Intersectionality and adolescent dietary behavior in Flanders: An analysis of the interaction between family affluence, gender, and migration background

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Master's Thesis

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ABSTRACT

Background: In general, children and adolescents in the World Health Organization (WHO) European Region currently enjoy better health and development than ever before, but still fall a long way short of achieving their full health potential. The Health Behavior in School-Aged Children (HBSC) study is a WHO cross-national research project that aims to increase understanding of adolescents' well-being, health behaviors, and social contexts. The data used in this thesis has been collected by the Flemish division of the HBSC study, during the 2017/18 HBSC study survey round.

A number of recent studies have discovered dietary inequalities among adolescents according to socioeconomic position (SEP), gender, and immigration status. Intersectionality is a theoretical framework for understanding how multiple social identities such as race, gender, immigration history, and SEP intersect at the micro-level of individual experience to reflect interlocking systems of privilege and oppression at the macro social-structural level. Because intersectionality takes the experiences of marginalized populations as its vantage point, it can facilitate and inform the development of well targeted and cost-effective health promotion interventions.

Aim: The objective of this Master's thesis was to apply an intersectional framework to the analysis of data from the 2017/18 HBSC study in order to investigate the relationship between consumption of vegetables, fruit, sweets, and sugar-sweetened beverages (SSB) and the interplay between family affluence, gender, and migration background in Flemish adolescents. The aim was to provide insight into the intersectional nature of the association between sociodemographic factors and dietary behaviors.

Participants and methods: Data was collected via surveys distributed by the Flemish division of the HBSC study to schools in Flanders, where a total of 11,035 pupils participated in the cross-sectional study. Consumption of vegetables, fruits, sweets, and SSB was measured on an ordinal scale and recoded using midpoint centering: "never" = 0, "less than once a week" = 0.25, "once a week" = 1, "2–4 days a week" = 3, "5–6 days a week" = 5.5, "once a day, every day" = 7 and "more than once a day, every day" = 14, representing consumption in times per week. Variables were created for gender (girl/boy), family affluence (continuous; measured by the Family Affluence Scale (FAS)), and migration background (Native Belgian, Western immigrant, Non-Western immigrant). Family type (living with both

parents/other) and age (continuous; in years) were used as control variables. Pupils with missing values on the variables of interest were removed from the data set used for this thesis, resulting in a final sample of 8,829 adolescents. Multiple linear regression was used to investigate associations between variables, and to test for interaction effects between independent variables.

Results: A positive association was found between family affluence and frequency of consumption of fruits, vegetables, and sweets ($p<0.001$), and a negative association was found between family affluence and frequency of consumption of SSB ($p<0.001$). There was a negative association between male gender and frequency of consumption of fruits and vegetables ($p<0.001$), and a positive association between male gender and frequency of consumption of SSB ($p<0.001$). Compared to Native Belgians, a Western immigrant background was negatively associated with frequency of vegetable consumption ($p=0.017$), while a Non-Western immigrant background was negatively associated with frequency of vegetable ($p<0.001$) and sweets consumption ($p=0.033$), and positively associated with frequency of fruit consumption ($p=0.031$). There were significant interactions between gender and family affluence for vegetable ($p=0.024$) and SSB consumption ($p=0.018$), between gender and Western immigrant background for sweets consumption ($p=0.016$), and between gender and Non-Western immigrant background for fruit consumption ($p=0.018$).

Conclusion: Interactions between family affluence, gender, and migration status were found, highlighting the importance of consideration of the intersectional nature of social identities when examining health-related outcomes. Future studies should attempt to look beyond the use of sociodemographic factors as unitary categories, and instead consider the use of an intersectional framework that takes into account interactions between, and variation within, categories of social identity.

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1 INTRODUCTION

A general understanding of inequalities in health in the general population, as well as knowledge of the methods employed in public health research to analyze these inequalities, is a necessary prerequisite to any examination of inequalities in dietary habits among adolescents. Inequalities in health among various population groups constitute one of the main challenges in public health (Mackenbach et al., 2008). Despite considerable attention to the problem of health inequalities since the 1980s, striking differences in health still exist among and within countries today (Arcaya et al., 2015). A pattern of social inequalities in diet quality and health continues to be observed in most high-income countries (Devine & Lawlis, 2019), and health behaviors, including diet, are strongly socially patterned (Petrovic et al., 2018). A 'social gradient' in health exists where increasing quantities of social resources such as education, social class, or income correspond with increasing levels of health in a dose-response relationship (Arcaya et al., 2015). Indicators of social position in epidemiological studies include education, housing, household amenities, wealth, income, and occupation based measures (Daly et al., 2002). Other measures used to discern social position in health research include gender, race, ethnicity, migration background, and age (Krieger et al., 1997).

This thesis begins with an overview of the Health Behavior in School-Aged Children (HBSC) study, explaining the background for the research. This overview is followed by an introduction to inequalities in health and dietary practices among adolescents. The focus is then expanded to a discussion of current practices for analyzing social inequalities, as well as proposed mediating factors. After a short review of intervention strategies currently employed to address these inequalities, the introduction concludes with an outline of the theory of intersectionality – a key concept in this thesis.

1.1 CONTEXT

The period of increased autonomy between 11 to 15 years of age can influence how adolescents' health and health-related behaviors develop, impacting health behaviors later in life, and affecting the development of health complaints, tobacco use, diet, physical activity levels, and alcohol use (Inchley et al., 2020). The HBSC is a World Health Organization (WHO) cross-national research project that aims to increase understanding of adolescents' well-being, health behaviors, and social contexts (Inchley et al., 2020). HBSC focuses on

understanding young people's health within their social context, and assessing how a variety of factors, individually and collectively, influence young people's health as they transition from children to young adults. Since adoption by the WHO Regional Office for Europe in 1983, the research network has grown to span 49 countries and regions across Europe and North America. Information collected in these studies is used to inform policy and practice in an effort the improve the lives of young people across the globe (Inchley et al., 2020).

The HBSC research network is an international alliance of researchers that collaborate on conducting the cross-national survey of school students. The HBSC study is a cross-sectional study repeated every four years employing a school-based survey that collects data through self-completion questionnaires administered in the classroom (Inchley et al., 2020). The questionnaire includes a coherent set of indicators that together provide a valid representation of the health, well-being, and risk behaviors of adolescents, and their developmental and social determinants. While a variety of economic indicators exist, the Family Affluence Scale (FAS) is the chosen method in the HBSC study. The FAS is a six-question measure of material family wealth developed as an indicator of absolute level of socioeconomic position (SEP) (Currie et al., 2009). Responses to the six questions are added together to produce a composite score.

The data used in this thesis was provided by Dr. Katrijn Delaruelle and Maxim Dierckens, in cooperation with Ghent University. The data has been collected by the Flemish division of the HBSC study, during the Flemish 2017/18 HBSC study survey round. The topic of study, research questions, variables, and statistical analyses described were developed by the Master's student for specific use in this thesis.

1.2 INEQUALITIES IN ADOLESCENT HEALTH

In general, children and adolescents in the WHO European Region currently enjoy better health and development than ever before, but still fall a long way short of achieving their full health potential (Currie et al., 2008). This results in significant social, economic, and human cost, with wide variations in young people's health in every Member State within the European Region (Currie et al., 2008). Young people's behaviours, lifestyles and social context change dramatically as they grow and develop through their adolescent years (Currie et al., 2008). This is reflected in the health behaviours, health outcomes, and social

perspectives attributed to young people of different ages. It is important to understand these patterns and transitions, as many of the inequalities that emerge during childhood translate into ongoing health problems during the adult years (Call et al., 2002).

Adolescence is a key period for the development of health inequalities (Call et al., 2002; Currie et al., 2008). Many negative health behaviours such as smoking, alcohol and other drug use can be established during the teenage years, and such behaviours can be mechanisms by which social gradients of health emerge (Currie et al., 2008). Habits that develop early in life may influence the trajectory of one's health choices. Although adults can choose to change health behaviors later in life, childhood habits may serve as predictors of adult choices that continue to impact health (Arcaya et al., 2015). Children and adolescents are therefore among the most important population groups to target for health promotion and protection.

There has been an increase in the percentage of obesity among youth in Europe attributed to socioeconomic differences, from 18 % in 2002 to 27 % in 2014 (WHO, 2017). Data from an extensive WHO study showed that young people from a relatively lower family affluence tended to be less physically active and were more likely to be overweight or obese (WHO, 2017). Inequalities related to family affluence, measured using the FAS, were evident across a range of health outcomes. Higher FAS scores were significantly positively associated with self-rated health and life satisfaction, but negatively associated with prevalence of perceived health complaints (significant for both genders and most countries) (Currie et al., 2009). Furthermore, in a sample of schoolchildren from seven European countries, children of higher educated parents had a lower body mass index and were less likely to be overweight or obese than children of lower educated parents (Brug et al., 2012).

Multiple HBSC study reports have discovered that boys were more likely to be overweight or obese, with the gender difference increasing with age (Currie et al., 2004, 2008, 2009; Inchley et al., 2020). Girls were nevertheless more likely to report being dissatisfied with their bodies and feeling they need to lose weight. Fifteen year old girls reported markedly higher rates of poorer health and health complaints, and lower rates of life satisfaction than 15-year-old boys (Currie et al., 2004, 2008, 2009). Almost all countries and regions showed the pattern of gradually increasing gender differences, indicating that the comparatively higher risk for low subjective health in girls is relatively independent of variation in societal and cultural factors;

in most countries and regions, the gender differences increased with age (Currie et al., 2004, 2008, 2009; Inchley et al., 2020).

The literature on race/ethnicity and obesity in the United Statues shows higher overweight prevalence among African Americans than whites of the same age and sex, with an inverse relationship between obesity and SEP among white, but not African-American or Mexican-American youth (Gordon-Larsen et al., 2003). In Europe, a study examining differences according to ethnic background among adolescents found significantly higher prevalence of overweight, obesity, body mass index, and waist circumference among non-native compared with native adolescents (Brug et al., 2012). Moreover, in an examination of the relationship between immigration and adolescent health within the multicultural context of the Brussels-Capital Region in Belgium, all immigrant adolescents were more likely than natives to be overweight, even after controlling for gender and age (Méroc et al., 2019). These effects turned out to be partially, but not fully, explained by sociodemographic factors (SEP, age, gender, FAS, main language spoken at home) and health-related behaviors (Méroc et al., 2019). While Delaruelle et al. (2021) found that social capital moderated the negative association between immigrant background and mental health, Gordon-Larsen et al. (2003) found that even if they were to equalize income and education, it would not eliminate health disparities between adolescent ethnic groups in the US. Based on their simulations, they determined that even at identical SEP levels, there were large differences in overweight prevalence by ethnicity.

1.2.1 DIETARY INEQUALITIES AMONG ADOLESCENTS

Across the time period 2002-2014, results from the HBSC studies showed that adolescents from a relatively lower SEP reported less healthful food choices (WHO, 2017). Higher family affluence was associated with higher fruit and vegetable intake and, to some extent, lower sugar-sweetened beverage (SSB) intake, and children from higher-affluence families were more likely to eat breakfast daily. Adolescents from higher-affluence families were more likely than those of lower affluence to eat sweets daily in around a third of countries and regions. Daily breakfast consumption, fruit consumption, and vegetable consumption decreased with age, while consumption of sweets and SSB increased with age.

Using data from the Italian 2018 HBSC study, Nardone et al. (2020) found that poor dietary habits were more common among adolescents with lower socio-economic conditions. These

results are similar to those reported by other studies – for example, a Norwegian study by Totland et al. (2013) that observed that adolescents with parents of low education consumed significantly more soft drinks at two time points than those of parents with high education. Moreover, a study by Fismen et al. (2012) using data from the Norwegian 2005/06 HBSC study found that higher family affluence was shown to predict more frequent consumption of fruit and vegetables, as well as more frequent consumption of breakfast and dinner. According to a review by Psaltopoulou et al. (2017), children from families with a lower SEP tend to consume more bread and sweets, exercise less, drink more, and eat significantly smaller amounts of fruit and vegetables in comparison with children from families with high SEP. Among schoolchildren from seven European countries, children of lower educated parents reported less favorable intakes regarding soft drink, fruit juice, and breakfast than children of higher educated parents (Brug et al., 2012).

A comprehensive review on determinants of children's and adolescents' fruit and vegetable intake concluded that gender is among the strongest determinants in adolescents; in 14 of 17 reviewed European studies girls reported eating more fruit and vegetables than boys (Rasmussen, 2006). Results from various reports using HBSC results found that girls consumed fruit and vegetables more frequently (Currie et al., 2004, 2008, 2009; Fismen et al., 2012; Inchley et al., 2020; Nardone et al., 2020;) Some found that girls also, however, skipped breakfast more frequently, and were more likely to be on diets to control their weight (Currie et al., 2004, 2008, 2009; Inchley et al., 2020). Boys were more likely to drink soft drinks every day in most countries and regions and for most age groups, with very few exceptions (Currie et al., 2004, 2008, 2009; Inchley et al., 2020). That boys report greater soft drink consumption than girls is consistent with findings from other studies investigating consumption of soft drinks (Bere et al., 2008b; Brug et al., 2012; Vereecken et al., 2008).

Moreover, in a study using data from the 2014 Belgian HBSC study, Rouche et al. (2019) found that immigrants more frequently consumed both healthy and unhealthy foods. Immigrants ate fruits, vegetables, and fish significantly more often than natives; on the other hand, immigrants also consumed SSB, chips, and fries significantly more often than natives. Using data from several countries in Europe, Brug et al. (2012) found that intake of sugary drinks and breakfast skipping was significantly higher among non-native adolescents. In an examination of the relationship between immigration and adolescent health in Brussels, immigrant adolescents were less likely than natives to report daily breakfast, daily family

dinner, and daily vegetable consumption, and were more likely to report daily soda and weekly fast-food consumption (Méroc et al., 2019).

1.3 ANALYZING SOCIAL INEQUALITIES

1.3.1 HEALTH DETERMINANTS APPROACH

Since the 1990s, the health determinants approach has been recognized in health policy and has gained ground among health researchers (Hankivsky & Christoffersen, 2008). This "social determinants" perspective focuses on the myriad demographic and societal factors that shape health and well-being (Benoit et al., 2009). At the same time it offers a way to understand inequities in health outcomes among groups by pointing to the layering of genetic and other biological factors with social and cultural factors, which in turn both interact with and shape personal attitudes and behaviors to positively or negatively influence health status (WHO, 2008). Recognition of how inequities in health are associated with socioeconomic status (SES) —as measured by education, occupation, and income —is one of the main contributions of the social determinants perspective (Bauer, 2014). Because capitalism and material resources are key to understanding health it is not surprising that much of the determinants of health research focuses on SES (Hankivsky & Christoffersen, 2008). However, income, material conditions and the distribution of various resources are not the only factors to consider, as they do not fully explain the complexity of power relations in society. Other variables or factors commonly understood as determinants include but are not limited to: sex, gender, age, ethnicity, race, education, social support, geographical location, and health care access (Bauer, 2014).

Ideally, ‘a health determinants approach [should] allow us to first, investigate variations in how [individuals] experience and recount different aspects of their health, and then, secondly, link these accounts to socio-structural forces and within particular socio-cultural contexts’ (Hankivsky & Christoffersen, 2008, p.272). One of the key challenges to adopting a health determinants perspective is considering the complexity of the relationship between health determinants. Documentation of health inequalities is often done with a focus on one unitary category of difference while controlling for the contribution of additional factors that explain varying health outcomes (Bauer, 2014). For example, within sex/gender research, research on inequalities is often seen as confirming expectations of “obvious” biological differences, with little attention given to distinguishing the effects of biologically sexed mechanisms from

gendered social processes, or allowing for their interaction (Hankivsky & Christoffersen, 2008). While sex refers to a biological classification of sexually-reproducing organisms - generally female, male, or intersex - according to functions that derive from chromosomes, hormones, or reproductive organs (Schiebinger et al., 2017), gender refers to cultural attitudes and behaviors that shape feminine and masculine behaviors, environments, and knowledge (van Hagen et al., 2020). Gender might interact with sex to increase or reduce individual and group risk. Likewise, race-based inequalities are still sometimes theorized as biological, or are followed with speculation on a range of possible causes, such as racism, family structure, diet, or even poverty (Bauer, 2014). Researchers in race, ethnicity and health have urged other researchers to avoid using race/ethnicity as a proxy for such factors, instead of acknowledging that the social process of racialization is real (Bauer, 2014).

Research studies may expand beyond one master category of social position to consider multiple categories, but often do not consider the unique intersections between the categories and variations within a category. Such explanations have been critiqued for stripping away the context of people's lives through identifying single sets of health determinants for entire populations (Bauer, 2014). This idea can be illustrated by an example from Canada. Although being in the highest income category is an important predictor of good health for Canadian women (Denton et al., 2004), Canadian women from low-SES backgrounds are more likely to smoke, be overweight, live in unsafe neighborhoods, maintain greater or sole responsibility for child and/or elder care, and perform substantial amounts of unpaid domestic labor than women from high-SES backgrounds (Spitzer, 2005). Here, it may be that low SES interacts with gender (as well as race, ethnicity, and immigration status) to constrain the opportunities and health status of women. Sociodemographic factors influence one's access to important social resources, and these fundamental determinants thus need to be understood within a broader context (Hankivsky & Christoffersen, 2008). Therefore, the present study focuses on family affluence, gender, and migration status, and attempts to discover how they are interconnected to give rise to health disparities.

1.3.2 FACTORS MEDIATING HEALTH INEQUALITES

Epidemiological research has long investigated potential mediating factors of the association between SEP and health outcomes. Socioeconomic health differences have been found to be associated with a range of demographic (e.g. age, ethnicity, and marital status), behavioral

(e.g. physical activity, smoking, alcohol use, and diet), psychosocial (e.g. stress, social support, and psychosocial work demands), and material factors (e.g. healthcare utilization and neighborhood conditions) (Coenen et al., 2018). However, socioeconomic health differences remain poorly understood, as they cannot be fully attributed to these factors.

Unhealthy behaviors have frequently been proposed as factors mediating socioeconomic differences in health due to their strong social patterning and relation to health outcomes (Petrovic et al., 2018). Despite extensive investigations, a clear understanding of the role of health behaviors in social inequalities in health is still lacking, a major challenge being that their estimated contribution to the socioeconomic gradient in health varies greatly across studies, ranging from 12% to 72% (Petrovic et al., 2018). Previous research has shown that socially disadvantaged individuals tend to adhere more to health detrimental behaviors due to a variety of different factors, including but not limited to material and financial constraints, perception of fewer benefits of health behaviors for longevity, a lack of knowledge of their detrimental effect, difficulties taking up health promoting behaviors, as well as more pessimistic attitudes about life (Petrovic et al., 2018). Low SEP individuals may lack the resources to buy adequate food or to access sports facilities, safe outdoor areas, and sufficient transportation. Additionally, lower-class neighborhoods may offer less opportunity for a healthy life and present low SEP individuals with frequent obstacles to healthy behaviors, such as an increased presence of small convenience stores that sell tobacco, alcohol, and processed foods, and fewer stores that sell fresh produce, resulting in so called 'food deserts' (Petrovic et al., 2018). Based on a human capital perspective, health sociologists stress that higher SEP and higher levels of education are associated with better health through active coping, healthy life styles, and better access to material and social resources (Delaruelle et al., 2020).

Beyond sex-linked biological differences, a variety of external factors have been put forward to explain gender inequalities in health. Purely social explanations of gender differences in health emphasize men and women's social positions and their differential access to protective resources (including income, education, safe parks, and other areas in which to exercise) as well as their exposure to a range of environmental factors that negatively affect health (including exposure to toxins and other social and behavioral risk factors such as domestic violence, crime, smoking, poor diet) (Rieker & Bird, 2005). Moreover, resources that vary on average by gender, such as education, may provide additional knowledge, opportunity, and income with which to

avoid multiple risk factors. Another aspect that might influence dietary habits is the motivation to adopt healthy eating behaviors, where females seeme to be more willing to follow dietary advice than men, as well as appear to be especially aware of the role exerted by nutrition on human health, and thus more ready to adopt a healthier diet (Masella & Malorni, 2017). In a study of older adults it was reported that men's poorer nutritional knowledge explained about half of the variation in fruit and vegetable intake associated with gender, while preferences, attitudes or dieting status did not explain any of the variance (Baker & Wardle, 2003); whereas, in a study of young adults, health beliefs explained around 40%, and dieting status 7%, of the gender difference in fruit intake (Wardle et al., 2004).

Several epidemiological studies have shown that immigrants tend to be more at risk of non-communicable diseases and poor mental health than natives (Méroc et al., 2019). This is perhaps in part because obstacles such as language and administrative barriers may limit access to health information and care resources. Moreover, specific health behaviors related to substance use and diet may arise out of home culture and religion and are characterized by the diversity of existing situations in contrast to the country of origin. Yet, some health behaviors observed at higher rates among immigrant adolescents, such as soft drink consumption and screen time, are less dependent on the culture of origin and are typical of socioeconomically disadvantaged children in general (Méroc et al., 2019). Previous research has found that socioeconomic factors underlie, at least in part, the association between immigration status and health (Méroc et al., 2019). However, even after taking into account several sociodemographic parameters, including socioeconomic conditions, and health behaviors, second-generation immigrants with both parents born abroad remained more at risk for overweight than natives (Méroc et al., 2019). This suggests that factors other than SEP are very important. In other words, these results propose that immigration status has an effect on health outcomes that goes beyond its relationship with SEP.

Empirical research over several decades and across multiple countries has documented that when immigrants arrive in the host country they are healthier than native residents, a phenomenon termed the "healthy immigrant effect" (Neuman, 2014). Often, this initial advantage deteriorates with time spent in the host country, and immigrants' health status converges toward (or below) that of native residents (Neuman, 2014). Even though the consequences of immigration depend on the circumstances surrounding the event, the conditions in which many immigrants live may result in increased vulnerability and affect

their health (Méroc et al., 2019). Perceived discrimination, marginalization, and lack of social integration can be detrimental to individuals and might contribute in some cases to the deleterious impact associated with low SEP and immigration status (Méroc et al., 2019). Psychosocial factors themselves can drive health inequalities and social group differences in health in particular (Arcaya et al., 2015). Psychosocial health impacts stem from feelings of social exclusion, discrimination, stress, low social support, and other psychological reactions to social experiences. To the extent that certain social groups are systematically more likely to have stressful, demoralizing, and otherwise emotionally negative experiences, psychosocial factors can help explain health inequities (Arcaya et al., 2015).

Although Petrovic et al. (2018) observed that health behaviors overall contributed to the association between SEP and health outcomes, this contribution varied substantially according to geographic location, sex, age, race, health outcomes, and methodological differences between included studies, the main reason for this heterogeneity being the differential socioeconomic patterning of health behaviors in given regional and demographic contexts. As shown in the studies by Mackenbach et al. (2008) and Petrovic et al. (2018), though lifestyle-related factors play a role in shaping the socioeconomic inequalities in health between population groups, both lifestyle choices and patterns of use of health care are likely to be constrained by inequalities in general living conditions, as structured by political, economic, social, and cultural forces, and fail to fully explain the observed differences in health between individuals of varying SEP. It has therefore become necessary for researchers and policymakers to piece together a more complex image of inequality in an effort to understand the origin of these differences in health among various social groups, and to attempt to reduce them. As eliminating socioeconomic disadvantage from society is difficult, and the true extent of the mechanisms behind its origin remain elusive, quantifying modifiable intermediate factors and targeting them could have important public health benefits and help to partially alleviate the problem as researchers continue their attempts to understand it (Petrovic et al., 2018).

1.4 INTERVENTIONS

A focus on distal factors rather than an exclusive focus on proximate risk factors is likely to facilitate the development of interventions more likely to affect the “fundamental causes” (e.g., poverty, social discrimination) of social inequalities in health (Patil et al., 2018; Evans

& Erickson, 2019). Interventions targeting the entire population tend to improve healthy eating outcomes in all socioeconomic strata, thus being likely to have no impact on social inequalities in diet (Darmon et al., 2016; Mayén et al., 2016). Evidence in high-income countries shows no impact on social inequalities in diet of interventions such as user-friendly food labeling (e.g. traffic light schemes), mandatory and standardized front-of-pack labeling, and population-wide control of unhealthy food marketing through mass media (Mayén et al., 2016). Interventions that approach underlying drivers of social inequalities, even if they do not specifically target inequalities, might be more effective in reducing dietary inequalities. Untargeted nutrition education programmes risk to increase health inequalities, as the resourced middle classes with lesser health needs are able to benefit more from the interventions than more underprivileged individuals (Lambert et al., 2017). Policy interventions could perhaps provide health promotion with the scale and intensity proportionate to the level of disadvantage, the so-called "proportionate universalism" (Lambert et al., 2017). In this philosophy, preventive interventions should be more adapted to the individual risk and preventive needs of the target population. The concept of proportionate universalism promotes a shift from individual behaviour change towards more up-stream interventions, integrating social environment and other social determinants (Lambert et al., 2017). Either way, it is desirable to gather evidence on social groups and the distribution of inequalities in health in order to form an idea of which groups are most subject to social disadvantage, instead of essentializing group identity. This information would make it possible to form policies that seek to help these vulnerable populations and raise them up, in an effort to decrease inequalities, instead of increasing the differences between groups. Policy interventions should ideally recognize diversity within sociodemographic groups, as well as between them; such an approach may allow policy-makers to develop tailored interventions.

1.5 INTERSECTIONALITY

In terms of the health determinants framework, examinations of health inequities that are reduced to any one single determinant or marker of difference would be viewed as inadequate for understanding the various dimensions that are always at play in shaping and influencing social positions and power relations (Hankivsky & Christoffersen, 2008). An examination of current gender-based analyses underscores a number of limitations with the current approaches to health determinants, and demonstrates how such dominant approaches may contribute to maintaining the status quo and reinforcing a range of social, political, and

economic hierarchies that influence health. Often, when gender is taken into account, its complexity and interaction with other determinants is inadequately investigated and understood. This is largely because of the dominance of gender-based analysis that is concerned with identifying and clarifying the differences between women and men, boys and girls, and demonstrating how these differences affect health status, access to, and interaction with, the health care system (Hankivsky & Christoffersen, 2008). The primacy of gender is consistently maintained. As a result, the importance of diversity is acknowledged, but unlike gender, it is not a central focus of analysis; while the effect of gender on health status may indeed vary depending on many factors, including geographical location, race, age, ethnicity, SES, and personal experience.

The lack of attention to how gender interacts with or is modified by other determinants of health, or in fact may be less relevant than other factors, wrongly essentializes the experiences of women, reinforces existing inequities among different groups of women, and arguably leads to the production of faulty and incomplete conclusions (Hankivsky & Christoffersen, 2008). In their recent review of the state of women's health in Canada, Varcoe et al. (2007, p. 18) describe in detail the dangers of focusing exclusively on gender: '[the] sole attention to gender carries the risk of treating all women the same...overlooking the fluid and changing nature of gender; overlooking the ways in which economics, race, ability, geography, sexuality and other influences shape and intersect with gender; and diverting attention away from differences [within groups]'.

A number of researchers are applying the concept of intersectionality to help address these problems. Intersectionality is a theoretical framework for understanding how multiple social identities such as race, gender, sexual orientation, immigration history, SEP, and disability intersect at the micro-level of individual experience to reflect interlocking systems of privilege and oppression (i.e., racism, sexism, heterosexism, classism) at the macro social-structural level (Hankivsky & Christoffersen, 2008). In an increasingly diverse society, an intersectional perspective is crucial to understanding power relations both between and within groups and the consequences for those with intersecting identities (Blessett, 2020; Smith et al., 2020).

An intersectional perspective does not simply add social categories to one another in an attempt to understand diverse experiences; instead, the methodology aims to uncover the convergence of experiences, including multiple forms of discrimination and oppression. In

other words, it seeks to highlight the significance of the interacting consequences of many different, but interdependent and reinforcing social identities and systems (Evans & Erickson, 2019). These include gender, race/ethnicity, immigration status, and SEP, or more appropriately the interlocking systems of oppression and opportunity for which they are proxies, e.g., sexism, racism, xenophobia, and classism/socioeconomic structural inequalities (Evans & Erickson, 2019). Paying attention to how axes of oppression affect one another and how various experiences of oppression are simultaneous gives new insights into social locations and experiences of identity. Moreover, because identities occur in interactions, within category diversity becomes important and the homogenization of social categories is rejected (Hankivsky & Christoffersen, 2008). For instance, because gender differences and inequities in any particular time and place combine with the effects of other forms of social division such as class and ethnicity, not all women or all men experience gender or gender-related health problems or issues in the same way (Hankivsky & Christoffersen, 2008).

In addition to the more obvious health inequalities that may arise through SEP, a number of other factors have been shown to influence health status and health outcomes of adolescents, including age, gender, race, immigration background, and parental educational attainment (Bere et al., 2008a, 2008b; Brug et al., 2012; Gordon-Larsen et al., 2003; Méroc et al., 2019; Totland et al., 2013; WHO, 2017). Considering how certain populations are excluded from social and economic benefits based on their age, gender, ethnicity, and educational background, analyses of social determinants of health and dietary inequalities should take these components into account, instead of focusing solely on socioeconomic factors. Additionally, explorations of social identity should aim to recognize the concept that a person's experience of belonging to one social category may depend on the other categories that she/he belongs to simultaneously. Because intersectionality takes the experiences of historically oppressed or marginalized populations as its vantage point, it can facilitate and inform the development of well-targeted and cost-effective health promotion messages, interventions, and policies (Bowleg, 2012; Yee et al., 2017).

While there are many factors that impact health, SEP, gender, and migration background represent three of the largest axes of oppression (i.e. sexism, racism, xenophobia, and classism/poverty) and are thus critical to any analysis of health inequalities. This is why they have been selected as the focus of the present study.

2 AIMS

2.1 OBJECTIVES OF THE STUDY

The objective of this Master's thesis was to apply an intersectional framework to the analysis of data from the 2017/18 HBSC study in order to investigate the relationship between dietary habits and family affluence, gender, and migration background in Flemish adolescents. The dietary habits under examination were frequency of consumption of vegetables, fruits, sweets, and SSB. The analysis provided insight into the association between sociodemographic factors and individual behavior, beyond SEP, gender, and migration background. The majority of previous HBSC studies have focused on examining SEP, age, and gender separately, and have not addressed the potential impact of migration background on the behaviors of adolescents. They have also analyzed SEP, age, and gender as unitary categories, and have not examined how these categories may interact with each other and produce a compounded effect.

The overarching aim was to determine if there existed differences in frequency of consumption of vegetables, fruits, sweets, and SSB by family affluence, gender, and/or migration status, and explore whether there were interactions between these three sociodemographic factors.

The research questions were as follows:

RQ1: Are there differences in the frequency of consumption of vegetables, fruits, sweets, and SSB by family affluence, gender, and/or migration status?

RQ2: Are there any interactions between family affluence, gender, and migration status that lead to variations in the frequency of consumption of vegetables, fruits, sweets, and SSB?

3 METHODS

3.1 THE HBSC STUDY

The Flemish HBSC study is part of the HBSC research network that spans 49 countries and regions across Europe and North America. The data used for this Master's thesis was collected during the Flemish 2017/18 HBSC study survey round.

The HBSC survey instrument is an international standardized questionnaire used by all participating countries. It is a school-based survey and the questionnaire is designed to be administered to a nationally representative sample of students within a classroom setting. The specific population targeted for sampling is young people, attending school, aged 11, 13, and 15. A minimum of 95% of the eligible target population should be within this sample frame. Cluster sampling is used, with the primary sampling unit being school class. All pupils within selected classes are included in the sample. Fieldwork usually lasts from one to two months in each country (Inchley et al., 2018).

The HBSC questionnaire for each survey consists of three types of questions (Inchley et al., 2018):

- Mandatory questions that each country is required to include to create the international dataset;
- Optional packages of questions on specific topic areas from which countries can choose; and
- Country-specific questions related to issues of national importance.

The mandatory questions provide information on: demographic factors (e.g., age, gender, SES); social context (e.g., family, peer culture, school environment); health outcomes (e.g., self-rated health, injuries, overweight and obesity); health behaviours (e.g., eating, physical activity and toothbrushing); risk behaviours (e.g., smoking, alcohol use, cannabis use, sexual behaviour and bullying); and well-being (Inchley et al., 2018).

HBSC is involved in a continuous process of developing and validating the research instruments. Validation work is ongoing within member countries, as new instruments and items are developed for each survey round. HBSC members have published validation studies on a wide range of topics over the years, including the FAS, the subjective health

questionnaire, food frequency questionnaire (FFQ), self-rated health, and sexual health (Torsheim et al., 2016; Vereecken & Maes, 2003; Vereecken et al., 2008). All mandatory and optional items in the questionnaires have been piloted within HBSC countries. Each participating country is required to carry out a pilot of their full national questionnaire prior to the survey to check for completion within given time, respondents' understanding of the items, appropriateness of questionnaire layout and sequencing of questions, translation issues, and provision of adequate instructions. Items are thoroughly tested in a number of countries within the study before being suggested as mandatory or optional (Inchley et al., 2018). The questionnaire administered in Flanders in 2017/18 included the mandatory questions, as well as a series of additional questions. The international standard version of the 2017/18 mandatory questionnaire included 44 questions, while the Flemish questionnaire, distributed in Dutch, included 99 questions.

Unlike other sectors of the international HBSC study, the Flemish group surveys a broader age group, including all pupils attending the primary and secondary schools surveyed, regardless of age. Cluster probability sampling was used to select pupils, with school classes as the primary sampling unit. The pupils were then surveyed by means of the standardized questionnaires that needed to be completed under supervised conditions in the classroom. Data was collected between February and June 2018. Informed consent was obtained from parents of all participating pupils and the study was approved by the Ethics Committee of the University Hospital Ghent (EC UZG 2013/1145).

In total, 194 Flemish schools participated in the study (response rate=21.6%), representing 817 classes and 11,035 pupils (response rate=72.2%) (Dierckens et al., 2019). The pupils were highly representative of the adolescent population in primary (fifth and sixth grade;±11–12 years old) and secondary schools (grade one to six;±13–18 years old) due to the strict sampling methodology that was used (Dierckens et al., 2019). Pupils with missing values on the variables of interest were removed from the data set used for this thesis. These restrictions resulted in a final sample of 8,829 adolescents.

3.2 VARIABLES AND CODING

The data deemed relevant to the aims of this Master's thesis were sourced from the sections of the questionnaire focusing on demographic factors, health-related behaviors, and family culture. From the questions on demographic factors, data was obtained on student gender,

age, family affluence, migratory background, family status, and eating habits. Family affluence was ascertained through use of the FAS. Information on eating habits was collected through a short FFQ.

The dependent variables used in the analyses were sourced from the FFQ section of the survey. Participants were asked to respond to how many times a week they consume a number of different food groups, including fruits, vegetables, sweets, and SSB. There were 7 response categories: never, less than once a week, once a week, 2-4 days a week, 5-6 days a week, once a day, every day, and every day, more than once; data was thus collected on an ordinal scale from 1 to 7. Responses were re-coded using midpoint centering to reflect consumption in times per week, in order to imitate a continuous scale. Categories were re-coded as follows: "never" = 0, "less than once a week" = 0.25 (reflecting a consumption frequency of once every four weeks), "once a week" = 1, "2–4 days a week" = 3 (midpoint of the interval), "5–6 days a week" = 5.5 (midpoint of the interval), "once a day, every day" = 7 and "more than once a day, every day" = 14, representing the average weekly consumption frequency (Vereecken et al., 2008).

The independent variables were family affluence, gender, and migration background. Family affluence was calculated using scores from the FAS. The FAS was comprised of reports for the following items: ownership of a family car (0, 1, 2 or more)(0=1, 1=2, 2 or more=3), own bedroom (no=1, yes=2), family holidays during the past 12 months (0, 1, 2, 3 or more) (0=1, 1=2, 2=3, >2=4), and family computer(s) (0, 1, 2, 3 or more) (0=1, 1=2, 2=3, >2=4), numbers of bathrooms (0, 1, 2, 3 or more) (0=1, 1=2, 2=3, >2=4), and ownership of a dishwasher (no=1, yes=2). Responses to these items were combined to produce a composite score ranging from 6 (low affluence) to 19 (high affluence) (Inchley et al., 2018). In addition to the continuous FAS variable, a variable was created to stratify FAS into three categories: low, middle, and high. The category low FAS included students with scores from 6 to 11, medium FAS included students with scores 12 to 15, and high FAS included students with scores 16 to 19. This categorical variable was used for descriptive analyses, while the continuous variable was used in correlation and multiple linear regression analyses.

Respondents were asked to respond to a binary question regarding their gender (male or female); this was used to create a binary gender variable. Males were used as the reference group. Migration background was determined based on the participant's responses to open

answer questions about country of birth, country of mother's birth, and country of father's birth. Former research indicates that 11-year old adolescents provide valid answers to these questions (Nordahl et al., 2011). Students were considered to be Native Belgians if they themselves and both of their parents were born in Belgium. Students were categorized as Western immigrants if they themselves, or at least one of their parents was born in a Western country (other than Belgium). Students were categorized as Non-Western immigrants if they themselves, or at least one of their parents was born in a Non-Western country. Native adolescents were used as the reference group.

Age and family structure were the control variables used. Age was calculated by subtracting the year of birth from the year of survey collection. The subsequent variable represents age in years of the participant. Family structure was included as a control variable due to prior research suggesting that several characteristics of the home environment, including parental modeling, parenting styles and parenting practices influence children's eating, physical activity, sedentary behaviors, and weight status (Lindsay et al., 2018). Family structure was determined based on responses to the question regarding the respondent's current living situation; they were asked whether they live with their father, mother, step-parent, in a foster home, and/or other. The variable for family structure was binary: living with two birth parents or other. If the respondent lived with both their birth parents they were considered to be in the first category, while any other living situation was categorized as 'other'. Adolescents living with both birth parents were used as the reference group.

3.3 STATISTICAL ANALYSIS

The statistical analyses were performed using IBM SPSS 27.0. All statistical tests were two-tailed and the alpha-level was set at 0.05. A data set was generated that included only complete cases, meaning all participants with missing on one or more of the questions included in the data analysis were removed from the data set. Descriptive analyses and One-Way ANOVA were used to describe the data and compare means between different sociodemographic groups. Pearson's correlation coefficient was used to calculate correlations between sociodemographic characteristics and dietary behaviors. Multiple linear regression was used to determine main effects and all possible interaction effects of the three sociodemographic factors, in order to identify differences in frequency of consumption of vegetables, fruits, sweets, and SSB by family affluence, gender, or migration status, as well as

interactions between family affluence, gender, and migration status. Final models included only significant interaction terms so as to examine their significance in the presence of one another. Figures were generated in order to facilitate interpretation of interaction effects.

4 RESULTS

4.1 SAMPLE CHARACTERISTICS

The original data set included responses from 11,035 participants. Their ages ranged from 8 to 24, with 98% of respondents falling within the age range 11 to 18. A description of the frequency of missing responses in each response category is shown in Table 1.

Table 1: Summary of missing values in a survey of Flemish adolescents in 2017/18 (n=11035)

	Missing values, *n (%)**
Gender	91 (0.8%)
Age in years[1]	65 (0.6%)
Family affluence[2]	234 (2.1%)
Family type	755 (6.8%)
Migration background[3]	937 (8.5%)
Vegetable consumption	377 (3.4%)
Fruit consumption	313 (2.8%)
Sweets consumption	528 (4.8%)
SSB consumption	356 (3.2%)

[1]Age in years at time of survey;
[2]Family affluence calculated by the formation of a composite score based on responses to Family Affluence Scale (FAS) survey questions. Graded on a continuous scale from 6-19. Low (6-11), Middle (12-15), High (16-19);
[3]Participant considered Native Belgian if both they and both their parents were born in Belgium. Participant considered to be a Western or Non-western immigrant if they or at least one of their parents were born in any other Western or Non-Western country, respectively;
SSB = Sugar-sweetened beverages.

The data set used for the rest of the analyses included only complete cases. After removal of incomplete cases, 8,829 participants remained (Table 2). The mean age of the respondents was 14.66 years, with a gender distribution of 47.7% boys and 52.3% girls. While 47.2% of participants were in the middle FAS category, 48.3% were of high FAS, and only 4.5% were of low FAS. The majority of participants (70.8%) lived with both birth parents, while 29.2% had another living situation. Native Belgians accounted for 76.2% of participants, while 11.0% were Western immigrants, and 12.9% were Non-Western immigrants.

Table 2: Characteristics of a sample of Flemish adolescents in 2017/18 (n= 8829)

Gender, *n (%)*	
Boy	4208 (47.7%)
Girl	4621 (52.3%)
Age in years[1], *M (SD)*	14.66 (2.55)
Family affluence[2], n *(%)*	
Low	397 (4.5%)
Middle	4169 (47.2%)
High	4263 (48.3%)
Family type, *n (%)*	
Living with both birth parents	6248 (70.8%)
Other	2581 (29.2%)
Migration background[3], *n (%)*	
Native Belgian	6724 (76.2%)
Western immigrant	969 (11.0%)
Non-western immigrant	1136 (12.9%)

[1]Age in years at time of survey;
[2]Family affluence calculated by the formation of a composite score based on responses to Family Affluence Scale (FAS) survey questions. Graded on a continuous scale from 6-19. Low (6-11), Middle (12-15), High (16-19);
[3] Participant considered Native Belgian if both they and both their parents were born in Belgium. Participant considered to be a Western or Non-western immigrant if they or at least one of their parents were born in any other Western or Non-Western country, respectively.

4.2 CORRELATIONS AND MEAN VALUES

There were negative correlations between age and frequency of fruit ($p<0.001$), vegetable ($p<0.001$), and sweets consumption ($p=0.014$), and a positive correlation between age and frequency of SSB consumption ($p<0.001$) (Table 3). There were positive correlations between family affluence and frequency of fruit, vegetable, and sweets consumption ($p<0.001$), and a negative correlation between family affluence and frequency of SSB consumption ($p<0.001$). Frequency of fruit consumption was positively correlated with frequency of vegetable consumption ($p<0.001$), and negatively correlated with frequency of SSB consumption ($p<0.001$). Frequency of vegetable consumption was positively correlated with frequency of fruit ($p<0.001$) and sweets consumption ($p=0.004$), and negatively correlated with frequency of SSB consumption ($p<0.001$). Frequency of sweets consumption was positively correlated with frequency of vegetable ($p=0.004$) and SSB consumption ($p<0.001$).

Table 3: Relationship between sociodemographic characteristics and dietary behaviors among a sample of Flemish adolescents in 2017/18, results of correlation analysis (n= 8829)

	Fruit consumption[3]		**Vegetable consumption**		**Sweets consumption**		**SSB consumption**	
	r	*p*	*r*	*p*	*r*	*p*	*r*	*p*
Age in years[1]	-0.239	**<0.001**	-0.040	**<0.001**	-0.026	**0.014**	0.098	**<0.001**
Family affluence[2]	0.124	**<0.001**	0.140	**<0.001**	0.049	**<0.001**	-0.070	**<0.001**
Fruit consumption	1	---	0.398	**<0.001**	0.000	0.987	-0.221	**<0.001**
Vegetable consumption	---	---	1	---	0.030	**0.004**	-0.154	**<0.001**
Sweets consumption	---	---	---	---	1	---	0.278	**<0.001**
SSB consumption	---	---	---	---	---	---	1	---

Associations calculated by Pearson's correlation coefficient; [1]Age in years = age in years at time of survey; [2]Family affluence calculated by the formation of a composite score based on responses to Family Affluence Scale (FAS) survey questions; [3] Frequency of consumption, measured in times per week; SSB = Sugar-sweetened beverages.

A comparison of mean values for dietary habits between different sociodemographic groups showed a significant difference according to gender for fruit consumption, vegetable consumption, and SSB consumption ($p<0.001$), where girls were more likely to consume fruit and vegetables, and less likely to consume SSB (Table 4). There was a significant difference in vegetable ($p<0.001$) and sweets ($p=0.029$) consumption between migrant groups. Results from Post hoc Bonferroni tests showed a slightly more frequent consumption of vegetables and sweets among Native Belgians than among the other groups, and a higher frequency of consumption among Western immigrants than Non-Western immigrants. A significant difference was found based on family type for all dietary variables ($p<0.001$;sweets, $p=0.029$). Adolescents living with both parents had a higher frequency of consumption of fruit, vegetables, and sweets, and a lower frequency of consumption of SSB than those with other living situations. Moreover, a significant difference was also found based on family affluence for all dietary variables ($p<0.001$). Adolescents with higher family affluence had a higher frequency of consumption of fruit, vegetables, and sweets, and lower frequency of consumption of SSB than those with middle or low affluence.

Table 4: Comparison of mean values for dietary habits between different sociodemographic groups among a sample of Flemish adolescents in 2017/18 (n = 8829)

	Fruit consumption[4], *M (95% CI)*	**p**	**Vegetable consumption**, *M (95% CI)*	**p**	**Sweets consumption**, *M (95% CI)*	**p**	**SSB consumption**, *M (95% CI)*	**p**
Sex								
Boy	4.41 (4.36, 4.46)	**<0.001**	5.34 (5.29, 5.38)	**<0.001**	4.12 (4.07, 4.17)	0.991	4.12 (4.10, 4.22)	**<0.001**
Girl	4.78 (4.73, 4.83)		5.59 (5.55, 5.63)		4.12 (4.07, 4.16)		3.63 (3.58, 3.69)	
Migration background[1]								
Native Belgian	4.61 (4.57, 4.65)	0.624	5.52 (5.49, 5.55)	**<0.001**	4.14 (4.10, 4.17)	**0.029**	3.88 (3.83, 3.92)	0.747
Western immigrant	4.56 (4.45, 4.66)		5.39 (5.31, 5.48)		4.11 (4.01, 4.21)		3.92 (3.80, 4.04)	
Non-western immigrant	4.62 (4.53, 4.72)		5.25 (5.16, 5.34)		4.01 (3.91, 4.10)		3.90 (3.79, 4.01)	
Family type[2]								
Living with both	4.69 (4.65, 4.73)	**<0.001**	5.54 (5.51, 5.57)	**<0.001**	4.14 (4.10, 4.18)	**0.029**	3.79 (3.74, 3.83)	**<0.001**
birth parents	4.40 (4.33, 4.47)		5.30 (5.25, 5.36)		4.06 (4.00, 4.12)		4.12 (4.04, 4.19)	
Other								
Family affluence[3]								
Low	4.13 (3.96, 4.31)	**<0.001**	4.83 (4.67, 4.99)	**<0.001**	3.90 (3.76, 4.05)	**<0.001**	4.22 (4.03, 4.41)	**<0.001**
Middle	4.46 (4.41, 4.51)		5.38 (5.34, 5.42)		4.08 (4.03, 4.13)		3.97 (3.91, 4.03)	
High	4.79 (4.74, 4.84)		5.61 (5.58, 5.65)		4.18 (4.13, 4.22)		3.77 (3.71, 3.82)	

Means, 95% CI of means, and significance level of difference between means calculated using One-Way ANOVA;
[1]Reference category = Native Belgian. Participant considered Native Belgian if both they and both their parents were born in Belgium.
Participant considered to be a Western or Non-western immigrant if they or at least one of their parents were born in any other Western or Non-Western country, respectively;
[2]Family type considered other if both birth parents do not reside together in home with participant.
[3]Family affluence calculated by the formation of a composite score based on responses to Family Affluence Scale (FAS) survey questions. Graded on a continuous scale from 6-19. Low (6-11), Middle (12-15), High (16-19); SSB = Sugar-sweetened beverages.
[4] Frequency of consumption, measured in times per week.

4.3 REGRESSION ANALYSIS AND INTERACTION EFFECTS

Table 5 features the results from the model including the dependent variable vegetable consumption. There were significant associations between vegetable consumption and all of the independent variables. The results show that boys generally consumed vegetables less frequently than girls ($p<0.001$), and that the consumption of vegetables was more frequent among adolescents with higher family affluence ($p<0.001$). Furthermore, both Western immigrants ($p= 0.017$) and Non-Western immigrants ($p<0.001$) consumed vegetables less frequently than native adolescents. In model 2, a statistically significant interaction was found between gender and family affluence ($p= 0.024$). The association between family affluence and vegetable consumption was stronger among boys (interaction effect = 0.102). In addition, the association between gender and vegetable consumption was less pronounced among adolescents with higher family affluence (interaction effect= -0.727). Figure 1 displays a plot of the interaction between gender and family affluence in predicting values for vegetable consumption. The slope is steeper among boys, indicating that the increase in frequency of vegetable consumption as family affluence increases is greater among boys than girls.

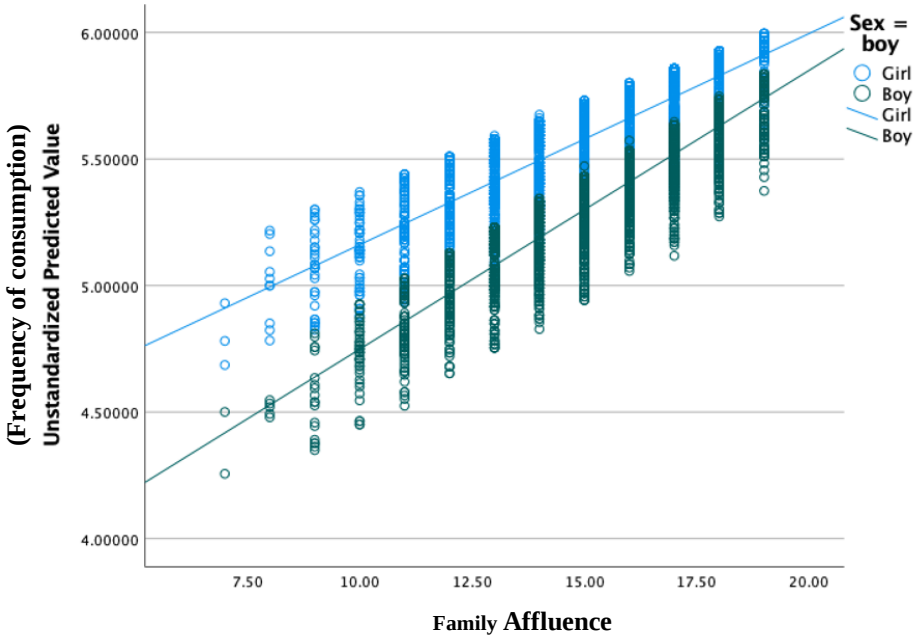
Table 5: Regression coefficients for the relationship between sociodemographic characteristics and the consumption of vegetables among a sample of Flemish adolescents in 2017/18, adjusted for covariates (n = 8829)

VEGETABLE CONSUMPTION[4]

	MODEL 1				**MODEL 2**			
	*b1**	*SE*	*β **	*P value*	*b1**	*SE*	*β **	*P value*
Constant	4.591				4.824			
Gender[1]								
Boy	-0.279	0.028	-0.105	**<0.001**	-0.759	0.214	-0.285	**<0.001**
Family affluence[2]	0.085	0.007	0.127	**<0.001**	0.070	0.010	0.105	**<0.001**
Migration background[3]								
Western immigrant	-0.107	0.045	-0.025	**0.017**	-0.109	0.045	-0.026	**0.016**
Non-Western immigrant	-0.215	0.042	-0.054	**<0.001**	-0.217	0.042	-0.055	**<0.001**
INTERACTION EFFECTS								
Gender x Family affluence					0.032	0.014	0.184	**0.024**

* Unstandardized coefficient; ** Standardized coefficient.; Values calculated using multiple linear regression.
[1]Reference category = Girls; [2]Family affluence graded on a continuous scale from 6-19 based on responses to the Family Affluence Scale (FAS). [3]Reference category = Native Belgians. Participant considered Native Belgian if both they and both their parents were born in Belgium. Participant considered to be a Western or Non-western immigrant if they or at least one of their parents were born in any other Western or Non-Western country, respectively.
Model 1 included variables for gender and family affluence, as well as dummy variables for Western immigrant Non-Western immigrant status, in addition to covariates age and family status. Model 2 included all aforementioned variables, in addition to an interaction term for Gender x Family affluence.
[4] Frequency of consumption, measured in times per week.

Figure 1: Plot of interaction between gender and family affluence in predicting values for vegetable consumption in a sample of Flemish adolescents in 2017/18 (n = 8829)



Family affluence graded on a continuous scale from 6-19 based on responses to the Family Affluence Scale (FAS); Frequency of consumption measured in times per week.

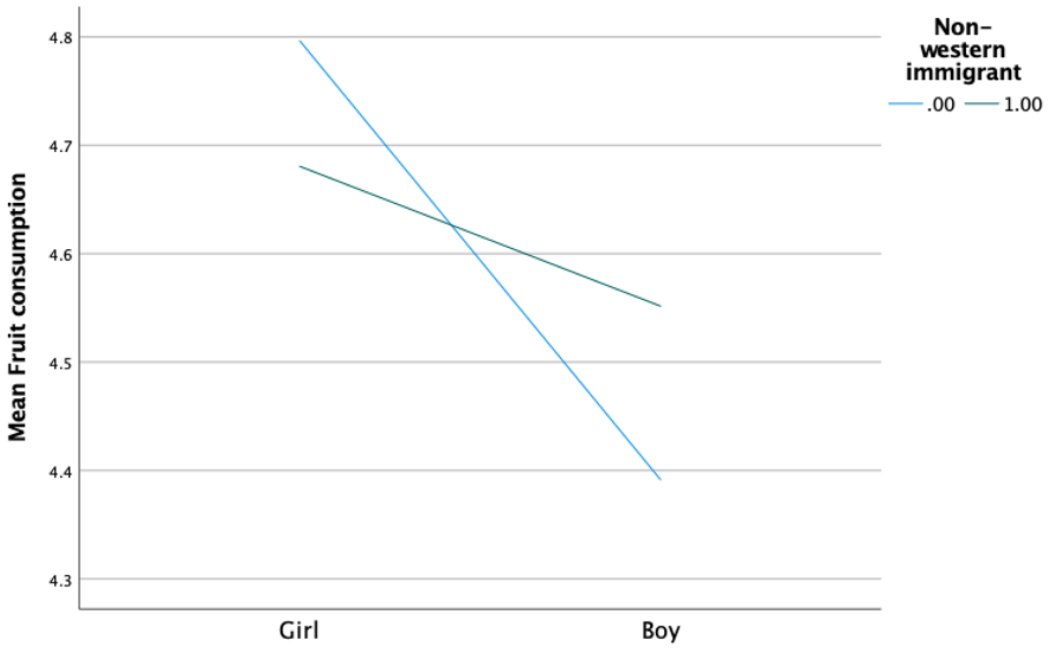
The results from the model including the dependent variable fruit consumption are shown below in Table 6. There were significant associations between fruit consumption and gender, family affluence, and Non-Western immigrant background. The results show that boys generally consumed fruit less frequently than girls ($p<0.001$), and that the consumption of fruit was more frequent among adolescents with higher family affluence ($p<0.001$). Moreover, Non-Western immigrants ($p= 0.031$) consumed fruit more frequently than native adolescents. In model 2, a statistically significant interaction was found between gender and Non-Western immigrant background ($p= 0.018$). The association between Non-Western immigrant background and fruit consumption was greater among boys, where it had a positive effect on fruit intake. Among girls, there was no association between Non-Western immigrant background and fruit intake ($p= 0.999$). Moreover, there were smaller gender differences in fruit consumption among Non-Western immigrant adolescents than among their native counterparts. The interaction between gender and Western immigrant background was not significant. Figure 2 displays a line graph of the interaction between gender and Non-Western immigrant background on mean fruit consumption in the sample. The slope among Non-Western immigrants is flatter than that among Native Belgians, illustrating the smaller gender differences in fruit consumption among Non-Western immigrants.

Table 6: Regression coefficients for the relationship between sociodemographic characteristics and the consumption of fruit among a sample of Flemish adolescents in 2017/18, adjusted for covariates (n = 8829)

FRUIT CONSUMPTION[4]								
	MODEL 1				**MODEL 2**			
	*b1**	*SE*	*β ***	*P value*	*b1**	*SE*	*β ***	*P value*
Constant	5.683				5.663			
Gender[1]								
Boy	-0.409	0.035	-0.120	**<0.001**	-0.450	0.040	-0.132	**<0.001**
Family affluence[2]	0.093	0.009	0.109	**<0.001**	0.092	0.009	0.108	**<0.001**
Migration background[3]								
Western immigrant	-0.003	0.056	-0.001	0.954	-0.045	0.077	-0.008	0.558
Non-Western immigrant	0.113	0.052	0.022	**0.031**	0.000	0.071	0.000	0.999
INTERACTION EFFECTS								
Gender x Western immigrant					0.088	0.112	0.011	0.433
Gender x Non-Western immigrant					0.247	0.105	0.034	**0.018**

* Unstandardized coefficient; ** Standardized coefficient.; Values calculated using multiple linear regression.
[1]Reference category = Girls; [2] Family affluence graded on a continuous scale from 6-19 based on responses to the Family Affluence Scale (FAS). [3]Reference category = Native Belgians. Participant considered Native Belgian if both they and both their parents were born in Belgium. Participant considered to be a Western or Non-western immigrant if they or at least one of their parents were born in any other Western or Non-Western country, respectively.
Model 1 included variables for gender and family affluence, as well as dummy variables for Western immigrant Non-Western immigrant status, in addition to covariates age and family status. Model 2 included all aforementioned variables, in addition to an interaction terms for Gender x Western immigrant and Gender x Non-Western immigrant.
[4] Frequency of consumption, measured in times per week.

Figure 2: Plot of interaction between gender and Non-Western immigrant background on mean fruit consumption in a sample of Flemish adolescents in 2017/18 (n = 8829)



Consumption measured in times per week.

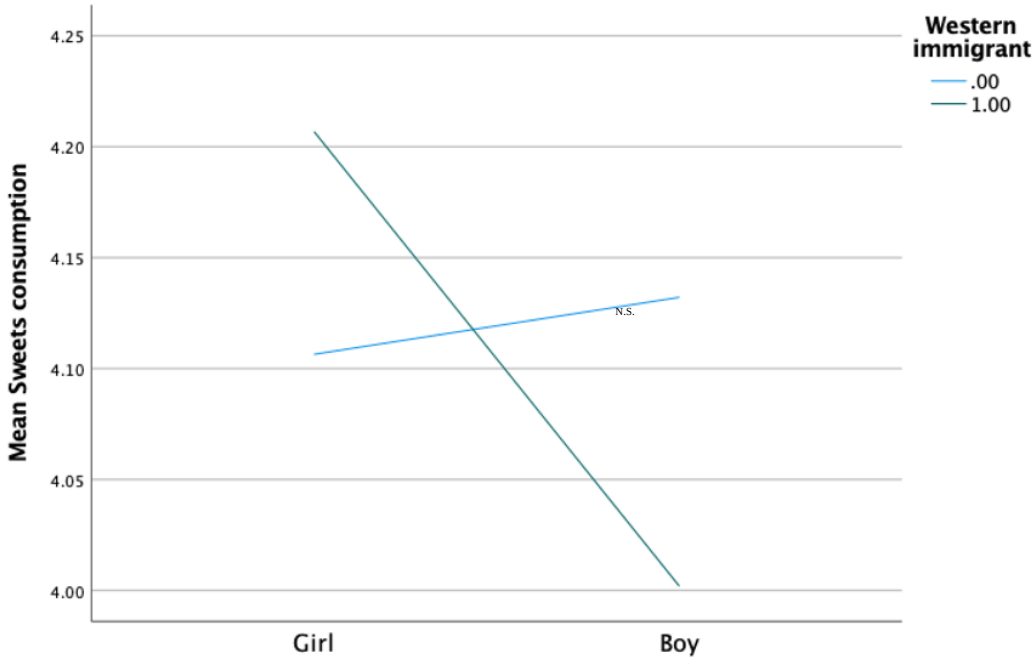
Table 7 includes the results from the model including the dependent variable sweets consumption. There were significant associations between sweets consumption and SEP and Non-Western immigrant background. The results show that the consumption of sweets was more frequent among adolescents with higher family affluence ($p<0.001$), and less frequent among Non-Western immigrants ($p= 0.033$). In model 2, a statistically significant interaction was found between gender and Western immigrant background ($p = 0.016$). There were no significant gender differences in sweets consumption among natives ($p= 0.760$); in contrast, among Western immigrant adolescents, boys tend to eat sweets less frequently than girls ($p= 0.016$). The interaction between gender and Non-Western immigrant background was not significant. Figure 3 displays a line graph of the interaction between gender and being a Western immigrant on sweets consumption. As visualized, the line representing sweets consumption among natives shows no significant difference between genders.

Table 7: Regression coefficients for the relationship between sociodemographic characteristics and the consumption of sweets among a sample of Flemish adolescents in 2017/18, adjusted for covariates (n = 8829)

SWEETS CONSUMPTION[4]								
	MODEL 1				**MODEL 2**			
	*b1**	*SE*	*β ***	*P value*	*b1**	*SE*	*β ***	*P value*
Constant	3.828				3.809			
Gender[1]								
Boy	-0.010	0.033	-0.003	0.760	0.039	0.038	0.013	0.296
Family affluence[2]	0.033	0.008	0.043	**<0.001**	0.034	0.008	0.044	**<0.001**
Migration background[3]								
Western immigrant	-0.020	0.053	-0.004	0.710	0.103	0.073	0.021	0.163
Non-Western immigrant	-0.107	0.050	-0.023	**0.033**	-0.029	0.067	-0.006	0.670
INTERACTION EFFECTS								
Gender x Western immigrant					-0.256	0.106	-0.037	**0.016**
Gender x Non-Western immigrant					-0.168	0.100	-0.025	0.091

* Unstandardized coefficient; ** Standardized coefficient.; Values calculated using multiple linear regression.
[1]Reference category = Girls; [2] Family affluence graded on a continuous scale from 6-19 based on responses to the Family Affluence Scale (FAS). [3]Reference category = Native Belgians. Participant considered Native Belgian if both they and both their parents were born in Belgium. Participant considered to be a Western or Non-western immigrant if they or at least one of their parents were born in any other Western or Non-Western country, respectively.
Model 1 included variables for gender and family affluence, as well as dummy variables for Western immigrant Non-Western immigrant status, in addition to covariates age and family status. Model 2 included all aforementioned variables, in addition to an interaction terms for Gender x Western immigrant and Gender x Non-Western immigrant.
[4] Frequency of consumption, measured in times per week.

Figure 3: Plot of interaction between gender and Western immigrant background on mean sweets consumption in a sample of Flemish adolescents in 2017/18 (n = 8829)



N.S. = not significant
Consumption measured in times per week.

The results from the model including the dependent variable SSB consumption are shown below in Table 8. There were significant associations between SSB consumption and gender and SEP. The results show that boys generally consumed SSB more frequently than girls ($p<0.001$), and that the consumption of SSB was less frequent among adolescents with higher family affluence ($p<0.001$). In model 2, a statistically significant interaction was found between gender and family affluence ($p= 0.018$). The association between family affluence and frequency of SSB consumption was stronger among girls (interaction effect = -0.042). In addition, the association between gender and SSB consumption was less pronounced among adolescents with higher family affluence (interaction effect= -0.138). Figure 4 displays a plot of the interaction between gender and family affluence in predicting values for SSB consumption. The slope is steeper among girls, illustrating the stronger association between family affluence and frequency of SSB consumption among girls.

The interaction between Western immigrant background and family affluence was found to be significant during original testing of interaction terms one by one ($p<0.001$; Table A.2). However, once the other significant term, representing the interaction between gender and family affluence, was added to the model, the interaction between Western immigrant background and family affluence was no longer significant ($p= 0.337$).

Table 8: Regression coefficients for the relationship between sociodemographic characteristics and the consumption of sugar-sweetened beverages among a sample of Flemish adolescents in 2017/18, adjusted for covariates (n = 8829)

SSB CONSUMPTION[4]

	MODEL 1				**MODEL 2**			
	*b1**	*SE*	*β ***	*P value*	*b1**	*SE*	*β ***	*P value*
Constant	3.409				3.749			
Gender[1]								
Boy	0.550	0.039	0.146	**<0.001**	-0.186	0.304	-0.049	0.541
Family affluence[2]	-0.056	0.010	-0.059	**<0.001**	-0.090	0.015	-0.095	**<0.001**
Migration background[3]								
Western immigrant	0.014	0.064	0.002	0.824	-0.441	0.475	-0.073	0.353
Non-Western immigrant	-0.030	0.060	-0.005	0.618	-0.680	0.402	-0.121	0.091
INTERACTION EFFECTS								
Gender x Family affluence					0.048	0.020	0.199	**0.018**
Western immigrant x Family affluence					0.030	0.031	0.076	0.337
Non-Western immigrant x Family affluence					0.043	0.027	0.115	0.105

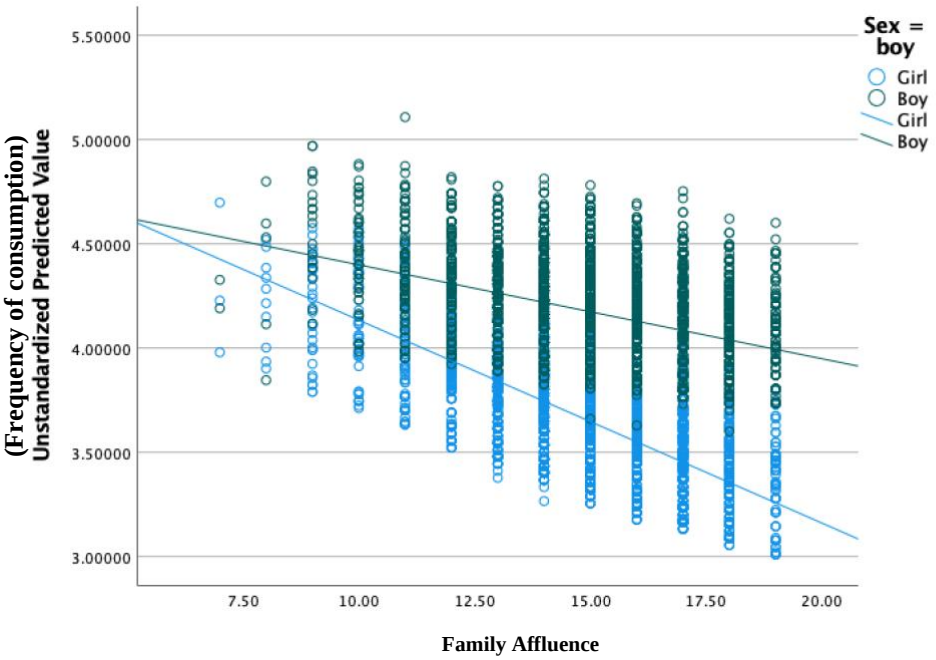
* Unstandardized coefficient; ** Standardized coefficient.; Values calculated using multiple linear regression.

[1]Reference category = Girls; [2] Family affluence graded on a continuous scale from 6-19 based on responses to the Family Affluence Scale (FAS). [3]Reference category = Native Belgians. Participant considered Native Belgian if both they and both their parents were born in Belgium. Participant considered to be a Western or Non-western immigrant if they or at least one of their parents were born in any other Western or Non-Western country, respectively.

Model 1 included variables for gender and family affluence, as well as dummy variables for Western immigrant Non-Western immigrant status, in addition to covariates age and family status. Model 2 included all aforementioned variables, in addition to an interaction terms for Gender x Family affluence, Western immigrant x Family affluence, and Non-Western immigrant x Family affluence.

[4] Frequency of consumption, measured in times per week.

Figure 4: Plot of interaction between gender and family affluence in predicting values for sugar-sweetened beverages consumption in a sample of Flemish adolescents in 2017/18 (n = 8829)



Family affluence graded on a continuous scale from 6-19 based on responses to the Family Affluence Scale (FAS); Frequency of consumption measured in times per week.

5 DISCUSSION

5.1 SUMMARY OF RESULTS

The objective of this Master's thesis was to apply an intersectional framework to the analysis of data from the 2017/18 HBSC study in order to investigate the relationship between family affluence, gender, and migration background and frequency of consumption of vegetables, fruits, sweets, and SSB among Flemish adolescents, as well as to examine interactions between these sociodemographic groups. Significant interactions were found between gender and family affluence for vegetable ($p=0.024$) and SSB consumption ($p=0.018$), between gender and Western immigrant background for sweets consumption ($p=0.016$), and between gender and Non-Western immigrant background for fruit consumption ($p=0.018$).

5.2 DISCUSSION OF RESULTS

Results from the multiple linear regression analysis gave insight into some of the associations that may exist between sociodemographic factors and eating behaviors in adolescents. In line with the aims of this study and framed within intersectionality, the findings also provide information about the potential interactions between sociodemographic factors, and their unique impacts on dietary habits. In contrast to studies before that have analyzed family affluence, gender, and migration status as unitary categories (Bere et al., 2008a, 2008b; Brug et al., 2012; Chansukree & Rungjindarat, 2017; Currie et al., 2004, 2008, 2009; Hinnig et al., 2018; Hiza et al., 2013; Inchley et al., 2020; Kouider et al., 2014; Mackenbach et al., 2009; Méroc et al., 2019; Nardone et al., 2020; Skårdal et al., 2014), the interaction analyses utilized in this study have allowed for examination of the intersectional nature of these factors. The results suggest that the intersectional component that has frequently been overlooked in previous studies may have a relevant impact on dietary behavior at these ages. In the next segments, the most important results for each indicator are described separately, then followed by a discussion of the intersectionality component of the results.

The findings in regards to socioeconomic differences in the consumption of vegetables, fruits, sweets, and SSB demonstrate the positive association between affluence and dietary habits. In the sample, the consumption of vegetables and fruit was more frequent among adolescents with higher family affluence, while the consumption of SSB was less frequent among this group. Interestingly, there was also a positive association between higher family affluence and

the frequency of consumption of sweets. This finding is in line with previous reports from the international HBSC studies (Currie et al., 2004,2008,2009; WHO, 2017), and may be due to access to foods, such as cakes and desserts, that might be considered frivolous or expensive among members of lower socioeconomic groups. A higher frequency of consumption of fruits and vegetables, and lower consumption of SSB, among higher family affluence groups is a trend that has been reported before in literature on socioeconomic differences in diet among adolescents (Bere et al., 2008b; Brug et al., 2012; Currie et al., 2004,2008,2009; Hinnig et al., 2008; Inchley et al., 2020; Skårdal et al., 2014; WHO, 2017).

Further, the results from the present study regarding gender differences in dietary consumption patterns are in line with previous research (Bere et al., 2008a, 2008b; Brug et al., 2012; Chansukree & Rungjindarat, 2017; Currie et al., 2004,2008,2009; Inchley et al., 2020; WHO, 2017), and highlight a trend among adolescents towards healthier eating among girls and more unhealthy dietary habits among boys. The conclusion that boys generally consume fruit and vegetables less frequently than girls, and more frequently consume SSB, is one that has been shown before in previous reports that have examined gender inequalities among adolescents (Bere et al., 2008b; Chansukree & Rungjindarat, 2017; Currie et al., 2004,2008,2009; Inchley et al., 2020; Skårdal et al., 2014; WHO, 2017). These gender differences may be due to preferences, accessibility, differences in general awareness and preoccupation with health status, weight-related concerns, and/or cultural influences (Bere et al., 2008a; Chansukree & Rungjindarat, 2017; Masella & Malorni, 2017).

This study, unlike many previous HBSC reports, included migration status as an independent variable, and thus examined the association between Western immigrant or Non-Western immigrant background and dietary habits, as compared to Native Belgians. Results from the analysis show that both Western and Non-Western immigrants had a lower frequency of consumption of vegetables than their Native counterparts. On the other hand, Non-Western immigrants were both more likely to have a higher frequency of consumption of fruits, and to have a lower frequency of consumption of sweets, than Native adolescents. These findings are partially in agreement with those of Rouche et al. (2019), who found that immigrant adolescents in Belgium were more likely to consume both fruits and vegetables. The higher frequency of consumption of fruit may be explained by cultural differences, and represents the potential protective effect of immigration status on dietary habits. The lower frequency of consumption of vegetables may be a sign of acculturation, and is in line with previous studies

of the relationship between immigration and adolescent health in European countries that found that immigrant adolescents were more likely than natives to be overweight, and less likely to report healthy habits (Brug et al., 2012; Méroc et al., 2019).

These associations, while important to address, cannot fully explain the mechanisms of inequalities in health between adolescents. With an intersectional approach, it is possible to look further, and consider the possibility of interactions between intersecting sociodemographic factors and social identities. In this study, interactions between family affluence, gender, and migration background were identified. Though frequency of consumption of vegetables was, overall, higher among adolescents with higher family affluence, this trend was not equal among both genders. Rather, the association between SEP and frequency of vegetable consumption was stronger among boys, and the association between gender and frequency of vegetable consumption less pronounced among adolescents with higher family affluence. In other words, family affluence and gender interact such that the differences in frequency of vegetable consumption along the FAS were more pronounced among boys than they were among girls, meaning that lower affluence has the potential to have a more negative association with boys' vegetable consumption than it does with girls'. Further, the gender inequalities seen in frequency of vegetable consumption are smaller among adolescents from families with higher affluence. That is, adolescents from families with lower affluence are more impacted by gender gradients in vegetable consumption.

A similar interaction was seen for SSB consumption, where the association between SEP and frequency of SSB consumption was stronger among girls, and the association between gender and frequency of SSB consumption was less pronounced among adolescents with higher family affluence. Girls from families with lower family affluence thus consumed SSB more frequently than girls from families with higher affluence, such that the negative association between female gender and frequency SSB consumption was stronger among girls from more affluent families. The gender gap in SSB consumption was narrower among adolescents with higher family affluence than it was among their less advantaged counterparts, partly due to a lower frequency of consumption of SSB among boys from this higher affluence group.

Significant interactions between gender and migration background were also found. For fruit consumption, there was a significant interaction between gender and being a Non-Western immigrant. This interaction impacted fruit consumption in that the association between Non-

Western immigrant background and frequency fruit consumption was greater among boys, where it had a positive association with frequency of fruit intake, while among girls there was no association between Non-Western immigrant background and fruit intake. Moreover, there were smaller gender differences in frequency of fruit consumption among Non-Western immigrant adolescents than among their native counterparts. In other words, boys that were Non-Western immigrants ate fruit more frequently than their native counterparts, while girls that were Non-Western immigrants ate fruit at a similar frequency as their native counterparts. This resulted in a narrower gender gap in frequency of fruit consumption among Non-Western immigrants than among Native Belgians. A significant interaction between gender and migration background was also seen for frequency of sweets consumption, but this time among Western immigrants. While there were no significant gender differences in frequency of sweets consumption among natives, among Western immigrant adolescents, boys were found to consume sweets less frequently than girls.

The results from this study provide an interesting look at the ways in which different social identities intersect and produce outcomes that may not have been expected when viewing them as unitary categories. From previous research, it is presumed that male gender, low SEP and immigrant background all have negative associations with healthy eating habits (Bere et al., 2008a, 2008b; Brug et al., 2012; Inchley et al., 2020; Méroc et al., 2019; Rouche et al., 2019; Skårdal et al., 2014; WHO, 2017). These conclusions, however, do not fully take into account the complex realities of society. Though the boys in the present study had a lower frequency of consumption of fruits and vegetables, and a higher frequency of consumption of SSB, there were also situations where male gender was associated with healthier dietary habits; among Western immigrants, for example, where boys were found to have a less frequent consumption of sweets than girls. In other situations, boys were again at a disadvantage; for example, among adolescents of lower family affluence, where lower family affluence had a more negative association with boys' frequency of vegetable consumption than it did with their female counterparts. Moreover, having an immigrant background did not always have negative associations with healthy dietary habits; boys with Non-Western backgrounds actually consumed fruit more frequently than their native counterparts, while girls with Non-Western backgrounds consumed comparable amounts of fruit to their native counterparts. Being from a family of lower affluence however, proved to be mainly negative in its association with dietary habits. While adolescents from less affluent families did consume sweets less frequently, they were also more affected by gender gradients in the

frequency of consumption of vegetables and SSB, at the same time as girls with low family affluence were less benefited by the protective effect of their gender on dietary patterns.

These findings highlight the importance of approaching inequalities in dietary habits from an intersectional perspective, and exploring within category diversity. For instance, because gender differences and inequities at any particular time and place combine with the effects of other forms of social division such as class and ethnicity, not all girls or boys experience gender or gender-related health problems in the same way, just as not all members of lower affluence groups experience their financial situation the same way, and not all immigrants share the same experience of their migration status (Bauer, 2014; Bowleg, 2012; Hankivsky & Christoffersen, 2008; Rouche et al., 2019). Information like that which was found in this study might make it possible to form policies that are more likely to reach those who are most in need, and decrease differences between groups instead of widening inequalities further. While this study was meant to identify cross-cutting determinants of health behaviours, future research should aim to examine why such variation exists within groups.

5.3 STRENGTHS AND LIMITATIONS

This study was able to apply an intersectional approach to the analysis of HBSC data and provide information about factors that may be associated with dietary patterns among adolescents. One of the strengths of the present study is the large number of participants surveyed. The data file used for this study had a large sample size of over 11,000 respondents, as well as a carefully controlled system of sampling. The use of data collected through the HBSC study allowed for a certain quality of data collection that may not otherwise have been obtained. All mandatory and optional items in the questionnaires have been piloted, and the FFQ and FAS used in the collection of the data sourced for this study have both been validated in multiple validation studies (Inchley et al., 2018; Torsheim et al., 2016; Vereecken & Maes, 2003; Vereecken, 2008).

However, there are some limitations to the present study. To begin, the results of this study are based on a cross-sectional analysis, so that no evidence of causal relationships can be provided. As HBSC is a study that is repeated every 4 years, however, the associations found can be reinvestigated over time. Another limitation lies in the fact that the sample only consists of data from adolescents living in the Flemish-speaking region of Belgium, and as

such, results might not be generalizable to other regions. The generalization of the results is limited to the school adolescents.

Furthermore, data from 2,206 individuals was removed from the data set prior to analyses due to missing values. As a non-response rate among participants with less desirable health behaviors is sometimes seen in studies (Cheung et al., 2017), this may have been the case here as well. Adolescents with lower family affluence and/or less healthy dietary habits may have avoided participation in the survey, or may have had more missing values that rendered their data unsuitable for use in the analysis. Moreover, there may have existed differential distribution of measured dietary habits and of several covariates (migration status, gender, family structure) between included participants and eligible participants not included in analyses due to missing data, leading to selection bias. The loss of this data may have had an effect on the results obtained, such that the results may have been different had these adolescents been included in the analyses. The results may therefore not be truly representative of the group of adolescents that were sampled and included in the original data set. This should be taken into account when interpreting the results and drawing conclusions.

As in the previous survey cycles, participants were asked whether they are boys or girls; in this question, it is unclear whether sex or gender is measured. Accordingly, some adolescents may have been unable to answer the question and thus been excluded from subsequent analyses or misclassified. Furthermore, this question is not appropriate for gender-nonconforming persons. Concerns about the format of this question have been discussed within the HBSC network (Költó et al., 2020), and a pilot study is currently being conducted in order to measure gender identity. However, survey research has not yet established best practice for asking about gender that works across countries (van Hagen et al., 2021). Moreover, the classification of immigrant status into three categories - Native Belgian, Western immigrant, and Non-Western immigrant - is an extremely simplified concept of migration background. There are many differences between the countries and cultures included within the categories and these labels do not account for these differences. Similarly, the operationalization of family type as a binary variable does not take into consideration the many different forms of families possible, and perhaps oversimplifies family structure. Some adolescents may have been misclassified by this system, for example those living from birth with one biological parent and one step-parent. Additionally, adolescents may have

overreported consumption of healthy foods and underreported consumption of unhealthy products due to social pressure (Moore et al., 2008; Rouche et al., 2019).

While our study was among the first to include intersectionality, the relatively small number of investigated dimensions is another potential weakness of the study design. The inclusion of individual and contextual characteristics beyond those addressed in this study, such as sexual orientation, mental health, weight regulating behavior, school location or parental educational level, may have mediated the associations discovered, and affected the significance of the results obtained. Similarly, the FFQ used to collect data for this study was limited to four food groups, and does not provide information on quantities consumed, only frequency. It is thus difficult to make inferences about the overall composition of participants' diets, as the data collected provides information solely about the frequency of consumption of fruits, vegetables, sweets, and SSB.

An additional limitation of this study is the type of data collected and its relative lack of suitability to analysis via multiple linear regression. The form of data collection for the dependent variables led to the formation of a data set including ordinal data for dietary habits. As detailed in the methods of this study, information about consumption of fruit, vegetables, sweets, and SSB was collected via an FFQ that functions on an ordinal scale, where respondents selected an answer from 1 to 7. Ordinal data is, in principle, not suited for use in a linear regression, which strictly speaking requires continuous response variables. However, for the purpose of this Master's thesis, the decision was made to carry on with linear regression, in order to avoid the dichotomization of dietary variables, and thus preserve as much variation in the data as possible. This choice was also backed by the general suitability of dietary data to the approximation of a continuous scale, and the use of midpoint centering further adapted the data for use in a linear regression (Bere et al., 2005; Melbye et al., 2020). Moreover, robust standard errors were employed for the preliminary multiple linear regression analyses, in order to adjust for heteroscedasticity in the data. There was no change in the statistical significance of the associations found between normal standard errors and robust standard errors. The results of this study should, however, be interpreted with relative caution.

6 CONCLUSION

The main objective of this Master's thesis was to apply an intersectional framework to the analysis of data from the 2017/18 HBSC study in order to investigate the relationship between dietary habits and family affluence, gender, and migration background among Flemish adolescents. The aim of the analysis was to utilize interaction effects with the purpose of examining whether family affluence, gender, and migration background interact with each other to produce effects on frequency of consumption of fruits, vegetables, sweets, and SSB.

Based on the results, significant differences between sociodemographic groups in regards to dietary habits were found. Adolescents from families with higher family affluence had a higher frequency of consumption of fruit, vegetables, and sweets, and a lower frequency of consumption of SSB than those from families with lower family affluence. Girls were more frequent consumers of fruits and vegetables, and less frequent consumers of SSB. There was a higher frequency of consumption of vegetables and sweets among Native Belgians than among immigrant groups, and a higher frequency of consumption among Western immigrants than among Non-Western immigrants; yet, Non-Western immigrants were more likely to consume fruit than their native counterparts.

In addition, a number of interactions between the chosen sociodemographic factors and intake of the included food groups were found. There was an interaction between gender and family affluence in regards to consumption of vegetables and SSB, such that the gender disparity in frequency of consumption of vegetables and SSB was less pronounced among adolescents from more affluent families. The association between family affluence and frequency of vegetable consumption was more pronounced among boys, while this effect was more pronounced among girls in regards to the frequency of consumption of SSB. Moreover, significant interactions were discovered between gender and migration background. For fruit consumption, there were smaller gender differences among Non-Western immigrants, where Non-Western immigrant background had a positive association with frequency of fruit intake. While there were no significant gender differences in frequency of sweets consumption among natives, among Western immigrant adolescents, boys were found to consume sweets less frequently than girls.

These findings highlight the importance of consideration of the intersectional nature of social identities when examining health-related outcomes. Future studies should move beyond the use of sociodemographic factors as unitary categories, and instead employ an intersectional framework that better accounts for the complex realities of life, including interactions between and variation within categories of social identity. Efforts should be made to understand the interaction of these factors and their relation with dietary behaviors through qualitative studies, such that it is possible to identify vulnerable groups, and develop targeted public-health campaigns.

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APPENDIX

Table A.1: Regression coefficients for interaction effects between sociodemographic characters and consumption of vegetables and fruit among a sample of Flemish adolescents in 2017/18, adjusted for covariates (n = 8829)

	Vegetable consumption[+]				**Fruit consumption**			
	*b1**	*SE*	*β***	*P value*	*b1*	*SE*	*β*	*P value*
Sex	-0.759	0.214	-0.285	<0.001	-0.255	0.267	-0.075	0.340
SEP	0.070	0.010	0.105	<0.001	0.097	0.012	0.115	<0.001
Western Immigrant	-0.109	0.045	-0.026	0.016	-0.003	0.056	-0.001	0.961
Non-Western Immigrant	-0.217	0.042	-0.055	<0.001	0.114	0.053	0.022	0.030
Sex x SEP	0.032	0.014	0.184	**0.024**	-0.010	0.017	-0.046	0.561
Sex	-0.292	0.030	-0.109	<0.001	-0.415	0.037	-0.122	<0.001
SEP	0.085	0.007	0.127	<0.001	-0.093	0.009	0.109	<0.001
Western Immigrant	-0.162	0.062	-0.038	0.009	0.028	0.077	-0.005	0.715
Non-Western Immigrant	-0.215	0.042	-0.054	<0.001	0.113	0.052	0.022	0.032
Sex x Western Immigrant	0.116	0.089	0.019	0.191	0.052	0.111	-0.232	0.638
Sex	-0.294	0.030	-0.110	<0.001	-0.439	0.037	-0.129	<0.001
SEP	0.085	0.007	0.127	<0.001	0.092	0.009	0.108	<0.001
Western Immigrant	-0.107	0.045	-0.025	0.017	-0.003	0.056	-0.001	0.951
Non-Western Immigrant	-0.270	0.057	-0.068	<0.001	0.005	0.071	0.001	0.940
Sex x Non-Western immigrant	0.121		0.021	0.146	0.236	0.104	0.032	**0.023**
Sex	-0.279	0.028	-0.105	<0.001	-0.408	0.035	-0120	<0.001
SEP	0.083	0.008	0.126	<0.001	0.096	0.009	0.113	<0.001
Western Immigrant	-0.197	0.330	-0.046	0.551	0.453	0.412	0.083	0.271
Non-Western Immigrant	-0.215	0.042	-0.054	<0.001	0.115	0.053	0.023	0.028
Western Immigrant x SEP	0.006	0.022	0.021	0.783	-0.030	0.027	-0.085	0.263
Sex	-0.279	0.028	-0.105	<0.001	-0.409	0.035	-0.120	<0.001
SEP	0.079	0.008	0.119	<0.001	0.095	0.010	0.112	<0.001

Western Immigrant	-0.108	0.045	-0.025	0.017	-0.003	0.056	-0.001	0.958
Non-Western Immigrant	-0.724	0.279	-0.182	0.010	-0.361	0.348	0.071	0.300
Non-Western Immigrant x SEP	0.034	0.019	0.129	0.065	-0.017	0.023	-0.049	0.471

* Unstandardized coefficient; ** Standardized coefficient.
Values calculated using multiple linear regression
[+] Frequency of consumption, measured in times per week.
Reference category = Girls.
Reference category = Native Belgians. Participant considered Native Belgian if both they and both their parents were born in Belgium.
Participant considered to be a Western or Non-western immigrant if they or at least one of their parents were born in any other Western or Non-Western country, respectively.
SEP graded on a continuous scale from 6-19 based on responses to the Family Affluence Scale (FAS).
Models included variables for gender and SEP, dummy variables for Western immigrant Non-Western immigrant status, covariates age and family status, as well as the interaction term specified for each row of results.

Table A.2: Regression coefficients for interaction effects between sociodemographic characters and consumption of sweets and sugar-sweetened beverages among a sample of Flemish adolescents in 2017/18, adjusted for covariates (n = 8829)

	Sweets consumption[+]				**SSB consumption**			
	*b1**	*SE*	*β***	*P value*	*b1*	*SE*	*β*	*P value*
Sex	-0.312	0.254	-0.101	0.219	-0.160	0.304	-0.042	0.598
SEP	0.024	0.012	0.031	0.039	-0.078	0.014	-0.083	<0.001
Western Immigrant	-0.021	0.054	-0.004	0.697	0.012	0.064	0.002	0.852
Non-Western Immigrant	-0.108	0.050	-0.023	0.030	-0.033	0.060	-0.006	0.576
Sex x SEP	0.020	0.017	0.100	0.230	0.047	0.020	0.192	**0.018**
Sex	0.015	0.035	0.005	0.660	0.548	0.042	0.145	<0.001
SEP	0.034	0.008	0.044	<0.001	-0.056	0.010	-0.059	<0.001
Western Immigrant	0.091	0.073	0.018	0.214	0.004	0.088	0.001	0.965
Non-Western Immigrant	-0.106	0.050	-0023	0.034	-0.030	0.060	-0.005	0.617
Sex x Western Immigrant	-0.232	0.105	-0.033	**0.028**	0.022	0.126	0.003	0.864
Sex	0.007	0.035	0.002	0.838	0.540	0.042	0.143	<0.001
SEP	0.034	0.008	0.044	<0.001	-0.056	0.010	-0059	<0.001
Western Immigrant	-0.020	0.053	-0.004	0.712	0.014	0.064	0.002	0.825
Non-Western Immigrant	-0.044	0.067	-0.010	0.508	-0.068	0.080	-0.012	0.398
Sex x Non-Western immigrant	-0.136	0.099	-0.021	0.168	0.084	0.118	0.010	0.478
Sex	-0.010	0.033	-0.003	0.761	0.550	0.039	0.146	<0.001
SEP	0.034	0.009	0.044	<0.001	0.096	0.009	0.113	<0.001
Western Immigrant	0.061	0.391	0.012	0.877	-0.290	0.468	-0.048	0.535
Non-Western Immigrant	-0.106	0.050	-0.023	0.033	-0.031	0.060	-0.006	0.603
Western immigrant x SEP	-0.005	0.025	-0.016	0.836	0.020	0.030	0.146	**<0.001**
Sex	-0.010	0.033	-0.003	0.762	0.550	0.039	0.146	<0.001
SEP	0.034	0.009	0.044	<0.001	-0.062	0.011	-0.065	<0.001
Western Immigrant	-0.020	0.053	-0.004	0.711	0.013	0.064	0.002	0.832
Non-Western Immigrant	-0.045	0.331	-0.010	0.892	-0.574	0.396	-0.102	0.147

Non-Western Immigrant x SEP	-0.004	0.022	-0.013	0.850	0.037	0.026	0.097	0.164

* Unstandardized coefficient; ** Standardized coefficient.
Values calculated using multiple linear regression.
[+] Frequency of consumption, measured in times per week.
Reference category = Girls.
Reference category = Native Belgians. Participant considered Native Belgian if both they and both their parents were born in Belgium.
Participant considered to be a Western or Non-western immigrant if they or at least one of their parents were born in any other Western or Non-Western country, respectively.
SEP graded on a continuous scale from 6-19 based on responses to the Family Affluence Scale (FAS).
SSB = Sugar-sweetened beverages.
Models included variables for gender and SEP, dummy variables for Western immigrant Non-Western immigrant status, covariates age and family status, as well as the interaction term specified for each row of results.