obtained from the UK National Diet and Nutrition Survey between 2008 and 2012. The study tested an association between the timing of the evening meal before or after 20.00 o'clock and the risk of being overweight or obese. The results showed that there was no scientific relationship between eating the evening meal in both cases or in both study groups (Coulthard, J., & Pot, G., 2016, p1616-1622).

A cross-sectional study of children aged 7 to 9.5 years conducted in Portugal between 2002 and 2003 and aimed at identifying risk factors for overweight and obesity in Portuguese children. Weight and height were measured for 2274 girls and 2237 boys, and overweight or obesity was determined by age- and sex-specific BMI percentile. Information about the family was obtained by means of a questionnaire for parents. The results showed that children who were overweight at birth and who sat the most watching TV and who had obese parents were more likely to be overweight and obese. While this percentage decreases in children who sleep for a longer period and the level of education of their parents is higher (Padez, C., et al, 2005, p 1550-1557).

In an exploratory study in 2011, cross-sectional health survey data from Australia, Canada, England, and Korea were collected, and an analysis of these data was conducted to explore the relationship between education and obesity. The results showed a wide linear relationship between the number of years of education and the probability of obesity. Most educated individuals showed lower rates of obesity but there was one exception in Korean men. This

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association was also shown to be stronger in women than in men. Gender differences in educational parameters of obesity were slight in Australia and Canada and clear in England and Korea. This study concluded that individuals who were educated for longer periods of time were less likely to be obese than their less educated counterparts, indicating that education influences obesity only in the long term (Devaux, Marion, *et al.,* 2011).

A study entitled "Educational inequalities in obesity and gross domestic product: evidence from 70 countries" collected data about obesity and education for 41,2921 people from 70 countries from 2002 to 2013 to test a hypothesis indicating that the relationship between obesity and education depends on the economic development of the country. The results of the study supported the hypothesis. In low-income countries, obesity was more prevalent among individuals with higher education, while in middle- and higher-income countries obesity was more prevalent among those with lower levels of education. This was more evident in women than in men (Kinge JM, et al, 2015).

2.1.3 Discussion on previous studies

The most prominent points that can be referred to through the analytical reading of previous studies are the following:

a. All these studies were conducted during the past decade, which explains the positive reactions towards the growth and spreading of the phenomenon of overweight and obesity in different human societies, and this is a strong indication of the importance, validity, and originality of the subject of the current study.

b. Several studies have dealt with the relationship of lifestyle factors with overweight and obesity in adolescents, but their results varied in determining the significant associations of factors that causing this phenomenon, which calls for more studies to confirm the credibility of these studies results.

c. These previous studies confirmed the existence of a strong relationship between overweight and obesity and the surrounding social class, but there remain disparities in results from one country to another.

d. Most of the studies which discussed in the literature review and conducted on the phenomenon of overweight and obesity in adolescents showed that one variable alone was not sufficient to show a direct effect on BMI, but with the participation of several variables, there was a strong significant effect on it.

e. The literature review process was not able to find sufficient previous studies covering the objectives of the current study in verifying the variables selected in it that might require the conduct of such a study.

2.2   Theoretical framework

2.2.1   Study Concepts

Overweight and Obesity

Clinically, being overweight or obese is defined as a condition in which there is excess body fat than normal and can lead to unhealth conditions (overweight or obesity) which leads to chronic health impairment and chronic diseases (Hubbard, V. S., 2000, November, p 1067.1068). The World Health Organization defines overweight, and obesity based on the criteria for body mass index (BMI) to provide an estimate of body fat in males and females of any age (WHO, 2020).

Body Mass Index (BMI)

It is calculated by taking a person's weight, in kilograms, divided by their height, in square meters (WHO, 2020). BMI is used to classify a person as being:

- underweight (BMI under 18.5 kg/m^2)
- normal weight (BMI greater than or equal to 18.5 to 24.9 kg/m^2)
- overweight (BMI greater than or equal to 25 to 29.9 kg/m^2)
- or obese (BMI greater than or equal to 30 kg/m^2)

These BMI classifications are used by the National Institutes of Health and the World Health Organization (WHO, 2000, *894*, i–253). However, in certain groups of individuals, such as athletes, BMI is sometimes considered inadequate as the only way to classify a person as obese or malnourished, but in children and adolescents, it is a good way to compare those of the same sex and age (Hales et al, 2018, p 1723-1725).

Calculating the body mass index for children and adolescents depends on other criteria, due to the difference in the body's content of fat and fluid during the different age stages between males and females, and it is difficult to put a single simple indicator for overweight and obesity in children and adolescents, because their bodies are subject to several physiological changes, with their growth. For this reason, the calculating the body mass index for a child or adolescent

is by using the BMI-for-age chart (figure 2) to classify BMI-for-age. (CDC., 2014, 9 September) & (Himes and Dietz, 1994, p 307-316).
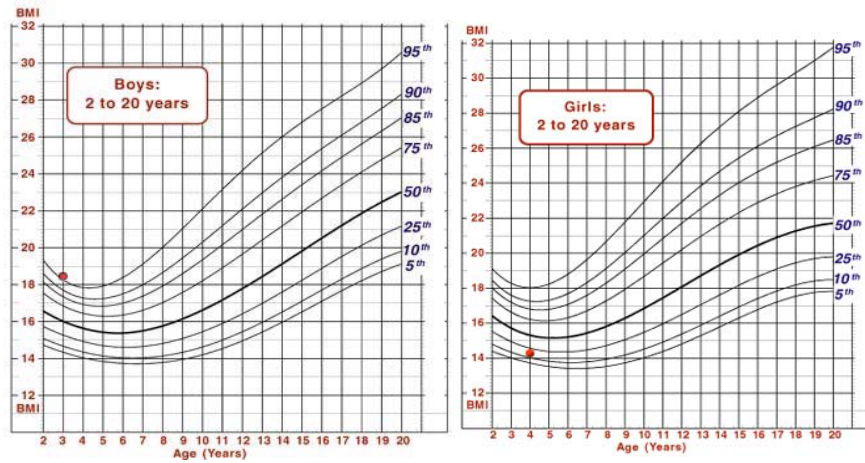
Figure 2. BMI-for-age charts to classify the Body Mass Index (BMI) percentiles from 2 to 20 years old for boys and girls. Source: (CDC, 2014).

Healthy weight and Unhealthy weight

In the current study, the healthy weight (normal weight) of adolescents was defined as the weight that falls between the values of BMI percentile from 5th percentile up to the 85th. While the unhealthy weight (overweight and obesity) of adolescents was defined as the weight that falls above 85th percentile for BMI percentile.

Adolescence

WHO defines Adolescence as «the phase of life between childhood and adulthood, from ages 10 to 19». It is considered an important stage of human development and an important period for laying the foundations for good health, as adolescents in this period are characterized by rapid in physical, cognitive, and psychosocial growth (WHO, 2021).

Lifestyle

World Health Organization defines lifestyle as a set of customs and traditions that affect, modify, encourage, or impede social practices throughout life, and these customs and traditions include the use of some substances such as: alcohol, tobacco, tea and coffee, nutritional habits, exercise, and other things that have important effects on health, which are often the subject of epidemiological investigations (Farhud D. D, 2015, p 1442-1444). The lifestyle in the current study is represented by the physical activities, whether sports or social, in which adolescents participate during their leisure time (Leisure time-PA).

Social Class

Social class is a type of socioeconomic classification used to define the groups into which a society is divided, considering the characteristics common to individuals. Individuals in a society are grouped according to a series of common criteria related to the socio-economic community, such as: wealth, income, employment, access to education, political power, beliefs, and values. Based on these criteria, social classes are established and help to understand the differences and similarities that exist between individuals and help in finding opportunities for a better quality of life (Britannica, T. Editors of Encyclopaedia, 2019, September 20). In the current study, social class is defined based on the criteria of economic status (Relative Family Affluence RFA).

2.2.2 Scientific Theories

Among the most important scientific theories that have tried to explain the behavior that exists in society at the individual and social level which can lead to the emergence of the phenomenon of overweight and obesity in the society, are the following:

A) **Hazuda's theory about the relationship of overweight with an individual's socioeconomic status**

Hazoda believes that the society that has been subjected to modernization processes because of the material wealth tends mostly to become obese in a large way until it reaches a specific point. Considering the new global situation and openness to the global market, which is trying to market its tempting food materials and products and present them in bright and tempting forms for consumption, the community has derived a certain cultural pattern in eating its meals that may eventually lead to an increase in weight. Then, the society is exposed to reach the highest levels of obesity in society. This same wealth can be used positively to reduce the level and rates of obesity, as it allows members of the community with greater opportunities for education and health awareness, so that the community begins to address this important health issue (Hazuda, H. P., et al, 1988, p 1289-1301).

B) **Social Action Theory for "Talcott Parsons" as one of the Functional Structural Theories**

Social action theory is one of the theories of functional constructivism. Scientists of this theory say that society is a system composed of parts interconnected with each other so that the part cannot be understood in isolation from the whole in which it is located. Any change in any part

leads in turn to changes in other parts of the system and leads to some extent to a defect in the system. This theory adopts two approaches to social action:

a. The deterministic tradition, as this approach explains that those surrounding social behaviors such as individual behavior, the way of eating and drinking, dressing, talking, and dealing with people all come from the external environment and the individual receives and owns them only and may feel over time that these behaviors arise from the core of the conscience.

b. The rationality approach is divided into four sections: rational action, which relates to the goal, rational action, which relates to the value of the work, emotional action, and traditional action, which is an action dictated by traditions, customs, and societal beliefs (Munch, R., 1982, p 771-826).

It is clear from the above that the phenomenon of overweight and obesity in adolescents, maybe due to external factors that the adolescent does not have control over. Contemporary life may impose on the teenager a lifestyle that was not accustomed in past generations. For example, means of communication and modern technologies (mobile, internet, satellite channels, etc.). And it maybe impose a lack of movement and activity on the teenager, and thus he feels lazy, which increases his weight and becomes obese. On the other hand, the social environment surrounding the adolescent may be a conducive factor for practicing healthy activities that reduce overweight or obesity: such as participating in sports, social clubs, and others.

According to Parsons' social action theory, overweight and obesity in adolescents can be explained by the fact that there are three patterns in the adolescent's environment: the family pattern represented by its social and economic status, the school pattern represented by student activities and school feeding, and the neighborhood pattern which he live. And that each of these systems has an important role, and a function that it performs in a harmonious and consistent manner with other systems to achieve several goals and objectives, including: the public health of all members of society in general, especially children and adolescents, and the prevention of diseases (Munch, R., 1982, p 771-826).

C) Critical structural theory (Social Reproduction theory for Pierre Bourdieu)

Two assumptions lie at the core of the critical structuralist social analysis approach: a) that people's ideas are products of the society in which they live. b) Thinkers should be objective and work to separate truth from value judgment in their work and they should adopt a critical

attitude towards the society they are experiencing which is one that makes people aware of what they should do, and that social change is their goal in the end (Janzen, J. M., 2009). According to scientists of this theory, the human body bears the signs of the social class to which it belongs due to three main factors: the individual's social position, the formation of his environment, and the development of his taste. This theory also explains part of the relationship between the lifestyle of adolescents and their overweight and obesity from several angles: 1) The social and economic status of the individual plays an important role, whether positive or negative in the human body. For example: the high level of cultural awareness among members of the community may help in maintaining health and identifying the negative effects resulting from overweight and obesity and the resulting diseases, and thus be an aid in the prevention of obesity. 2) On the other hand, the availability of money for individuals may help them to buy foods saturated with fat or to acquire channels satellite TV and sitting in front of the TV for long hours, which negatively affects the health of their bodies. 3) There are external forces such as large companies that aim primarily to gain money, and marketing of goods and products, whether food, transportation, or communications. For example: fast food companies that contain saturated fat food and soft drinks; It exerts pressure on consumers to promote those fast-food meals, and negatively affects the health of members of society in general, especially young people, and consequently the incidence of overweight and obesity and the accompanying health effects social and economic (Janzen, J. M., 2009; Macris, V., 2011, p 19-46).

Chapter Three

The Research Process and Methodology Statistical

This chapter deals with the study methodology used and presents the study population and its sample, in addition to the study tool, its procedures, and the mechanism for verifying its validity and reliability. It also deals with the statistical tools used in analysing the data to reach the results that help to achieve the objective of the current study in determining the prevalence of overweight and obesity among Norwegian adolescents and linking it to the percentage of their participation in physical activities in their leisure time as well as the level of their relative family's affluence based on the existing data.

3.1 Study design and data source

The current study is a cross-sectional study based on relevant quantitative data derived from a previous Norwegian prospective longitudinal cohort study produced and arranged by Hedmark collage in Norway in 2016 on a sample of school students aged between 12-14 years to gain better knowledge about children and adolescent mental health, physical activity, and academic achievement.

This type of studies, cross-sectional studies, is characterized by a lower cost and lower required ethical consideration. The advantage of this kind of studies are they also study the relationship between different variables at a particular time. The cross-sectional analysis also relates to how variables affect each other at the same time and period (Broom, A. & Willis, E., 2007, p 16-31). Another advantage of this kind of studies are to study the relationship between different variables at a particular time (Setia M. S., 2016, p 261-264). Finally, the cross-sectional analysis relates to how variables affect each other at the same time and period (Broom, A. & Willis, E., 2007, p16-31; Setia M. S., 2016, p 261-264).

Related questions out of 53 questions were chosen from the questionnaire presented in the previous study to achieve the objective of the current study (Appendix 2). The validity and credibility of these selected questions was confirmed by comparing them with previous studies and by discussing them with the other supervising researcher.

3.2 Data management plan

The current study addressed secondary data from a previous study where direct or indirect personal information had previously been laundered. The questionnaire was written on paper and the data used in the current study was grouped and stored in the SPSS statistical program format by digital intrusion for used it in this study without including any identification information directly or indirectly, as the list of codes belonging to the study participants was deleted.

The data were described by converting words to values started from zero. The evidence was shared and discussed with the supervisor responsible for the current study and with the relevant authorities (NSD). The data has been stored in serial numbers, which have no indication of personal information belonging to the study participants. In the SPSS file that used in the current study, the search supervisor has given all respondents a new ID- number so that they cannot be associated with the main file/link key in the original master project. This makes it impossible to trace the data back to reach the participants.

3.3 Ethical considerations

The using of survey data for the original study has been approved in the current study by the supervisor responsible for the current search and by the professor in charge of the master's program in public health at the Inland Norway University of Applied Sciences.

Participants in the original study were asked to provide their written consent at the beginning of the questionnaire and before completing a self-survey (Appendix2).

The current study obtained the approval of the NSD (Norwegian Center for Research Data) on the method and confidentiality of handling and storage of data used in the study.

3.4 Study Sample

The participants in the current study were a representative sample of the Norwegian students aged 12-14 years. A total of 599 participants were selected as a random sample from ten different schools in Hedmark county. The number of participants in the studied sample was 253 boys and 307 girls after applying the exclusion criteria. The current study adopted the following exclusion criteria in selecting the sample: a) Participants aged <12 years or >14 years old. b) Adolescents who have physical disabilities, which can affect their functional and motor performance. c) Adolescents who have been proven to be taking any kind of medication or stimulants that could lead to gain weight. d) Adolescents who have previously been diagnosed with a metabolic or endocrine disorder that causes overweight or obesity. e) Out of a total of

599 participants, the relatively low number of participants in the 'underweight' category (~2%, n=14) were excluded from the study sample. F) 42 out of 575 respondents had a deficiency in their answers to the questions asked in the questionnaire, so it is considered a missing value, which was equivalent to (7.3%). The set of missing information in the study sample was also excluded from additional statistical analyses.

3.5 Study variables

Based on the hypothesis of the current study to be proven, these variables were selected to answer the questions raised in this study:

A) The dependent variables

Body mass index (BMI) was used as a dependent variable for the current study to assess the ratio of the distribution of healthy versus unhealthy weight in the study sample and how this variable relates to the independent variables.

Height and weight measurements were taken by the public health staff of the original study, which data of the current study relied on, and then these data were uploaded by them to the statistical program SPSS. The BMI value was calculated by relying on CDC calculator for Child and Teen (figure 3). This method is used scientifically for calculating BMI for this age group, and it is based on the use of weight and height, and then calculating the percentage corresponding to this indicator for age and gender (CDC, 2021).

underweight, less than the 5th percentile

healthy weight, 5th percentile up to the 85th percentile

overweight, 85th to less than the 95th percentile

has obesity, equal to or greater than the 95th percentile.
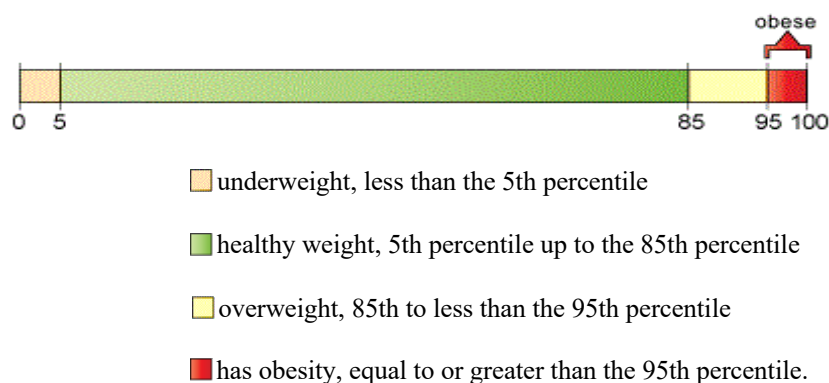
Figure 3. BMI Percentile Calculator for Child and Teen. Source: (CDC, 2021).

B) The independent variables

The current study relied on three main independent variables to analyze them to confirm or negate the theory of this study:

1) The independent variable related to students' lifestyle in the current study was to measure the percentage of these students' participation in physical activities in their leisure time. Data related to this variable were collected by asking the participants in the questionnaire how often they engaged in Leisure Time Physical Activities during a month (Leisure time-PA) (Appendix2). There were seven answer options for this question that were categorized and coding in the SPSS statistical software to measure and interpreting its outcome according to the 7-points Likert scale (Sullivan, G. M., & Artino, A. R., Jr, 2013, p 541–542) as follows: 1=Never, 2=less than once a month, 3=once or twice a month, 4=at least once a week, 5=twice a week or more, 6=3-4 times a week, 7=almost daily).

2) The independent variable related to the social class factors of the family were studied by the percentage of the Relative Family Affluence (RFA) and this is in accordance with the recommendations of the World Health Organization (WHO, 2006, pp. 14 -25). Data for this variable were collected based on questions 9,10, 11, 12,15, 16, 17 and 18 in the questionnaire (Appendix2). Likert-Type Scales was used in each question to analyze, encode and Interpret their information in SPSS program as follows:

In Q9: Does your family own a car? The coding was 1= no, 2= yes, one and 3= yes, two or more. In Q10: Does you have a bedroom? The coding was 1= no and 2= yes. In Q11: How many times did you and your family go on vacation abroad last year? The coding was 1= never, 2= one time, 3= two times, and 4= more than two times. In Q12: How many computers and the tablets that the family owns? The coding was 1= never, 2= one, 3= two, 4= three and 5= more than three. In Q15: Does the family own a dishwasher at home? The coding was 1= yes and 2= no. In Q16: Where they you live? (Detached house/house/condominium)? The coding was 1= in a detached house, 2= in a terraced house and 3= in an apartment. In Q17: Does your family have a cabin or holiday home/holiday apartment in Norway? The coding was 1= no, 2= one, 3=two and 4= more than two. In Q18: Does your family have a cabin or holiday home/holiday apartment abroad? The coding was 1= no, 2= one, 3=two and 4= more than two.

These questions are also included in a different special coding to derive the RFA categories in SPSS syntax which is encoded into 3 categories of RFA. First category was lowest RFA 20%, second category was medium RFA 60%, and third category was highest RFA 20%.

3) The third independent variable was related to gender and its data collected from the question that was related to gender and was coded simply in SPSS program as: 1= boy 2= girl (Appendix2).

3.6 Statistical Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 28. Both One-Way and Two-Ways ANOVA with Post Hoc Tests analysis were used to simultaneously test the effect of each of the independent variables on the dependent variable and identifying any effect of the interaction (Pallant, 2013).

Appropriate assumption tests (general Anova) were performed and approved prior to the analyses. During this analyze the effect of each of the categorical independent variables, (gender, RFA and Leisure time-PA) on the dependent variable (BMI) was tested at the same time while determining the presence of no interaction effect.

Means, standard deviations, frequencies, and percentages were used to describe demographic data. Whereas, Mean Difference, Standard Error (SE), 95% confidence Interval and P-value were obtained for the between-group analyses. A P-value of less than 0.05 was considered statistically significant.

Chapter Four

4 Results

To answer the study's questions about the current prevalence of overweight and obesity among Norwegian adolescents aged 12-14, and whether there is a relationship between overweight and obesity, the recreational Leisure-PA of these adolescents and their RFA, the results were as follows:

4.1 Descriptive information of study sample

Originally, the dependent variable BMI in the current study had consist of two categories, normal weight, or healthy weight category (n = 447) and overweight or unhealthy weight category (n = 113), which means that the prevalence of normal weight was about 79.5% and the prevalence of overweight was about 20.5% among the sample of the study. N=83 participants av unhealthy weight category were overweight (MBI for confidence interval = or more than 85% and less than 95%) which equivalent to 14.4% of the study sample and n= 30 participants av unhealthy weight category were obese (MBI for confidence interval = or more than 95%) with an overall 5.2% of sample size respectively, which represents the age group of Norwegian adolescents between 12 and 14 years (Figure 4).

The gender distribution in the current study showed a slightly higher participation of girls (n = 307, which equivalent to 55% of participations) compared with boys (n = 253, which equivalent to 45% of participations) (Figure 4). A total of 205 of 253 boy's participant followed the healthy weight category which equivalent 81% and 48 of 253 boy's participant were followed the unhealthy weight category which present 19% of overweight among this gender group. Among girls, the prevalence of overweight was 21.5% (n=65 of 307 girls' participant), compared to 78.5% (n=242 of 307 girls' participant) of those with normal weight, respectively (Figure 4).
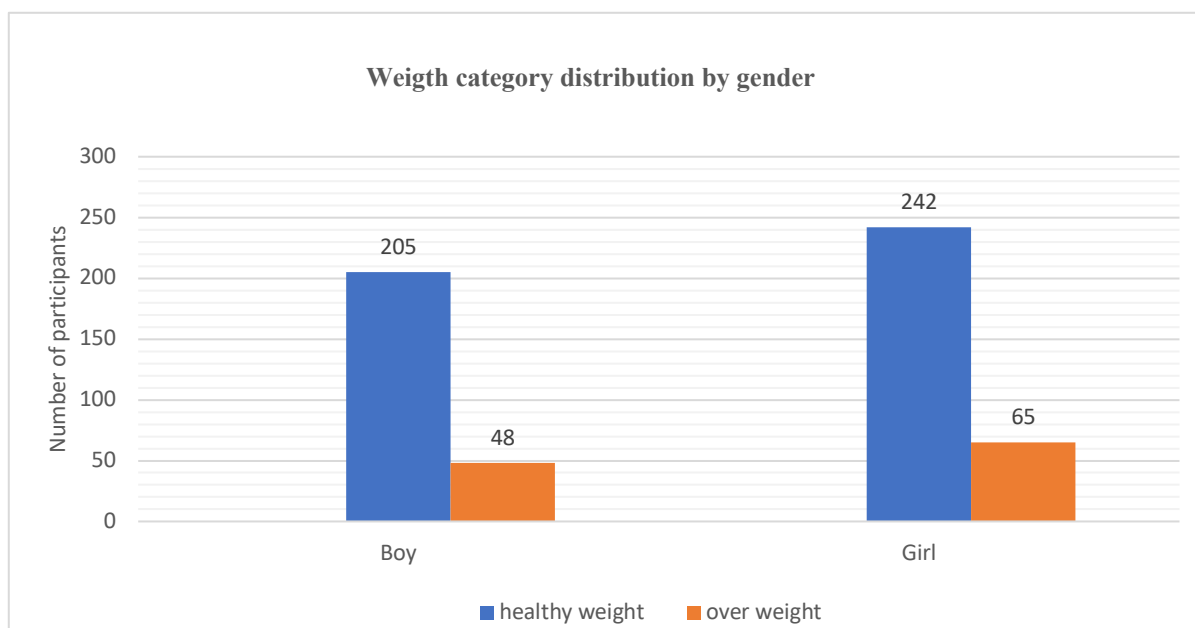
Figure 4. Distribution of healthy weight category and unhealthy weight category among Norwegian boys and girls aged 12 to 14 years.

With regards to the relative family affluence (RFA), most of the study sample was the medium RFA 60% with an overall of respondents (n=322) which is equivalent to 60 % of sample size, followed by the lowest RFA 20% with an overall of respondents (n=127) which is equivalent to 24% of sample size and finally was the highest RFA 20% of with an overall of respondents (n=84) which equivalent to 16% of sample size (Table 1).

The BMI for normal weight was range between 15.5 to 22.8 kg/m^2 and the value of mean was 18.86 kg/m^2, whereas the range of overweight was between 22.9 to 34.7 kg/m^2 and the value of mean was 25.2 kg/m^2. The estimated means of the BMI variable changes slightly between the three categories of the relative level of RFA (lowest RFA 20%, medium RFA 60% and highest RFA 20%), which was between 19-20 kg/m^2 (mean= 19.33 kg/m^2, 19.64 and 20 kg/m^2 respectively) for boys and 20-20.9 kg/m^2 for girls (mean= 20.34 kg/m^2, 20.12 and 20.92 kg/m^2 respectively) (Table 1).

The number of participants and those who practice Leisure time-PA almost daily was the highest among the participants (n=174) followed by those who participate in Leisure time-PA 3-4 times a week (n=133) and then those who have engagement Leisure time-PA twice a week (n=87), then those who have Leisure time-PA at least once per week (n=65), once or more Leisure time-PA per month (n=24), and the least number of those who do not have any Leisure time-PA (n=9) (Table1).

Table 1. Descriptive information of study population (n=533). The table presents age, height, weight, body mass index (BMI) and leisure time physical activity level for the three categories of relative family affluence RFA.

	Relative family affluence (FRA)											
	Lowest 20%				Medium 60%				Highest 20%			
	Boys (n=63)		Girls (n=64)		Boys (n=138)		Girls (n=184)		Boys (n=40)		Girls (n=44)	
Characteristics	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age (years)	47.5	31.2	57.1	28.1	51.9	28.1	59.7	61.8	52.8	30.4	61.6	25.1
Height (cm)	164.1	7.8	161.6	6.8	163.2	9.2	161.3	6.9	164.8	7.8	163.4	6.7
Weight (kg)	52.2	11.9	53.2	9.9	52.7	11.9	52.4	9.8	54.3	12.2	55.6	9.6
BMI (kg/m^2)	19.3	3.1	20.3	3.1	19.6	3.2	20.1	2.9	20.0	4.0	20.9	3.3
Leisure time-PA (on a 7-point Likert scale)												
Never (N=9)	18.2		17.7		16.8	1.1	19.9	5.4	17.8		19.8	
Less than once a month	19.3	5.0	20.5		20.2	3.8	19.8	1.5	19.6	0.9	18.9	0.7
1-2 times pr. Month (n=24)	20.1	5.7	18.8	2.9	19.3	2.5	22.8	3.5	28.9	8.1	20.6	
At least once a week (N=65)	18.5	2.9	20.2	3.1	22.8	4.4	19.8	2.8	19.5	2.2	20.3	2.9
Twice a week or more (N=87)	18.7	1.6	22.5	4.7	19.8	2.9	19.8	2.9	20.5	3.4	21.6	3.7
3-4 times pr. Week (N=133)	19.1	3.3	19.9	3.4	19.1	3.4	20.4	3.2	19.2	3.8	21.5	3.8
Almost every day (N=174)	19.1	2.7	20.4	2.3	19.3	2.5	20.0	2.5	19.8	3.9	21.0	3.2

In the healthy weight category (n=412), the highest prevalence was for medium RFA 60% which is equivalent to 62.1% of this category (n=257), then it was for the lowest RFA 20% which is equivalent to 23.1% (n=95), and finally was the highest RFA 20% which is equivalent to 14.8% to this category (n=61). As for the unhealthy weight category (n=106), the highest prevalence was for medium RFA 60% which is equivalent to 56.6% of this category (n=59), then it was for the lowest RFA 20% which is equivalent to 24.5% (n=26), and finally was the highest RFA 20% which is equivalent to 18.9% of this category (n=20) (Figure 5).
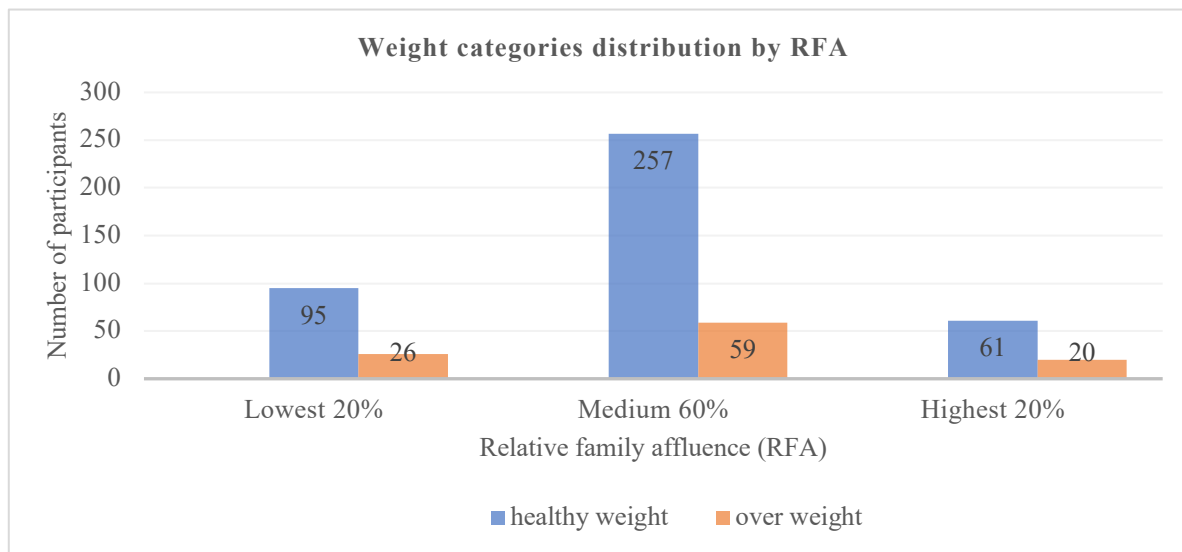
Figure 5. Distribution of healthy weight category and unhealthy weight category (overweight) among the three groups for the Relative family Affluence RFA.

4.2 Group comparisons of variables

The gender difference in BMI was calculated by using one-way Anova analysis and the results showed that there was a slightly different in BMI between boys and girls when RFA was not included in the model of analysis ($F(1, 573) = 5.83$, $p = 0.016$). In other words, girls are more likely than boys to be overweight or obese, and this maybe explain in a way the prevalence of overweight or obesity that appeared more in girls than boys in the current study sample. In contrast, the results from the two-way Anova revealed that there is no significant interaction effect between the kind of gender and the distribution of RFA ($p=0.665$), meaning that there is no significant difference in the effect of distribution of RFA among boys and girls on the BMI for boys and girls. However, as a result of the same analysis it was found that there is a significant main effect of gender on BMI ($F(1, 527) = 6.32$, $p = 0.012$), but no main effect of RFA on BMI ($F(2, 527) = 1.24$, $p = 0.291$). This means that the three different levels in the RFA (high RFA 20%, medium RFA 60% and low RFA 20%) did not differ in terms of impact

on BMI, but there was a significant difference in scores on BMI for boys and girls. According to Cohen's classification in 1988, this effect of the gender variable on BMI (p= 0.016 or p=0.012) was classified as a small-scale effect making it poorly rated to explain the strength of the relationship between gender and BMI (Berry, K. J., & Mielke Jr, P. W., 1988).

By including the three variables gender, RFA and Leisure time-PA in the two-way Anova analysis, the results showed a significant interaction effect from the combination of these three factors (F (11, 473) = 2.03, p=0.024). This indicated that when these factors were analyzed independently, they had no significant effect on BMI, but when they were combined and overlapped, this significant association appeared with the effect on BMI and the mean of the MBI began to deviate from the normal range.

This interaction effect led to conduct Post Hoc Tests analysis using the Fisher's Least Significant difference (LSD) that showed a significant difference in BMI when comparing the lowest RFA 20% group with the highest 20% RFA group (-0.24 kg/m^2, 95% CI: -0.76 to -0.01, p = 0.049) (Table 2). In other words, this means that the BMI can be more and the probability of becoming overweight increases with increasing the wealth of the family.

This multiple comparative analysis model also showed a significant association between BMI and adolescents who engage in Leisure time-PA once or twice a month (-2.67 kg/m^2, 95% CI: -5.05 to -0.29, p = 0.028) or who engage in Leisure time-PA at least once a week (-2.21 kg/m^2, 95% CI: -4.37 to -0.04, p = 0.046) compared to those who did not have any engagement in Leisure time-PA. There was also a slight but insignificant effect on BMI for those who engage in Leisure time-PA two or more times per week compared to those who do not engage in any Leisure time-PA (-1.88 kg/m^2, 95% CI: -4.01 to 0.25, p=0.083) (Table 2). This means that adolescents who do not participate in any physical activities in their leisure time are more likely to be affected by their BMI and more likely to be overweight compared to those who participate in physical activities in their leisure time two or more times during the month or at least once a week.

Table 2. Between-groups analysis of variance showing differences in BMI as dependent variable related to gender, and comparisons of different categories within i) relative family affluence RFA and ii) leisure time-PA level.

Characteristics	Mean difference	SE	95% CI		p-value
Gender **(boys vs. girls)**	-0.47	0.50	-1.44	-0.51	0.012
Relative family affluence					
Lowest 20 % vs Highest	-0.88	0.45	-1.76	-0.01	0.049
Lowest 20% vs Medium	0.24	0.33	-0.89	0.42	0.481
Medium 60% vs Highest	-0.65	0.39	-1.41	0.11	0.095
Leisure time PA (on a 7-point Likert scale)					
Never vs. Less than once a month	-1.62	1.23	-4.03	0.79	0.192
Never vs.1-2 times pr. month	-2.67	1.21	-5.05	-0.29	0.028
Never vs. At least once a week	-2.21	1.11	-4.37	-0.04	0.046
Never vs. Twice a week or more	-1.88	1.08	-4.01	0.25	0.08
Never vs. 3-4 times pr. week	-1.72	1.07	-3.81	0.38	0.112
Never vs. Almost every day	-1.64	1.06	-3.72	0.44	0.123

As a conclusion, when the first model of the analysis (One-way Anova analysis) used it showed a main effect of gender on BMI (p=0.012), but this main effect of gender was omitted in the latest model (Post Hoc Tests analysis), where the RFA and Leisure-PA were included, and showed instead an interaction effect (p=0.049) among the three independent variables that makes it possible to evaluate the post-hoc test from this analysis and compare to illustrate the effect of this interactivity.

Chapter five

Discussion and Conclusion

5.1 Discussion

The current study attempted to understand the phenomenon of overweight and obesity in Norwegian adolescents from a social perspective by linking scientific theories and previous studies with the results of this study. The results answered the questions raised in this research and confirmed to some extent the validity of the hypothesis that suggested a statistically significant relationship between the prevalence of overweight and obesity among Norwegian adolescents, their participation in physical activity at leisure time and their relative family affluence.

Results of the current study showed a significant interactive effect when the three independent variables (gender, RFA and leisure-PA) were combined. There was a slight difference in BMI between boys and girls, but when the other variables were added, this difference was neglected and there was no significant interaction effect between gender and the distribution of RFA groups on BMI for both boys and girls, but it showed a significant difference in BMI when comparing the lowest RFA 20% group with the highest RFA 20% group. The results also showed significant associations between BMI and adolescents who engage in Leisure time-PA once or twice a month or who participate in Leisure time-PA at least once a week compared to those who never participate in Leisure time-PA. There was also a small but non-significant effect on BMI for those who participated in the Leisure time-PA two or more times per week compared to those who never participate.

The results of the analysis in the current study showed that the BMI for Norwegian adolescent girls was deviates from the norm slightly more than boys after verifying that there is no effect of the other factors among them and this result was similar to result of British's study (Jebb, S. A., Rennie, K. L., & Cole, T. J., 2004, p 461-465). It is noted that the prevalence of overweight among Norwegian adolescents in the current study sample (19% for boys and 21.5% for girls) was globally close to the report of the World Health Organization in 2016 on the phenomenon of overweight prevalence among adolescents in developed countries (about 18% for boys and 19% for girls) (World Health Organization. 2021, 9 June). This prevalence almost identical with the reports of the Norwegian Institute of Public Health, NIPH, and the

results of the previous studies of the prevalence of overweight and obesity among adolescents which conducted in Norway (study of Child Growth as part of the European Childhood Obesity Surveillance Initiative (COSI) in the region of West, South and North Norway and cohort study in North Trøndelag and Tromsø), which showed a prevalence of overweight and obesity of about 18% for boys compared to about 21% for girls in Norway (Dvergsnes, K., Et al, 2009, p 13-16; Kolle. E, et al, 2009, p 9-389; NIPH, 2017a, August).

In the current study, the relative family affluence RFA was chosen as an indicator of socioeconomic status at the individual level because it provides information about the joint status of the family and represents the purchasing power of families including the income used to purchase food. However, studies such as the one in Australia and "Educational inequalities in obesity and gross domestic product: evidence from 70 countries" was used the highest level of academic qualifications of mothers and fathers as indicators of socioeconomic status. It has found similar socioeconomic gradients in the risks of obesity and overweight in adolescents (Devaux, Marion, *et al.,* 2011; Kinge JM, et al, 2015).

In the literature review, there was one study (Sigmundova, D., et all, 2019, June 14) discussing the relationship between the participation in various physical activities among adolescents and the level of family wealth affluence in various European countries and North America. This study concluded that participants with the higher the level of family wealth in the country have more participation in various physical activities. This is almost close to the results of this study, where the largest number of the sample size of the medium RFA 60% (n=316) and those who practice Leisure time-PA almost daily is the highest among the participants (n=174), followed by those who participate in Leisure time-PA 3-4 times a week (n=133).

Another study conducted in France for children aged 11 to 15 years in 2011 did not find any relationship at the individual level between lifestyle factors (such as eating daily breakfast, watching TV, and engagement in physical activities) and being overweight, as well as social factors related to the family such as smoking and alcohol consumption. The relationship was negative between them and being overweight (Dupuy, M., et al, 2011, p 1-11). A study done in Scotland concluded that there are significant association between overweight and psychological distress in adolescent girls, but not in boys and there was no change in outcomes due to influences through social or lifestyle factors (Gray, L., Leyland, A.H., 2008, December, p 616-621). In the current study, the relationship between variables (gender, leisure time-PA

and RFA) was negative when they were studied individually, but there was a positive effect on BMI when these factors were combined.

Among the sociodemographic variables examined in the current study (RFA), a consistent negative association was observed between the three levels of RFA (highest RFA 20%, medium RFA 60% and lowest RFA 20%) and prevalence of overweight. The results showed that the higher the Relative family affluence, the greater the probability of affecting the body mass index of adolescents, and the higher the proportion of them exposed to an increase in their weight. These results can reflex the theoretical ideas discussed in the theories as Hazuda's theory which talked about the relationship of overweight with an individual's socioeconomic status (Hazuda, H. P., et al, 1988, p 1289-1301). They also corresponds to many, but not all, previous reports such as reports from developed countries including the USA, Canada, and Northern European countries. In European northern countries such as Finland, Denmark and north America, there was a strong increase in the risk of being overweight or obese in adolescents from families in the highest relative family affluence compared to those in the lowest (Due, P., et al, 2009, p 1084-1093). Opposite trends in socioeconomic inequality in childhood and adolescent obesity risk have been reported in other studies such as the one in England and Denmark (Matthiessen, J., et al, 2014, p 385-392; Mireku, M. O., & Rodriguez, A., 2020, p 428; Jebb, S. A., Rennie, K. L., & Cole, T. J., 2004, p 461-465). A study conducted between 2000 and 2004 in Norway concluded that the northern provinces of Norway, such as Tromsø, are more likely to be overweight than the capital, Oslo, and that the percentage of overweight increases with less education, lack of participation in sports activities, and family poverty as well (Grøholt, E.K., et al, 2008, september, p 258–265).

Although several recent studies show a hypothetical stabilization or moderate reduction in trends in childhood and adolescent obesity in Norway, it appears that more affluent societies such as Norway compared to poorer societies in other countries have disproportionately affected the persistence of overweight and obesity (National Institute of Health, 2017a; FHI, 2019).

Most of the old and recent studies, such as the study that took place in Norway in 2008 (Grøholt, E.K., et al, 2008, september, p 258–265) and the Scandinavian study that took place in 2005 to assess the BMI of the Norwegians adolescents between 1993 and 2000 and its relationship to physical activities (Andersen LF, et al, 2005, p 99-106) emphasized the importance of exercise and participation in physical activities, which had a strong positive

effect on the mean of BMI mean and its deviation to the normal distribution. A study conducted in the Czech Republic to investigate the effect of children's and adolescents participation in physical activities in leisure time, the results of this study were almost similar to the results of the current study and it showed that adolescents who participate in physical activities in leisure time more than three times a week have a significant relationship with their BMI compared to those who do not have any participation in physical activities (Sigmund, E., & Sigmundová, D, 2020, p 8737). In the current study, data regarding the relationship between Leisure time-PA and BMI have been inconsistent. Specifically, different levels of physical activity (measured by objective methods: a 7-point Likert Scale) showed different relationships with excess weight, where there was a strong relationship between BMI and Leisure time-PA once or twice a month or once a week compared to those who had no Leisure time-PA participation ($p = 0.028$ and $p = 0.046$ respectively), while there was no relationship between BMI and adolescents who participate in Leisure time-PA two or more times a week compared to those who did not have any participation. In addition, the effect of gender on the relationship between Leisure time-PA and BMI was not consistent, as no differences were shown between boys and girls in the strength of the relationship.

5.1.1 Strengths and limitations of the study

Considering the previous literature references, the current study is the first on the interrelationship between the two independent variables (leisure-PA and RFA) and BMI and therefore the results could be slightly different from those of other literature or other study groups. The results of the current study add some information to the growing body of literature that highlights the impact of social and economic inequality on the health of children and adolescents, which could be of reference for other investigation studies such as the long-term international research project which already initiated under the Norwegian institution of the Public Health NIPH (NIPH, 2018, May).

The BMI calculating in this study was based on the height and weight data that were measured by health workers of the original study, Norwegian prospective longitudinal cohort study produced and arranged by Hedmark collage in Norway in 2016, on which the current study relied. This indicates that the BMI taken in this study was reliable and appropriate for establishing valid relationships in epidemiological studies (Strauss, R. S., 1999, p 904-908). Therefore, it can be excluded whether the data on BMI cause bias in the study results. Thus, the finding of an association between BMI and gender ($p = 0.016$) which observed in the current

study was probably not subject to underreporting. However, when other study variables were considered on the original scale, the results were not affected by gender. From the Nord-Trøndelag and Tromsø Child Growth and Health Surveys study conducted in 2010 came height and weight data from health workers as well and this study concluded that these data were more reliable than other studies whose data were self-reported (Evensen, E., et al, 2017, e015576).

The main limitation in this study is related with the subjective measurement tools that were used in the study for data collection, which it was the multipoint Likert scale. The use of such a scale for this age group may question its exaggeration and the possibility of misinformation in the information given about participation in physical activity or about information that correlates with the percentage of relative family affluence, which may affect the data and lead to a bias in the results (Lohman TG, et al, 2008, p 1163-1170).

Existing findings regarding factors of BMI, participation in leisure physical activities, and relative family opinions were based on self-reported data by questionnaire, which can be subject to socially desirable reporting bias (Tokmakidis, S. P., et al, 2007, p 305-310). However, honest reporting was encouraged within data collection of the original study by telling the students that their answers would be anonymous and used only for the purposes of the study in question and by ensuring confidentiality by explaining the procedures followed to preserve this data.

It is possible that the associations found in the current study based on self-reported data could be influenced by several other lifestyle variables (e.g., adolescent behavior and attitude) that were not examined in the current study. In addition, the results could be influenced by the relative inaccuracy of some of the measures used as confounders (Tokmakidis, S. P., et al, 2007, p 305-310).

Also, the subject of the current study is related to the lifestyle of adolescents (Leisure time-PA) and the social class (RFA) to which they belong. This type of variables cannot be accurately identified because of confounding variables (Mathieson, A. & Koller, T., 2006). To get a clear picture about all these factors it is important to collect and understand all similar published studies and the current medical opinions, and thus apply them in a comprehensive and large-scale study.

Usually in this age group a high percentage of missing information is expected to be present in the data (Sigmundova, D., et all, 2019, June 14). In the current study, 7.3% of the sample had

missing information which could potentially bias the results. These defects, whether theoretical or methodological, are natural when the subject of the study is related to the category of adolescents, as dealing with them requires a special kind of dealing for physiological reasons and psychological factors that characterize this age group (Matthiessen, J., et al, 2014, p 385-392).

Despite explaining the objectives of the study and emphasizing strict confidentiality in dealing with information, the researchers may find a good percentage of these adolescents who refuse to participate in scientific studies without clear reasons, and according to the ethics of scientific research, the decision to participate or not is up to them. All the above can affect the size of the studied sample, as the sample size in the current study was 599 participants, which is too small for this type of quantitative cross-sectional studies and thus could affect the credibility of the results. Therefore, data from long-term studies with huge sample size in this age group could be more useful (Matthiessen, J., et al, 2014, p 385-392).

Finally, this study was carried out without any financial funding to help purchase the necessary tools for data analysis, such as the SPSS program, which led the researcher to face difficulty in dealing with the program on the university's website.

5.2 Conclusion

While many international studies have identified many social, economic, and cultural factors that maybe associated with childhood overweight, a few corresponding studies have been conducted in Norway. The current study presented a report on a sample of Norwegian adolescents on the relationship between overweight and obesity and factors related to lifestyle and socioeconomics. The results highlighted the importance of improving adolescents' participation in physical activity during their leisure time and its positive effect on their body mass index. On the other hand, the results showed a negative relationship between the body mass index and the level of relative family affluence for these adolescents, as the adolescents who belonged to families with a high level of affluence were more likely to be overweight compared to those who belonged to families with a low level of affluence.

Particular attention should be paid to the inequality of assessment as an added value of daily life in relation to social and economic status (Matthiessen, J., et al, 2014, p 385-392; Mireku, M. O., & Rodriguez, A., 2020, p 428). The results of the current study extend the findings of previous studies that examined the many different risk factors for overweight among

adolescents in Norway and highlight the importance of multifaceted approaches that promote and encourage participation in physical activity in the leisure time to prevent overweight in these adolescents.

Strategies and procedures in place must consider age, social and economic differences. Adolescents who claim low levels of physical activity need special attention. The challenge is to introduce policies at the school and community level, able to involve teens from different affluent families in physical activities as well. Opportunities for physical activity should be improved through curricula and extracurricular school activities, as well as community initiatives, which are also accessible to all families with different socioeconomic level.

It is clear from the current study that the problem of overweight and obesity needs more comprehensive and long-term studies at all levels, not only to confront and treat it, but to prevent its occurrence by understanding the complex factors that cause it, whether at the level of individuals or at the level of social class. Indeed, a long-term study has begun at the level of nine different countries in the world, headed by Norway, and aims to reduce the prevalence of overweight and obesity among adolescents (NIPH, 2018, May), because overweight and obesity are one of the most important factors that cause life-threatening chronic health problems, especially in adulthood, such as heart disease, diabetes, depression, and other social problems.

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Appendices

Appendix 1: Supervision-student Agreement

SUPERVISION AGREEMENT FOR MASTER'S DEGREE
PUBLIC HEALTH STUDIES WITH EMPHASIS ON
CHANGING LIFE STYLE HABITS
(most recent revision 13.02.2013)

The Supervision Agreement is to be given to the supervisor and signed by both supervisor(s) and student. After it has been signed, the Supervision Agreement is to be submitted to the study coordinator. The supervisor and student keep the time sheet, which is to be kept up-to-date throughout the supervision period.

For the supervision to be valid, the study coordinator must have received a signed Supervision agreement.

HEDMARK UNIVERSITY COLLEGE

Parties to the Agreement

1. **Student:**
Name: Maher Mustafa Kachef
Address: Vindheia vegen 57, 2406 Elverum
Telephone: 41151226 **E-mail:** mahara.mostafa67@hotmail.com
MA year group: 2021 / 2022

2. **Supervisor:**
Name: Svein Barene
Institution: Inland University of Applied Sciences, Faculty of Social and Health Sciences
Address: Hamarvegen 112, 2406 Elverum
Telephone: 62430319 **E-mail:** svein.barene@inn.no
Number of hours contributed to the supervision: 10 hours

3. **Secondary supervisor:**
Name: ....
Institution: ....
Address: ....
Telephone: .... **E-mail:** ....
Number of hours contributed to the supervision: ....

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Supervision Regulations for Masters Degree Studies
at the Faculty of Public Health

1. Introduction

The Supervision Agreement is a follow-up of the programme descriptions for master's degree studies at HUC/PH and it regulates the scope and duration of the supervision. In collaboration with the study coordinator, the department in question appoints a supervisor during the 3rd semester of the master's degree programme. All students are entitled to a primary supervisor, and in special cases they may request that a secondary supervisor is appointed. All master's degree students are obligated to enter into a Supervision Agreement during the second semester. An Agreement is usually only entered into once. **Master's degree students who do not pay the semester fee and confirm their individual education plan within the stipulated deadline each semester lose their right to study and therefore also their entitlement to supervision.**

2. Parties to the Agreement

The Agreement is entered into by student and supervisor, and, if relevant, secondary supervisor. One Agreement is entered into, and this is signed by both primary supervisor and secondary supervisor, if relevant, together with the student. The Agreement does not enter into force until the parties have signed it. The supervisor is normally appointed from the department's academic staff. An external supervisor may be appointed if there are special academic or resource reasons for it.

3. Project plan

The student must plan and draw up a project plan for the master's thesis.

4. Agreement period and number of supervisions

As a rule the agreement period runs as long as the student has the right to study. The student is entitled to a total of 10 hours supervision during the scope of the agreement period. If both a primary and secondary supervisor are used the supervision hours must be shared between the supervisors covered by the Agreement.

5. Approved supervisors

It is the study coordinator who appoints supervisors, in collaboration with the Head of Department. Approved supervisors are:

- All associate professors and higher positions at HUC/PH
- Personnel in PhD positions at HUC/PH, in collaboration with associate professors and those in higher positions
- External academic personnel that have been approved by the study coordinator/Head of Department

6. Progression, interruption and leave

In accordance with the Regulations Concerning Examinations at Hedmark University College, a master's degree student has a right to study for 50% more than the normal period of study. This entails a right to supervision within the allocated resources for this period. There are special rules in connection with leave; please contact the study administration for more information if and when needed.

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7. Work plan and time schedule and collaboration between student and supervisor:
Together the student and supervisor shall:
- In their first session clarify the supervision relationship. Including:
    - who is responsible for contacting who
    - frequency of sessions
    - mutual expectations
    - plan how allocated supervision hours are to be used
    - clarify need for technical assistance in cases of laboratory-related projects
- be well prepared for the supervision sessions
- give notification well in advance if one is unable to attend an agreed supervision session
- keep a time sheet for registering supervision at each supervision session

The student shall:
- follow the approved work plan in accordance with the project description, regularly update supervisor about work on the thesis. Reasons must be given for delays.
- assess his/her own progress in relation to the time schedule and work plan, raise serious collaboration problems with the study coordinator/Head of Department.

The supervisor shall:
- discuss and assess plan, method, execution and results
- make sure that the project can be completed within the normal time period
- facilitate the completion of the project
- make sure that the necessary applications for central approval (NSD, REK etc.) are sent in
- assess the work in relation to a time schedule and work plan that has been determined beforehand
- raise serious collaboration problems with the study coordinator/Head of Department
- offer the student the supervision sessions he/she is entitled to in the agreement period, cf. clause 4.

The Head of Department/study coordinator shall:
- appoint a supervisor/supervisors for the student
- be available for contact both from supervisor and student if appropriate and necessary
- approve technical assistance if required by the project work

The Study Administration shall:
- check that the student has the right to study
- process applications for leave and individual education plans with reduced study progression

9. Rules for publication
See Attachment 1

10. Submission and examination
The master's degree theses are to be submitted by two fixed dates:
- **20th May in the spring semester**
- **31st October in the autumn semester**

The student must give the Study Administration notification of submission at the latest on 31st March or 30th September. If there are special grounds, the Study Administration may process applications for submission of theses at other times than the fixed dates.

11. Signature

I have read the rules and understand and am aware of the prevailing conditions.

Date: 16/5-22

Signature of supervisor(s)..

Signature of student ....

Attachments
1. Rules for publication (incl. ownership to the data)
2. Time sheet

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ATTACHMENT 1

Rules of publication

Abstract
When submitting abstracts to congresses, both national and international, the abstract must be presented to co-authors and other parties who have contributed significantly to the work. In addition, the rules for co-authorship mentioned below apply.

Lectures/posters
If there is a presentation at a congress, co-authors must be given information of this beforehand, and if advisable, be given the opportunity to hear the lecture/see the poster. Co-authors should be mentioned during the lecture (or be named on the title page).

Authorship
As regards authorship, the following applies:
Each author must have taken part in the work to such an extent that he/she can assume public responsibility for the contents. Authorship is to be based on significant contributions to:

1)   a) Idea, planning and design
       b) Execution, data processing and analyses
       c) Interpretation of data

2)   Preparation of the manuscript itself or critical revision of the contents

3)   Approval of the final manuscript version

At least two of the items under 1), as well as both 2) and 3) are pre-requisites that must be met.

The order of the authors and publication priorities should be agreed between the parties involved before the project starts.

Conflict
In cases of conflict about *authorship* (who is to be first author, co-author(s) and the last author) and/or *breaches* of the above-mentioned guidelines, the Faculty of Public Health is authorised to settle the dispute.

Ownership to the data
The ownership to the data must be agreed in writing before the data collection starts. The agreement must follow this Supervision Agreement as an attachment.
In the cases where the University College has the ownership rights to the collected data and the student has not submitted the thesis within half a year after the agreed time, the supervisor may reserve the right to publish on the basis of the data. However, the student may submit his/her thesis based on the same data at a later time. Also the supervisor may publish from the collected data before the planned submission date if this has been agreed in writing beforehand.

The first author has a deadline of one year after completion of the master's degree examination to submit a 1st draft of an article to the supervisor a 1st draft of an article. If this deadline is not met, the supervisor gains the right to publish and to determine the order of authors.

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Supervisor and student agree to the guidelines above concerning ownership to the data:

Date:. 16/5-22 ....

Signature of supervisor(s)..

Signature of student ....

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ATTACHMENT 2

Time sheet for supervision for master's degree thesis

Date	Semester	Number of hours with student	Number of hours preparation/ follow-up	Sign. student and supervisor
10/21	3	1	2	
01/22	4	1	1	
02/22	4	2	1	
03/22	4	2	3	
04/22	4	2	3	
05/22	4	2	2	

The time sheet is to be signed by both supervisor and student. In addition, the Head of Department/study coordinator must approve the time sheet. External supervisors append completed forms for fees. These forms can be obtained from Head of Department.

Dates for approval........................., ..., ..., ...

Signature of supervisor(s)
....

Signature of the student ....

Crediting undertaken by the section (dates): ....

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Appendix 2: Questionnaire

INFORMASJON OM SAMTYKKE

Skole, læring og psykisk helse prosjektet

Takk for at du er positiv til å delta i undersøkelsen vår. På denne måten hjelper du oss med å få bedre kunnskap om barn og ungdom sin psykiske helse, fysiske aktivitet og skolemiljø. Ungdommer fra 10 ulike skoler skal svare på de samme spørsmålene. Svarene dine skal være hemmelige, og ingen på skolen vil få lov til å se spørreskjemaet ditt etter at du har fylt dette ut.

For å få god kunnskap om ungdommer sin psykiske helse, fysiske aktivitet og skolemiljø er det til stor hjelp for oss at du svarer så ærlig som mulig på alle spørsmålene. Om det likevel er noen spørsmål du ikke ønsker å svare på, lar du dette stå åpent og går videre til neste spørsmål. Det er heller ingen svar som er rett eller galt, svar slik du virkelig føler. Om noe er forvirrende, be om hjelp, så skal vi hjelpe deg.

Noen av spørsmålene kan virke veldig like. Det skal de også være. Det er imidlertid viktig at du leser spørsmålene grundig (godt) fordi svaralternativene til spørsmålene vil variere.

Tusen takk for hjelpen!

Professor Miranda Thurston
Prosjektleder

◯ Jeg har lest teksten og ønsker å være med på undersøkelsen

	6 siffer 2 siffer 4 siffer
ID-nummer	☐ ☐ ☐

Denne undersøkelsen er produsert og tilrettelagt av
Høgskolen i Hedmark

Her kommer noen spørsmål om deg og din familie

1. Hva er fødselsdagen din

	Dag
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 J
Velg i nedtrekklistene	◯ ◯

2. Er du gutt eller jente?

◯ Gutt

◯ Jente

3. Hvilket klassetrinn går du på?

◯ 8. klassetrinn

◯ 9. klassetrinn

◯ 10. klassetrinn

Denne undersøkelsen er produsert og tilrettelagt av
Høgskolen i Hedmark

9. Har familien din bil?

○ Nei

○ Ja, en

○ Ja, to eller flere

10. Har du eget soverom?

○ Nei

○ Ja

11. Hvor mange ganger reiste du og familien din på ferie til utlandet i fjor?

○ Ingen

○ En gang

○ To ganger

○ Mer enn to ganger

Denne undersøkelsen er produsert og tilrettelagt av
Høgskolen i Hedmark

12. Hvor mange datamaskiner og nettbrett har familien din?

○ Ingen

○ En

○ To

○ Tre

○ Mer enn tre

13. Hvor mange bøker har familien din hjemme? Det er vanligvis rundt 40 bøker i hver rekke i bokhylla

○ Ingen

○ 1-10 bøker

○ 22-50 bøker

○ 51-100 bøker

○ 101-250 bøker

○ 251-500 bøker

○ Mer enn 500 bøker

Denne undersøkelsen er produsert og tilrettelagt av
Høgskolen i Hedmark

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14. Hvor mange bad (rom med badekar eller dusj) er det i hjemmet ditt?

- ◯ Ingen
- ◯ Ett
- ◯ To
- ◯ Flere enn to

15. Har familien din oppvaskmaskin hjemme?

- ◯ Ja
- ◯ Nei

Denne undersøkelsen er produsert og tilrettelagt av
Høgskolen i Hedmark

16. Hvor bor du?

- ◯ I en enebolig
- ◯ I et rekkehus (ta også med to- eller firemannsbolig)
- ◯ I en leilighet

17. Har familien din hytte eller feriehus/ferieleilighet i Norge?

- ◯ Nei
- ◯ En
- ◯ To
- ◯ Flere enn to

18. Har familien din hytte eller feriehus/ferieleilighet i utlandet?

- ◯ Nei
- ◯ En
- ◯ To
- ◯ Flere enn to

Denne undersøkelsen er produsert og tilrettelagt av
Høgskolen i Hedmark

De neste spørsmålene handler om fritid og fysisk aktivitet

42. Hvor ofte har du drevet med følgende treningsaktiviteter de siste 12 månedene i snitt?

	Aldri	Under 1 gang per uke	1 gang per uke	Flere ganger per uke
Utholdenhetsidrett (f.eks. løp, langrenn, sykling, svømming, aerobic)				
Lag/ballidretter (f.eks. squash, håndball, fotball, ishockey)	○	○	○	○
Estetisk idrett (f.eks. dans, turn, rytmisk gymnastikk)	○	○	○	○
Styrkeidrett (f.eks. bryting, vekttrening)	○	○	○	○
Kampsport (f.eks. judo, karate, taekwondo)	○	○	○	○
Tekniske idretter (f.eks. ridning, alpint, telemark, friidrett, snowboard, golf, skateboard, skøyter)	○	○	○	○
Risikoidrett (f.eks. elvepadling, fjellklatring, paragliding)	○	○	○	○

Annet: [   ]

Denne undersøkelsen er produsert og tilrettelagt av
Høgskolen i Hedmark

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