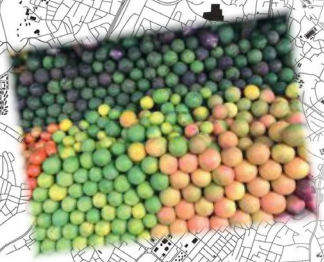
we should be able to decide

Obesogenic factors influencing dietary behaviours of adolescents in Ethiopia



Ursula Trübswasser

Propositions

1. Supported by evidence-based information, a healthy environment and trusting parents, adolescents can make their own dietary choices. (this thesis)

2. Assessing the food environment without the perspective of people living in it, only tells part of a story.
(this thesis)

3. Researchers from high-income countries can add value to research in low- and middle-income countries only when they are aware of their limitations and privileges.

4. The lower the funding for research, the more focused, creative, and hands-on researchers have to be.

5. Eating and sharing diverse foods in different cultures not only feeds but nourishes.

6. Women cannot have it all, neither can men, but if men had less, everyone would have more.

Propositions belonging to the thesis, entitled

"We should be able to decide" - Obesogenic factors influencing dietary behaviours of adolescents in Ethiopia

Ursula Trübswasser

Wageningen, 8 July, 2022

“We should be able to decide”
Obesogenic factors influencing dietary behaviours of adolescents in Ethiopia

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This research was conducted under the auspices of the Graduate School VLAG (Advanced Studies in Food Technology, Agrobiotechnology, Nutrition and Health Sciences)

“We should be able to decide”

Obesogenic factors influencing dietary behaviours of adolescents in Ethiopia

Ursula Trübswasser

Thesis

submitted in fulfilment of the requirements for the degree of doctor at Wageningen University
by the authority of the Rector Magnificus,
Prof. Dr A.P.J. Mol,
in the presence of the
Thesis Committee appointed by the Academic Board
to be defended in public
on Friday 8 July 2022
at 11 a.m. in the Omnia Auditorium.

Ursula Trübswasser
"We should be able to decide" - Obesogenic factors influencing dietary behaviours of women and adolescents in Ethiopia
204 pages

PhD thesis, Wageningen University, Wageningen, the Netherlands (2022)
With references, with summary in English

ISBN: 978-94-6447-214-1

DOI: https://doi.org/10.18174/568896

To Mathilde and Felix

CONTENTS

ABBREVIATIONS AND ACRONYMS

AGP	Agricultural Growth Programme
AMICYN	Adolescent, Maternal, Infant and Young Child Nutrition
BMI	Body Mass Index
CASP	Critical Appraisals Skills Programme
DDS-W	Dietary Diversity Score for Women
EFDA	Ethiopian Food and Drug Administration
ENTREQ	Enhancing Transparency in Reporting the Synthesis of Qualitative Research
Food-Epi	Healthy Food Environment Policy Index
FV	Fruits and vegetables
FNP	Food and Nutrition Policy
GDR	Global Dietary Recommendations
GIS	Geographic Information System
GPS	Global Positioning System
GS	Government school(s)
GTP	Growth and Transformation Plan
INFORMAS	International Network for Food and Obesity/Non-Communicable Diseases Research, Monitoring and Action Support
IFPRI	International Food Policy Research Institute
LMIC	Low- and Middle-Income Country/ies
MDD-W	Minimum Dietary Diversity for Women
NCD	Noncommunicable Diseases
NNP	National Nutrition Program
NSA	Nutrition Sensitive Agriculture
NSAP	National Strategy Action Plan
PS	Private school(s)
PSNP	Productive Safety Net Programme
QES	Qualitative Evidence Synthesis
S.E.	Standard Error
SES	Socio-economic status
SD	Standard Deviation
SSB	Sugar-Sweetened Beverages
UNICEF	United Nations Children's Fund
WHO	World Health Organization
WRA	Women of Reproductive Age

CHAPTER 1

General introduction

BACKGROUND

Problem of malnutrition

Malnutrition affects many people around the world. Globally, in 2020 around 149.2 million children under 5 years of age were stunted and 45.4 million were wasted. In the same year, 38.9 million children were overweight and 570.8 million girls and women of reproductive age were anaemic. Overweight and obesity affects 2.2 billion adults and rates are rising in every part of the world, with no country successfully reversing this trend.[1]

Most children with malnutrition live in sub-Saharan Africa and Asia.[2] Also, the burden of overweight and obesity is not equally distributed, as more than 70% of all adults with overweight and obesity live in low- and middle-income countries (LMIC).[3] Furthermore, women in LMIC have a higher overweight and obesity prevalence than men in LMIC.[4,5]

Adolescents (age 10–19 years) are also affected by different types of malnutrition. The prevalence of overweight in adolescent boys increased from 14.4% in 2010 to 20.2% in 2019 and in girls from 13.8% to 18.4% in the same period. One study estimated that in 2016 a total of 324 million adolescents between 10 and 24 years of age were overweight.[6] Simultaneously, anaemia affected 430 million adolescents globally in 2016, which is an increase of 20% from the 357 million in 1990.[6] Although thinness in 2010 declined from 12.3% to 7.9% in girls and from 13.4% to 8.1% in boys, it remains high.[1] Similar to the adult population, adolescents in Asia and Africa are most affected by malnutrition, with more girls affected by overweight and obesity.[5,7-10]

This co-existence of over- and underweight in the same population, also termed the double burden of malnutrition, affects most LMIC. The focus of this thesis is on overweight and obesity, which has been associated with multiple causes.

Causes of overweight and obesity

Overall, the factors leading to overweight or obesity include: unhealthy eating patterns; lack of physical activity; increased sedentary behaviours and short sleep duration; stress; environmental pollutants; genetic, pre-natal, parenting and family factors; social norms; and physical activity and food environments.[4,11,12]

Pre-natal factors are related to the nutritional status of mothers, with children of overweight or obese women tending to have higher birth weights and more body fat, leading to increased risk of developing obesity later in life.[13] Furthermore, stunted or underweight children are also more likely to be overweight as adults due

to lower energy expenditure, higher susceptibility to the effects of a high-fat diet and impaired regulation of food intake or food assistance programmes, especially in urban LMIC settings where energy-dense food becomes increasingly available.[14-16]

Overweight and obesity are also associated with socio-economic status and, depending on the income level of the country, these associations are shifting.[17]In LMIC, the more affluent and/or those with higher educational attainment are more likely to be obese, but with increasing income level of a country the burden of obesity shifts to the poor.[18] Urbanization and the physical environment have also been associated with overweight and obesity, the highest prevalence being in LMIC but also in urban areas of sub-Saharan Africa.[4,19,20]

Although the causes of malnutrition are complex, an unhealthy diet remains one of the key contributors, with data from the last 10 years showing that diets have only improved marginally.[1] Globally, the intake of some healthy foods (whole grains, fruit and vegetables) has increased slightly but fish and legume intake remains sub-optimal. Furthermore, sugary drink intake and red and processed meat consumption increased between 2010 and 2018.[1]

The diets of adolescents in LMIC are also reported to be inadequate, seeming to be predominantly cereal-based and limited in terms of animal-sourced foods, fruit, and vegetables. Particularly in urban areas, an increased consumption of processed energy-dense and nutrient-poor foods and drinks has been reported.[21,22] A literature review by Keats et al.[21] found that 4% of adolescent girls consume sugar-sweetened beverages (SSB) daily and 49% weekly. In LMIC, street foods high in unhealthy fats, sugar and salt contribute 12–40% of children's energy intake.[19] Among adolescent girls from LMIC, 20% consume fast food daily and 32% consume these foods two or three times a week.[21] Consumption of fast foods and other processed foods has increased particularly among school-age children and adolescents in urban areas of LMIC.[23]

Adolescence: An important period for dietary behaviours

Adolescence encompasses a period defined by rapid physical growth, psychological and behavioural changes and major social role transitions, and is most commonly defined as covering the age range of 10–19 years.[24] This period is very important in terms of nutrition because the nutritional requirements are increased.[25] It is also a time when dietary preferences and habits are formed[26] that can impact adolescents' future health and nutrition, as well that of future generations.[26-28]

Certain behaviours of adolescents could be detrimental to their health, such as a preference for processed, fast and snack food, a low vegetable and fruit intake and the skipping of meals.[29] Snacking in children and adolescents aged 5–19 years has

been associated with poor dietary patterns and increasing obesity trends.[23] Adolescents' preference for unhealthy foods and beverages,[30] their desire for autonomy, motivation to gain social status,[31] risk aversion or lack of motivation for long-term health consequences[32] and exposure to advertising of unhealthy foods and beverages[33,34] can all negatively influence their diets.

Causes of unhealthy diets

Causes of unhealthy diets can best be described using the socio-ecological framework (Fig. 1.1), categorizing factors into individual-, social-, physical- and macro-level factors.[35]

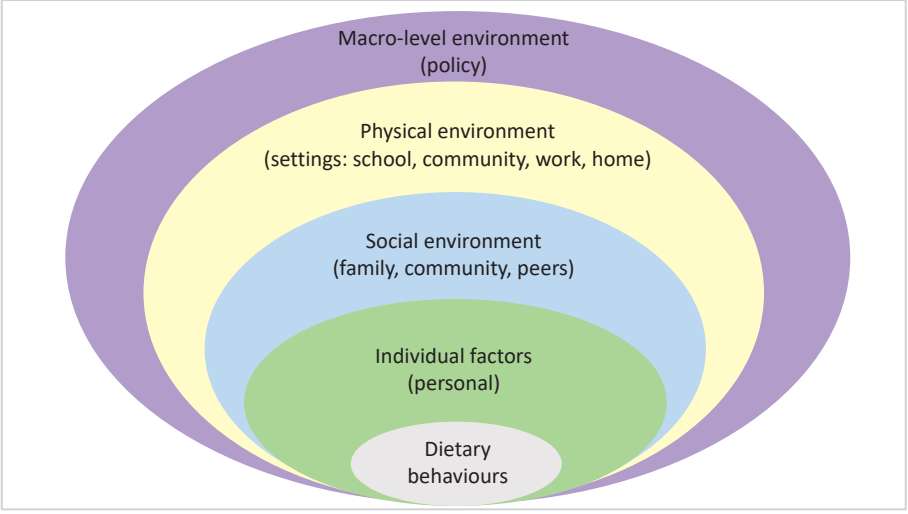

Figure 1.1. Socio-ecological framework

Individual-level factors

At the individual level, biological factors, preferences, habits, and socio-economic status are important factors for dietary behaviours. Specific to the African setting and adolescent girls and women, one review identified 17 determinants of diet and related behaviours, mostly related to individual and household food environments; determinants included perceptions of body image and diet, nutrition-related knowledge, dietary behaviours and preferences, such as meal skipping or snacking, and socio-economic factors such as education and food expenditure.[36] With regard to adolescents, preferences, habits, social norms and biological factors play an important role. Especially in LMIC, a preference for 'modern food' was associated with higher perceived social status. A South African study found that adolescents

who purchased and consumed non-traditional foods were perceived to have better social standing whereas those consuming traditional foods faced ridicule;[37] therefore, adolescents might choose to spend the small amount of money they have on snacks.[31]

The socio-economic status and income of an individual or household also determine which foods are affordable. A review on the dietary behaviours of African women found that higher status was associated with higher fruit and vegetable consumption and dietary diversity.[36] In contrast, lower socio-economic status and limited affordability of foods were associated with lower diversity. A study on women in Kenya found that food affordability was the most important factor for women living in urban informal settlements.[38] In addition, healthy foods are often more expensive than unhealthy foods and the cost of a healthy diet is beyond most people's purchasing power. Globally, the cost of a healthy diet was estimated to be 3.27–4.57 USD per day, which is above the international poverty line of 1.90 USD. Three billion people globally are not able to afford the cheapest version of a healthy diet, of which most live in Southern Asia (1.3 billion) and sub-Saharan Africa (829 million).[39] For adolescents, access to food depends on food-purchasing decisions taken by caregivers and guardians, but also on the level of autonomy they can exercise with potential pocket money.[30]

Social-level factors

At the social level, the influences of family, peers, friends and the broader community are crucial because the gender roles and norms that girls and women have to fit into could influence their food choices or body image.[36] Parents can play the role of gatekeepers for adolescents, but this changes as the children get older and gain increasing autonomy and agency to make and act on decisions and also as their peers become more influential.[29-31] While parental influence is associated with healthier options, peer influence has been linked to unhealthy foods and beverages such as SSB and energy-dense foods.[40,41] Studies suggest that the availability and accessibility of healthy or unhealthy foods within the home promotes the consumption of these foods in adolescents.[42,43] Furthermore, more permissive parenting styles predicted a higher intake of sugary drinks.[41] Social pressure linked to certain foods and beverages could also influence parents of adolescents to purchase unhealthy food items for their children, despite their knowledge and preference for healthy diets.[37]

Physical-level factors

The physical environment in which people live is an important determinant of dietary choices. Food environments are central components of food systems, where people interact with the food system by purchasing, preparing, and consuming food.

The main elements of the food environment are availability, physical and economic access, promotion, advertising and food quality and safety.[44]

Food environments in urban areas of LMIC have been changing with the expansion of modern retail,[45] the growing availability of ultra-processed, energy-dense, nutrient-poor foods[46] due to expansion of transnational food and beverage cooperations into emerging markets and the globalization of food trade.[47] In South Africa, for instance, the supermarket sector was estimated to account for 75% of all grocery sales.[48] While supermarkets provide lower prices and potentially better hygiene for many products, they also provide ultra-processed foods. However, especially in LMIC, traditional outlets and open markets offer fresh produce at lower prices than supermarkets.[49-51]

The different elements of the food environment (availability, accessibility, affordability, convenience and safety) have been associated with dietary outcomes.[52,53] A review on qualitative studies from high-income countries found that availability, accessibility and affordability determined store choice, purchasing behaviour and food choice.[53] Studies in high-income countries also defined and categorised different retail outlets. For instance, corner stores and convenience stores were described as having less variety and fewer or no healthy items compared to supermarkets.[53] Challenges to the access of stores due to lack of transport puts lower socio-economic groups in particular into so-called 'food deserts', where residents cannot access affordable, healthy food.[54] However, in LMIC, small shops, informal vendors or open markets are important outlets to access affordable food.[55,56] In Brazil, for instance, the availability of fruit and vegetables in the retail food environment was associated with higher fruit and vegetable consumption.[57] Similarly, a higher availability of SSB was associated with increased SSB consumption.[57] Eating outside the home was associated with lower vegetable consumption but also more diverse diets.[36] Furthermore, in LMIC, street food is a major contributor to the total intake of fat, trans-fatty acids and sugar[58] and has also been associated with food safety concerns because it is often prepared and sold in precarious conditions that lack sanitary surveillance and legal control.[59]

As adolescents get older, their environment expands from their home environment to schools and the retail environment surrounding their schools and homes. Adolescents therefore increasingly consume food out of the home.[32] The availability of unhealthy food options at school in LMIC has been associated with the consumption of these foods, such as soft drinks and deep-fried snack food.[60] On the other hand, private schools in LMIC with cafeterias selling fruit were associated with lower consumption of salty snacks.[42,61]

The food environment is also characterised by food marketing. In low- and middle-income settings, children and adolescents are often targeted by fast-food chains and

transnational industries to expand their markets in these settings.[62] For adolescents, social media is also important; it allows direct marketing and influences community attitudes beyond the physical borders of a neighbourhood or a country.[26,63] Food marketing was found to be directly linked to children's preferences, nutrition knowledge and consumption patterns,[62] increasing unhealthy eating behaviours.[64]

Maco-level factors

Macro-level factors such as urbanization, food supply and national policies also determine food availability. Urban centres are expanding, accompanied by improved access to electricity, which can increase the shelf life of perishable food, reduce food hazards, and simplify food preparation, leading to changes in consumption patterns. Furthermore, urbanization in Africa is associated with fewer people working in the agricultural sector,[65] thus individual energy requirements are reduced but, at the same time, the demand for convenience food by working people with limited time to spend on food preparation is increased.[66,67] Urban diets therefore include more fast food, street food and ultra-processed food and beverages that contain high levels of salt, sugar and undesirable fats,[68] which replace traditional diets.[46] A review of food environments in LMIC identified positive associations between levels of urbanization and the availability of market-based food vendors, such as fast-food restaurants, full-service restaurants and supermarkets.[69]

In addition, the current food supply does not meet the dietary needs. Fruit and vegetable availability, for instance, cannot meet the population needs to achieve the dietary recommendations in most countries. Based on current World Health Organization (WHO) recommendations of 400g per day, the production of fruit and vegetables is 22% below global population requirements and 58% below consumption needs in low-income countries.[3,66] In contrast, staple cereal, oil and animal-source food availability has increased worldwide.[66]

Available tools to identify factors influencing obesogenic diets

The food environment can be assessed in objective or perceived terms. Objective measures can assess proximity or density of different outlets (availability), distance to different outlets, convenience, and available transport (accessibility), prices of different food items and beverages at different outlets or neighbourhoods, store audits of food prices (affordability) and type, proximity and density of advertising. However, different methods might be necessary for different food environments. Downs et al.[70] defined natural food environments as wild or cultivated and built environments as either informal or formal market environments. Most food environment assessments have been developed, conducted and validated in high-income countries, where food environments are mostly formal and not as diverse

as in LMIC[71,72] There is therefore little knowledge of the influence of food environments on diets or nutritional outcomes in LMIC, even though food environment research is increasingly taking place in LMIC.[69,73]

The food environment can be mapped with geographic information system (GIS)-based methods to assess the density or proximity of different categories of outlets.[69] One of the first methods to assess specific elements within the food environment was developed by Glanz et al.[74] as part of the Nutrition Environment Measure Survey (NEMS). The NEMS tools assess the availability of specific foods within a store, using store inventories to categorise vendors according to food items based on American diets. In 2013, the International Network for Food and Obesity/Non-Communicable Diseases Research, Monitoring and Action Support (INFORMAS) developed a comprehensive set of tools to measure different dimensions of the food environment, such as food composition, labelling, promotion, provision, retail, prices, trade, and investment.[75] Since then, several tools to assess prices and affordability have been developed, such as the Cost of a Healthy Diet tool,[71] which collects prices for least-cost items available in local markets to meet the national food-based dietary guidelines in order to calculate the cost of a healthy diet.[39]

Although there is a range of measures and tools available, no standardised measure for food environment assessments exists. In LMIC especially, methods for the evaluation of different dimensions of informal market food environments are scarce.[71] A review of food environment studies in LMIC concluded that most studies used quantitative GIS-based methods to describe or analyse the food environment in terms of availability (vendor counts or densities), and only half of them tested associations with diet, nutrition or health outcomes.[69]

Perceptions of consumers can be assessed using questionnaires containing different items related to accessibility of outlets and availability, affordability or desirability of healthy foods that respondents rank on a scale.[72,76,77] Qualitative methods to capture perceptions and people's lived experience of food environments include in-depth interviews, group discussions, visual or geospacial methods, observations of routines and practices, and participatory action research methods such as Photovoice.[78] Studies using perceived measures of the food environment are limited compared to those that use GIS-based methods and are mostly focused on high-income countries. In LMIC, only two studies were identified that assessed perceived availability.[69] Furthermore, mixed-method studies in food environment research have been underutilised[69] and quantitative methods are often not linked with consumer surveys or interviews,[71] risking to homogenise neighbourhoods while ignoring the lived realities of residents.[79] Our study therefore aimed to use a mixed-method approach to assess the food environment in terms of perceived and objective measures that includes GIS-based methods as well as people's lived experiences.

Policy action to prevent obesogenic behaviours

Several policy actions have been identified to promote healthy diets that are high in quality, safety and nutrients but limited in nutrient-poor refined foods high in sugars, fats and/or salt, including ultra-processed foods.[80-82] Policy actions can address the different levels of influence described in the socio-ecological framework above (Fig 1.1). For instance, at the individual level, approaches such as education and raising public awareness using counselling or behaviour change communication can be promoted to increase the appeal of nutritious foods. Such actions targeting the individual as opposed to physical- or macro-level factors are prioritised in most countries.[83,84]

Policymakers can also reshape food environments using a variety of policy actions, such as taxes on unhealthy foods and beverages to decrease the affordability of SSB, for example.[80] Food provision in schools and public institutions can contribute to improved access to nutritious food and reduced access to unhealthy food. Furthermore, regulations related to the marketing of unhealthy foods and beverages or food labelling could reduce the appeal of unhealthy food.[81,82,84]

Price interventions, taxation and subsidies, food provision in school settings, product reformulation to reduce sugar, fats and salt and reducing package sizes were all found to be effective at changing consumer behaviour and dietary intake:[84,85] For instance, the Mexican soda tax implemented in 2014 showed a 12% reduction in the consumption of taxed beverages over a one-year period; and the junk food tax in Mexico showed a 5% reduction in consumption of the taxed foods.[85] Despite the evidence for policy action addressing the food environment, action on availability, processing and marketing have been limited in LMIC.[73,83] At the macro level, actions could promote the agricultural production of certain crops through subsidies or by improving the supply of nutritious foods through international trade. Also, technology and research could be geared towards breeding, storage, transport, and the processing of healthy foods.

A study assessing policy actions to promote healthier diets in 144 countries identified 36 countries with explicit actions in their policies to increase fruit and vegetable intake,[86] 20 countries with actions aimed at addressing dietary fat consumption and 23 countries with actions to limit salt intake.[86] The Healthy Food Environment Policy Index (Food-EPI) assesses the extent of implementation of recommended food environment policies compared with international best practices; by 2018 it had been implemented in 11 countries, of which most implement one or two key policies rather than a comprehensive policy package across all areas of the food environment to promote healthy diets.[87] In Ghana, for instance, three-quarters of all good practice indicators were assigned a 'low' rating

in relation to international best practice.[88] In Kenya, where nutrition-related non-communicable diseases were recognised as a growing problem, one-third of all areas were in the implementation phase.[89] Furthermore, most food-related policy actions were identified as biased towards undernutrition and food security, and as curative rather than preventative.[90]

For adolescents, policy action traditionally focused on micronutrient supplementation but increasingly actions are directed more broadly at healthy diets; however, this is mostly in high-income countries. For instance, European countries have taken action to tackle the digital marketing of unhealthy products to adolescents.[91] Many of the successful and large-scale adolescent nutrition programmes in LMIC focus on micronutrient deficiencies, especially anaemia reduction through weekly iron and folate distributions, but also on diets overall and undernutrition. Fewer policies and interventions address overweight and obesity in adolescents in LMIC.[92]

Situation in Ethiopia

Setting: Urban Ethiopia

Ethiopia has one of the fastest growing economies in East Africa, with rapidly growing urbanization.[93] In 2014, 19% of Ethiopians were living in urban areas and it is estimated that the urban population will triple by 2034.[94] In 2015, more than 80% of the urban population lived in secondary cities and towns of less than 0.5 million people.[68] Almost one-quarter of all people in Ethiopia who live in urban areas reside in Addis Ababa, the capital city. Addis Ababa is home to about 5 million people and this figure is estimated to reach 9 million in 2035.[95]

Malnutrition in Ethiopia

Malnutrition is a major public health problem in Ethiopia. Until recently, undernutrition and micronutrient deficiencies were dominating, but overweight and obesity rates, especially in adult women in urban areas, are increasing.[96-99] While the national average of overweight and obesity remains low (3% in men and 8% in women), a review of studies, mostly on urban adults in Ethiopia, found prevalences ranging from 4.7% to 40.1%. The estimated pooled prevalence rate was 19%.[98] A study in Addis Ababa found the rates of overweight and obesity in adults to be 21.5% and 2.9%, respectively.[100]

Together with the persistent prevalence of underweight, Ethiopia is affected by a double burden of malnutrition. In Addis Ababa, overall, more than one-third (34.7%) of women were estimated to be either under- or overweight in 2014.[101]

A recent study on adolescents aged 10–18 years in Addis Ababa found an overweight/obesity rate of 21.2%.[102]

In Ethiopia, women's age, wealth status, educational attainment and urban residence have been associated with being overweight.[98,101,103] These findings suggest changing nutritional and lifestyle trends, the consumption of energy-dense, nutrient-poor foods and less physical activity in urban populations of higher socio-economic status.[103] For adolescents in Ethiopia, studies found associations between overweight and private school attendance, wealth, frequency of meat and fast food consumption and time watching TV or using a computer.[101,104-106]

Diets in Ethiopia

Urban populations in Ethiopia spend more of their income on non-food items and a higher share of their budget on animal products, oils and fats, as well as fruit and vegetables.[107] Although this implies dietary diversity in urban areas is better,[108] the household fruit and vegetable consumption is still below the recommended amount.[109]

Studies with Ethiopian adolescents indicated sub-optimal intakes of micronutrient-rich fruit and vegetables and protein-source foods but substantial intakes of salted snacks, cookies, sweets and fizzy drinks, especially in urban and affluent settings.[110] A 35% increase in the sugar consumption of adolescents over the past 15 years has been observed[111] and another study reported that 22.7% of adolescents consumed SSB at least once in a week during the previous three months.[112] The latter study was conducted in a small town, so this percentage could be even higher in bigger cities. However, the causes of unhealthy dietary behaviours have not yet been studied in adolescents.

Food environment in Ethiopia

Food environments in Ethiopia have changed in recent years in terms of food availability, prices, and retail outlets. The availability of foods is determined by the agricultural production, which significantly increased between 2011 and 2015.[113] However, this increased production stems primarily from the cereal sector at the expense of other food groups, leading to lower production diversity.[113] This lack of diversity can in turn affect what foods are available or affordable at market level.

Prices of nutrient-dense foods such as fruit, vegetables and unprocessed meat increased by 21–74% in the period 2005–2018, whereas prices of sugar, oils and fats declined by 41–49%.[114] This higher cost of nutrient-dense foods such as fruit and vegetables makes them unaffordable, especially to the poorest households in Ethiopia.[115]

With regard to retail development, Ethiopia has a unique situation because direct foreign investments are not allowed, which has kept multinational retail chains from entering the country.[116] Food retail outlets in Addis Ababa include a mix of private modern retail, public cooperatives and small informal vendors. The importance of these outlets differs depending on the food products, as many of them are specialised, such as millers and butchers. Higher-end retail entails increasing private modern retail selling high-quality products, whereas the lower end includes cooperatives that sell subsidised and price-controlled products such as sugar, flour, and oil. The prices and quality of food in the different outlets vary: for instance, white wheat flour costs almost twice as much in modern retail compared to local flour mills; and fruit and vegetables sold at modern retail outlets are commonly more expensive and of better quality.[116]

RELEVANCE AND OBJECTIVES OF THE THESIS

Relevance

It is expected that adolescents' dietary behaviours will be influenced by the income, practices, and nutrition knowledge of their family, as adolescents have limited decision-making power in Ethiopia. To a certain extent, their choices should also be influenced by what is available, affordable, or advertised in the food environment. The different spheres that are expected to influence the adolescents' diets can be seen in the socio-ecological framework mentioned above (Fig. 1.1). However, the impact of all these factors on adolescents' diets has not yet been studied in Ethiopia.

Adolescents have been mostly neglected in the global priority setting,[26] which could be due to the limited data available on adolescents' diets and nutritional status.[31] Even less research is available on the causes and consequences of dietary behaviours and malnutrition at individual, household, community and national level, especially related to overweight and obesity.[21,26,92] Overweight and obesity in adolescents has therefore been identified as a key area for further research considerations, especially in the African and Asian contexts.[92]

Increases in overweight and obesity are part of the global nutrition transition, which is starting slowly in Ethiopia, making it an important time to look at influencing factors in the environment and identify potential entry points for interventions before the situation worsens. Given that no country in the world has been able to reverse the upward trend in obesity rates, it is even more important to address overweight and obesity before it becomes a societal problem in Ethiopia. This research is therefore aimed at assessing the different influencing factors and how they are addressed in current policies.

Objectives

The overall objective of this thesis is to understand the factors influencing dietary behaviours of women and adolescents in LMIC, and specifically of adolescents in Ethiopia. Additionally, it aims to explore how these adolescents perceive their food environment and how policies address the different factors of the food environment.

In this thesis the following objectives will be addressed:

1. To synthesise the qualitative evidence on factors influencing obesogenic behaviours among women and adolescent girls in LMIC (**Chapter 2**).
2. To assess factors influencing the dietary behaviours of adolescents in Addis Ababa, Ethiopia (**Chapter 3**).
3. To assess whether food environments in and around schools in urban Ethiopia influence the dietary diversity, purchasing behaviour and body mass index (BMI) status of adolescents (**Chapter 4**).
4. To assess how different food environment domains have been addressed in Ethiopian policy goals and actions over time and how they compare with global good practice benchmarks (**Chapter 5)**.

Framework used in the research

The main underlying framework used for this study was the socio-ecological framework defined by Bronfenbrenner[117] and a framework developed by Story et al.,[43] which has also been adapted to the African context.[118] These frameworks are all based on a similar structure, with the individual at the centre, influenced by factors from the individual-, social-, physical- and macro-level environments.[119]

With regard to the food environment, there are different ways of framing it: Glanz et al.[74] defined the different influencing environments, such as consumer, community and organizational, whereas Turner et al.[69] divided the food environment into external and personal. While most public health nutrition disciplines take a socio-ecological approach,[35,119,120] agricultural and food system disciplines tend to focus more on the physical food environment located in the food system, which could affect the dietary outcomes of individuals.[44,52,119] While all these frameworks represent mostly the same factors, food system frameworks tend to exclude the influence of social factors.[119]

The different chapters of this thesis address different levels of the socio-ecological framework (Fig. 1.1): the evidence synthesis described in **Chapter 2** uses the socio-ecological framework as a starting point but deconstructs it, together with frameworks designed to understand the influencing factors of physical activity behaviours, and then develops a data-driven framework based on the findings; the

study in **Chapter 3** uses the socio-ecological frameworks developed by Story et al.[35] and Ossei-Kwasi et al.[118] in the design and analysis; **Chapter 4** mostly focuses on mapping the physical environment and understanding its influence on individual factors and dietary behaviours; and **Chapter 5** focuses on the physical environment, applying frameworks specific to food environment policies.[44,121]

RESEARCH METHODOLOGIES

This thesis applied a mixed-method research approach, employing both quantitative and qualitative methods. For **Chapter 2**, a qualitative evidence synthesis (QES) was used to bring together the different types of qualitative evidence; QES is an umbrella term for the methodologies associated with the systematic review of qualitative research evidence.[122] This systematic review followed a framework synthesis methodology to extract, analyse and synthesise the qualitative data from primary research studies.[123]

For **Chapter 3**, we applied participatory action research using the Photovoice method, in which participants take photographs of their local environment to document and represent their community in relation to a specific topic. The three-staged approach includes individual and/or group discussions to select (i.e. choose the photographs that best reflect the topic), contextualise (i.e. explain the context of the photographs) and analyse (i.e. identify the issues, themes and emerging theories) the photographs.[78,124]

A cross-sectional approach was used for **Chapter 4**. Using interview-administered questionnaires, participants were interviewed on socio-demographic characteristics and food consumption. Height and weight were also measured to assess the BMI status. In addition, the food environment in and around selected schools was assessed using protocols from INFORMAS to measure food environments that contain elements on food advertising and types of food outlets.[125]

For **Chapter 5**, a policy analysis was conducted using the on the INFORMAS Food-EPI framework as a basis.[121] This study analysed Ethiopian policy documents with regard to policy actions addressing food environments and the respective dietary and nutritional goals. The documents were outputs of decision-making[126] and included legal outputs (from the highest to lowest hierarchy: proclamations, regulations, directives), documents stating overarching government plans (policies and strategies) and sectoral documents proposing policy actions to implement policy goals (sectoral strategies, action plans, programme documents or guidelines).[127]

Chapter 6 provides a general discussion of the main chapters (Chapters 2–5), synthesizing the key findings and reflecting on the methodologies used and future research and policy actions.

OUTLINE OF THIS THESIS

Table 1.1 provides an overview of the main chapters, summarizing the objectives and methods used in this thesis.

Table 1.1. Overview of thesis chapters and methodologies

Chapter	Objective	Setting and population/ study material	Methodology
2. Factors influencing obesogenic behaviours of adolescent girls and women in LMIC: a qualitative evidence synthesis	To synthesise the qualitative evidence on factors influencing obesogenic behaviours among women and adolescent girls in LMIC	LMIC; qualitative research studies	Qualitative evidence synthesis
3. Assessing factors influencing adolescents' dietary behaviours in urban Ethiopia using participatory photography	To assess factors influencing the dietary behaviours of adolescents in Addis Ababa, Ethiopia	Two schools in Addis Ababa, Ethiopia; 26 adolescents, 14–19 years old	Participatory action research: Photovoice
4. Adolescents face pervasive advertising and availability of ultra-processed foods and beverages in and around schools in Addis Ababa, Ethiopia	To assess whether food environments in and around schools in urban Ethiopia influence dietary diversity, purchasing behaviour and the BMI status of adolescents	Twelve schools in Addis Ababa, Ethiopia; 217 adolescents, 15–19 years old	Cross-sectional: mapping of school food environment (advertising and food outlets), dietary diversity and BMI of adolescents
5. Benchmarking policy goals and action for healthy food environments in Ethiopia to prevent malnutrition in all its forms	To assess how different food environment domains have been addressed in Ethiopian policy goals and actions over time and how they compare with global good practice benchmarks	Ethiopia; national policy papers	Thematic analysis of policy documents

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CHAPTER 2

Factors influencing obesogenic behaviours of adolescent girls and women in low- and middle-income countries: a qualitative evidence synthesis

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Obesity Reviews
https://doi.org/10.1111/obr.13163

INTRODUCTION

Adolescent girls and women of reproductive age are particularly vulnerable to malnutrition (including undernutrition, micronutrient deficiency, overweight and obesity) due to poor dietary intakes,[1] inequitable distribution of food within households,[2] dietary taboos,[3] and gender inequality.[4] Growth spurts, pregnancy and lactation during adolescence substantially increase nutrient requirements, making adolescents even more at risk.[5] Furthermore, malnutrition can span generations and affect all stages of the lifecycle. For example, women classified as underweight are more likely to give birth to infants with a low-birth weight.[4] Obesity among mothers can also have adverse health effects on new-borns and increase the risk for childhood obesity.[6]

Overweight and obesity are rising in every part of the world, with women and adolescent girls particularly affected, and no country has successfully reversed this trend.[7] Globally, the prevalence of adult women with overweight and obesity increased significantly over a short period of time (from 32% in 2010 to 40% by 2016).[7] This burden is not equally distributed, as more than 70% of all adults with overweight and obesity live in low- and middle-income countries (LMIC).[8] For adolescent girls (aged 15-19 years) in LMIC, more than 10% are classified as having obesity or overweight, with rates either being stagnant or on the rise between 2000 and 2017.[9] This increase in obesity has also been faster compared to adults.[10] As major risk factors for noncommunicable diseases (NCD), overweight and obesity not only affect morbidity and mortality of individuals, but also drive a growing economic burden on health care systems and societies.[11,12]

Recognised drivers of overweight and obesity in LMIC include increasing urbanization, changing food environments with the expansion of modern retail,[13] and growing availability of ultra-processed, energy-dense, nutrient-poor foods.[14] Additionally, rising numbers of women in the workforce increase the demand for convenience foods and out-of-home consumption.[15] Together with reduced physical activity due to more sedentary lifestyles and less conducive built environments,[16] these factors represent important contributors to overweight and obesity.[17,18] Other contributing factors relate to socio-economic status,[19] genetics,[20] stress, early-life undernutrition[4] and cultural beliefs about body size,[21] among others.[22] There is also evidence that food assistance programs, which aim to reduce undernutrition, actually contribute to adult overweight and obesity.[23] For adolescents in particular, exposure to food and drink advertising, and the role of the family/home environment, as well as the school environment, are important influences on overweight and obesity.[24,25]

Obesogenic behaviours are promoting or contributing to obesity through unhealthy diets, physical inactivity, or high sedentary behaviours. Despite the apparent rise of

overweight and obesity in LMIC, most research on obesogenic behaviours has been conducted in high-income countries. Furthermore, previous systematic reviews focused only on Africa,[26–28] on diets of adolescents in LMIC,[1] on young children,[29,30] and on adolescents[31,32] or on considerations for interventions to prevent overweight and obesity.[21,33] Little of this evidence stems from qualitative research[26–28] as primarily this prior research was aimed at quantifying the influence of different drivers. This limits the understanding of the specific factors influencing obesogenic behaviours in LMIC settings,[34] which are experiencing rapidly transitioning obesogenic environments and changing behaviours. To address these changing behaviours effectively with interventions throughout the lifecycle, a better understanding of how and why adolescent girls and women of reproductive age (WRA) make their dietary choices is urgently needed. A synthesis of primary qualitative research studies would elicit multiple perspectives, views, beliefs, and priorities in relation to such influencing factors, and would go beyond the existing evidence. This review aims to serve this purpose and address these knowledge gaps, by synthesizing the qualitative evidence on factors influencing obesogenic behaviours among adolescent girls and WRA, specifically in LMIC.

METHODS

To identify factors influencing obesogenic behaviours in adolescent girls and WRA (aged 10-49 years old) in LMIC we applied a qualitative evidence synthesis (QES). QES is an "umbrella term for the methodologies associated with the systematic review of qualitative research evidence".[35] It refers to all methods that bring together different types of qualitative evidence. In this QES we perform a systematic review following a framework synthesis[36] methodology to extract, analyse and synthesise the qualitative data from primary research studies. This method helps connect and integrate findings from included primary research studies with existing theory.[36] For our review, it involved two complementary tasks of i) identifying existing frameworks and theories and ii) identifying eligible studies.[37] The protocol was documented according to PRISMA-P guidelines[38] and registered a priori to describe detailed inclusion criteria and analytic methods (PROSPERO CRD42019134044; available from: https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42019134044). The Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ) statement was followed to report this qualitative evidence synthesis.[39]

Theoretical framework

We aimed to identify existing frameworks and theories that conceptualised how factors influence the following obesogenic behaviours: unhealthy diets and physical inactivity. We searched for existing frameworks using a within-topic search[40] on MEDLINE using the below described search strategy (supporting material 1)

together with the following search syntax: framework* OR theor* or model* or concept*. We did not limit ourselves to the "Low- and Middle-Income Countries" concept to allow for inclusion of frameworks developed for various contexts.[41] This scoping search identified six frameworks. Four of them were adaptations of the socio-ecological framework;[42–47] two of the frameworks on physical activity and sedentary behaviours were structured differently.[48,49] None of the individual frameworks were sufficiently comprehensive to capture factors influencing obesogenic behaviours.[36] We therefore deconstructed the six identified frameworks[44,46–50] into individual constructs and fitted them within the levels of influence (individual, social, physical, macro) of the socio-ecological framework,[45] which has also been previously adapted for dietary factors in the African context.[50] Subsequently, by merging or renaming these constructs, an a priori meta-framework was developed including a total of 78 constructs across the four levels of influence (appendix 2.2). Constructs were omitted when they were not applicable to our research question, such as those relating to different age groups (geriatric syndromes/sarcopenia[48]).

Identification of eligible studies

Search strategy

To identify eligible studies, searches were conducted in five electronic databases: Web of Science (http://www.webofknowledge.com), SCOPUS (https://www.scopus.com), CABI abstracts (https://www.ovid.com/product-details.31.html), MEDLINE (Pubmed; http://www/ncbi.nlm.nih.gob/pubmed), and Psyc-INFO (https://www.ebsco.com/products/research-databases/apa-psycinfo). Google Scholar was searched for grey literature. Subsequently, citation searches were conducted for all included references on Google Scholar. Additional eligible studies were identified from the reference lists of included studies. The initial search strategy was developed in MEDLINE using the Setting, Perspective, Interest, phenomenon of, Comparison and Evaluation (SPICE) model[51] combining search terms for setting (LMIC), perspective (adolescent girls and women of reproductive age, 10-49 years of age), phenomenon of interest (perceptions and/or potential influencing factors of obesogenic behaviours) and evaluation (themes identified from original qualitative research). Scoping searches were conducted in MEDLINE to refine the search strategy, using database-specific indexing terms. The search syntax was further adapted to the specific requirements of each database. A social science librarian provided input into the search strategy. The final search syntax included text words and MeSH terms (appendix 2.1). The search was conducted in May 2019, citation alerts were set up in all the databases and the search was updated in January 2020 to ensure inclusion of relevant publications since the first search.

Eligibility criteria

Studies were eligible if they were conducted in a LMIC (using the World Bank definition of LMIC as of 2019[52]), were of qualitative nature, and included female adolescents or women of reproductive age (10-49 years). The selection of the age group was based on the World Health Organization (WHO) definition of adolescents (10-19 years) and WRA (15-49 years) and the importance of following a lifecycle approach. If studies included a broader age range and/or male participants, verbatim quotations and/or authors' interpretation had to be clearly attributable to girls or women aged 10-49 years to be included. Studies with clinical populations were not included. Phenomena of interest were perceptions related to obesogenic behaviours and/or potential influencing factors of these behaviours of adolescent girls or WRA. Studies had to apply qualitative methods but were only included if qualitative findings were explicitly reported and distinguishable from quantitative data, in the case of mixed methods studies. The review was limited to studies published in English without any restrictions in terms of year of publication. Correspondence, commentaries, and editorials were excluded.

Screening process

All retrieved references were imported into Endnote and, after de-duplication, data on references were imported into Microsoft Excel. One reviewer (UT) conducted title and abstract screening following the eligibility criteria and retrieved and reviewed full texts of selected references for inclusion. To ensure the quality of inclusion, independent reviews at title and abstract screening (28% by KB) and full text screening (22% by KB and LS) were performed by co-authors. In case of disagreement, discrepancies in selection of references were discussed between reviewers. In case of doubt at any stage, the record was carried forward to the subsequent stage. Reasons for exclusion were recorded at every stage of the screening (Figure 2.1).

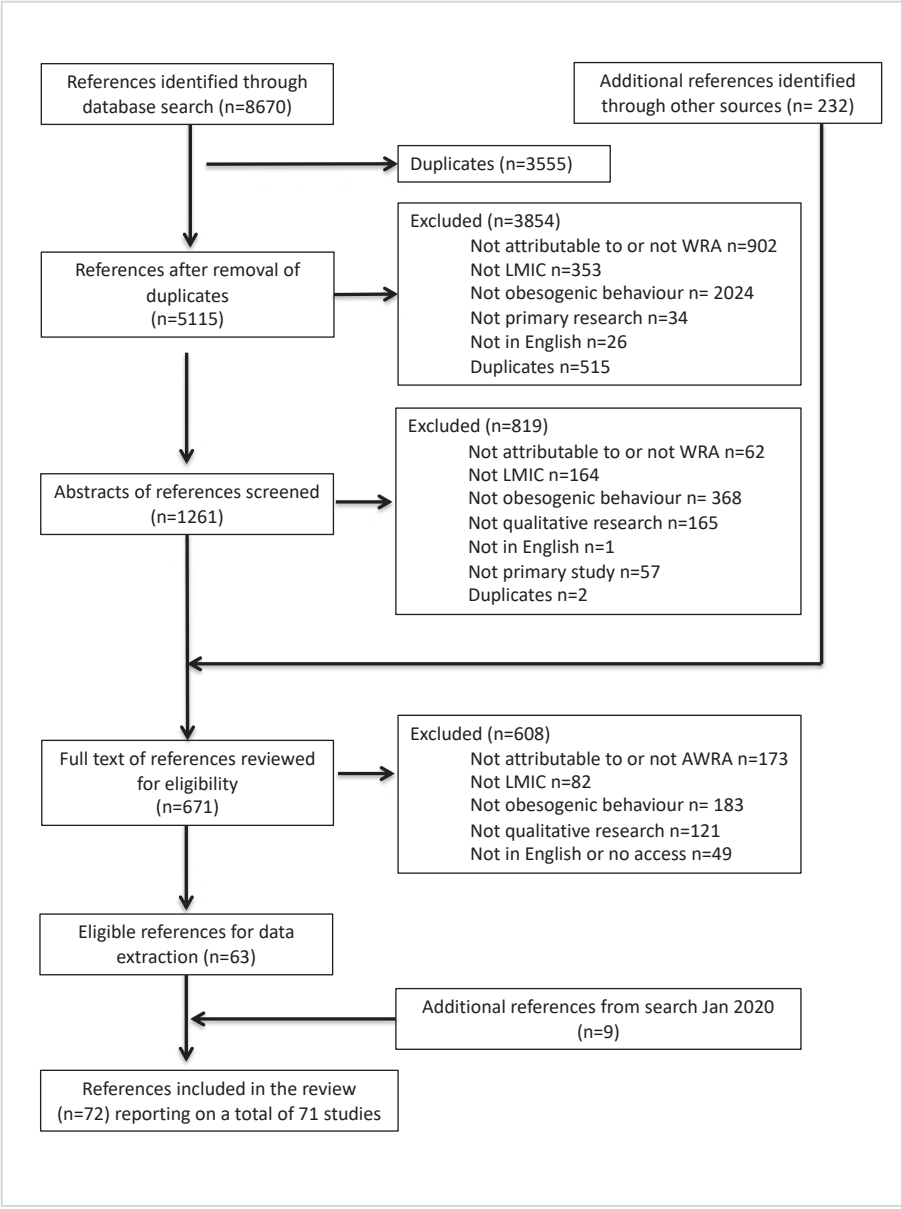

Figure 2.1. PRIMSA chart

Data extraction and coding

Data extraction of the following descriptive characteristics was performed by UT: country/countries in which the study was conducted, income level of the country, setting of the study, characteristics of the participants (including number, age, gender in case of inclusion of a male population), and type of obesogenic behaviour. The a priori defined meta-framework (appendix 2.2) was used to code data, including verbatim quotations from participants as well as author interpretations, on influencing factors. Coding was performed independently by UT and the review team (KB, LS, MH and RV) in NVivo (12.5.0), and followed a stepwise approach. First, the coding framework was piloted by coding data from two papers (UT, RV, MH, LS, KB) which was further refined based on discussions. Subsequently data of all included references were coded against the constructs of the meta-framework Finally, 11 of these coded references were checked by co-reviewers to ensure quality control and harmonization of coding. Discrepancies were discussed and addressed in coding the remaining references.

Quality assessment

Methodological quality of included references was assessed using the Critical Appraisals Skills Programme (CASP) checklist for qualitative research assessing validity of the results, the analysis and reporting of the data and the value of the research.[53] One reviewer (UT) assessed all references and to ensure a consistent application of the CASP criteria, two reviewers (AB and RV) independently assessed 10% of the verdicts. Studies were not excluded based on their quality, but a sensitivity analysis was conducted to evaluate the relative contribution of quality on the review findings.[54]

Data analysis and synthesis

The analysis used a deductive approach by systematically coding data with the a priori constructs included in the meta-framework (appendix 2.2) and was complemented by an inductive approach when data did not fit the meta-framework. All coded quotations, including memos written throughout the coding process, were then analysed to identify themes inductively. Themes were then iteratively rearranged by refining and merging overlapping themes. Based on themes, a summary of findings was prepared for review by all authors. Identified themes were visualised in the data-driven socio-ecological framework (Figure 2.2). Appendix 2.3 provides an overview of all identified themes and studies supporting them.

Sensitivity analyses were conducted for a number of sub-categories, such as study quality (high or low), population (adolescent girls or adult women), continent

(Africa, Asia, or South America) and setting (rural or urban) in order to identify themes specific to those categories. This was conducted by bringing together and analysing data within these subgroups; quotes were rearranged by subgroup highlighting more granular findings. The additional eligible references identified through the search update were added to the synthesis in January 2020; they were coded and analysed for new emerging themes or for strengthening existing ones and underwent quality assessment.[55]

RESULTS

Results of the data synthesis are presented by level of the socio-ecologic model, i.e. individual, social, physical, and macro level and supported with quotations of participants (in quotation marks) as well as author interpretations from included references (reference, country, and population). Findings of the sensitivity analyses are mentioned whenever we found a difference. Additional quotations are provided in appendix 2.4.

General characteristics

The full text review resulted in a total of 72 included references reporting on a total of 71 studies from 27 different countries, with 23 studies conducted in Africa, 34 in Asia, and 14 in South America. Figure 2.1 shows details of references screened, included, and excluded and Table 2.1 the general characteristics of the included studies.

Forty-one studies were conducted with adolescent girls only, 24 with WRA and six with both. Thirty-two studies focused on factors influencing dietary behaviours, 17 on factors influencing physical activity and 22 on factors influencing both behaviours. Most studies were conducted in urban areas (*n*=50), 26 studies were conducted in low and lower-middle and 45 in upper-middle income countries.

Table 2.1. General characteristics – Number of studies

Characteristics	Africa (n)	Asia (n)	South America (n)
Phenomenon			
Diet	6	18	8
Physical activity	6	10	1
Diet and physical activity	11	6	5
Population			
Adolescents	13	21	8
Women	6	9	5
Adolescents and women	4	4	1
Setting			
Urban	17	25	8
Rural	4	2	2
Urban and rural	2	5	4
Income level of the country			
Low income	1	1	0
Lower-middle income	8	14	4
Upper-middle income	14	19	10
Countries	South Africa (12) Cameroon (2) Ghana (2) Kenya (2) Botswana (1) Cape Verde (1) Libya (1) Morocco (1) Uganda (1)	Iran (11) India (7) Indonesia (4) China (2) Turkey (2) Malaysia (2) Nepal (1) Pakistan (1) Samoa (1) Sri Lanka (1) Tonga (1) Bangladesh (1)	Mexico (5) Costa Rica (3) Brazil (2) Guatemala (2) El Salvador (1) Bolivia (1)
TOTAL	23	34	14

Factors influencing obesogenic behaviours at the individual level

Attribution

A common perception among participants was considering one's health or body weight as a destiny[114, 137] or "God's will"[103], or blaming their current weight on their own mothers' concerns about their low childhood weight. Obesity and individual body weight were also perceived as beyond an individual's control due to genetic predisposition.[104, 114, 145, 171]

> *Some even believed that "nothing can be done about it" when overweight is inherited*. (Ghana, WRA)[104]

Adolescents did not perceive obesity as an immediate threat, but something older people struggle with, only to be faced in the future or when confronted with health problems.[116, 117, 218, 137, 150, 155].

Awareness

Participants in the included studies were aware of the importance of physical activity[101, 125, 139 149] and mental health,[157] as well as the potential negative effects of physical inactivity.[108] However, the perception that physical activity was only relevant for weight loss was also revealed.[124, 170]

> "*I don't remember anybody who I've come across talking about exercising. Only when they want to lose weight, then they want to exercise*." (South Africa, WRA)[170]

Awareness of the importance of healthy diets included the importance of dietary diversity,[132, 135] eating fresh or natural foods,[116, 117, 151] while avoiding fatty, salty, sugary or fast foods.[114, 116, 150] Healthy diet misconceptions were related to consuming snacks and skipping meals, which were perceived as positive due to eating less.[111] Some perceived that exercise could replace a healthy diet,[172] while others preferred to diet instead of engaging in physical activity.[148]

Findings from the sensitivity analysis revealed that only participants from rural settings associated risks of underweight, food borne diseases and the importance of food and micronutrients for growth with healthy diets.[120, 122, 160 163, 167]

Food safety concerns

Food safety concerns were related to food adulteration, expiry dates, hormones and pesticides or other chemicals contained in foods.[102, 109, 117, 135, 144] Overall, (un)healthiness of food was perceived more in relation to food safety and hygiene than nutritional quality *per se*.[163] Participants perceived packaged foods as the safer option,[110, 111] which could limit fruit and vegetable consumption.[134, 153]

> "*A snack which is produced by dirty hands contains microbes and can cause illness. […] Therefore, I prefer packed puffs and chips to traditional bread and cheese because they are safer*". (Iran, adolescents) [110]

Food prepared outside the home was generally considered unhealthy while home-cooked food was considered safer.[109, 111, 120, 135, 153, 164] Food seen as unsafe was also perceived as tasty, so that participants ate food they considered unhealthy,[135] notwithstanding food safety concerns.[168] The sensitivity analysis revealed that in South America, food safety concerns were only expressed in relation to additives and processing level, whereas in Africa and Asia, hygiene concerns around street food were often raised.

Subjective norms

Perceived body weight. Overweight was perceived as a sign of a healthy, wealthy and happy life,[114, 119, 122, 130, 138, 151, 159] and as a symbol of beauty.[104, 125, 139, 166] Thinness was conversely associated with illness.[125, 130, 151, 170] For adolescent girls, thinness was the ideal in two studies,[131, 172] while in another study, thin girls were teased for looking androgynous.[147] A higher body weight was also expected for older and married women, reflecting dignity, maturity,[104, 130, 138, 166] motherhood or marriage.[114, 130, 138, 155]
In Africa, a larger body was associated with health, attractiveness, and wealth, whereas in Asia and South America thinner and "feminine" looking bodies were more socially desirable.

Gender. Women and girls were expected to look beautiful and feminine.[131,139, 146, 148, 156, 166] Participants were also concerned about which types of physical activity were gender-appropriate, making vigorous or outdoor activities less accessible for girls.[147, 149, 101, 128, 161]

> *"Soccer is for men, ballet is for women, this is like saying strength and delicacy..."* (Costa Rica, adolescents) [147]

Girls were also not expected to show muscles,[139] look sweaty, messy, or tanned,[139, 147, 157, 162] since these were signs of poverty or masculinity. Menstruation,[157] school uniforms and religious dress codes also kept women and girls from being active.[143, 145, 152] Furthermore, women and girls were less likely to engage in physical activity due to prohibition in some countries on them being unaccompanied in public.[101, 103, 111, 123 136, 143, 152, 157] In addition, women and girls were faced with sexual harassment and objectification for wearing exercise clothes.[136, 147, 171]

Age. Physical activity was perceived as more appropriate for schoolgirls and not for adult women.[125, 151, 155, 170, 171] This perception that any sport or physical activity was only appropriate for young people was most dominant in Africa.

> *Exercise was seen to be associated with what children and young people did, and it was not acceptable for women (particularly married women) to be seen exercising. (South Africa, WRA and adolescents)[170]*

Social status. Sedentary lifestyle and car ownership were associated with higher socio-economic status,[123, 125, 139] while active transport was stigmatised as being for poor people.[123] Certain types of foods were also associated with higher social status. Traditional foods, homegrown vegetables or packed meals taken from home to school were considered less socially favourable.[113, 135, 137, 140, 166] However, an abundance of food,[131] eating out, eating packed food, modern snacks were seen as a sign of wealth.[111, 113, 114, 140, 146, 163, 166, 167] Particularly for adolescents, unhealthy foods were perceived as more popular, while eating healthily made them feel like an outcast.[113]

Motivation and habit strength

Participants emphasised the importance of making physical activity and healthy dietary practices a habit from childhood onwards.[109, 114, 116, 124, 136, 137, 138, 149] At the same time, unhealthy habits engrained from childhood were difficult to change for adults.[114, 138] Adolescent girls' reported a preference for indoor, sedentary activities involving screen time on different media devices, and a tendency to laziness, which kept them from engaging in physical activity,[101, 111, 129, 152, 154, 157, 162, 165, 166] while adult women struggled to establish good habits due to lack of time.[136] Motivations to lose weight, eat healthily or engage in physical activity were mostly related to an experience of poor health, a disease diagnosis[114, 128, 155] or the desire to look beautiful.[137, 167, 169]

> *"I am a fast food lover but the dream of being skinny forces me to have self-control. In my age, appearance is the most important concern for a girl."* (Pakistan, adolescents)[167]

Taste, satisfaction, and pleasure

Taste was an important factor in adolescents and women's dietary choices. Fast foods were perceived as tasty[110, 114, 132] due to their combination of salty, sweet and, sometimes, artificial flavours,[111, 117, 146, 164, 165] which made unprocessed foods such as fruit and vegetables less tasty or appealing to participants.[117]

> "*Nowadays people don't like taking the traditional foods, they despise the 'mboga' (green vegetables), they say it's not sweet. So they prefer taking the junk food like pizzas.*" (165, Kenya, adolescents)

In addition to taste, attractive and colourful packaging of snack food was a temptation.[137, 146] While adolescents mostly referred to experimenting with new tastes of fast and snack foods,[111, 140, 164, 166, 168] women associated tastiness with meat, fried foods, traditional or spicy dishes.[102, 116, 118, 132, 151] In urban settings, participants put a stronger emphasis on taste, while for rural participants foods primarily had to satisfy their appetite.

Pleasure and fun were important factors, particularly for physical activity. Lower intensity physical activity was associated with more fun.[125] Having fun with friends or making new friends while being physically active was also an important motivating factor.[101, 139]

Socio-economic status

Affordability of physical activity was influenced by the cost of classes and membership fees for recreation facilities.[147, 152] Healthy diets were seen as unaffordable; as fruit, vegetables, meat and wholegrain cereal were perceived as more expensive than staples,[125, 159, 163, 171, 172] snacks or fast foods.[111, 117, 164, 165, 167] Food insecurity during childhood was perceived as having a lasting impact on

current habits, such as skipping breakfast and the tendency to overeat once people attained higher socio-economic status in adulthood.[114, 138] For adolescents, financial autonomy was associated with the amount of pocket money they received from their parents. Adolescents from poorer families did not tend to receive pocket money,[105] while most parents who gave their adolescent children pocket money were not concerned with how it was used[106, 120, 158.]

Factors influencing obesogenic behaviours at the social level

Family environment

Traditional gender roles in the household, such as cooking for the family, tempted adult women to eat more,[138] and taking care of children kept women from engaging in physical activity.[128] Prioritizing and adapting to the husband and children's dietary preferences has also been reported.[109, 126, 144] While women would prefer home-cooked meals, they agreed to eat at restaurants at children's request[126] or previously vegetarian women would start eating meat if their husband was not vegetarian.[109]

> *"…We do not eat green vegetables now. My husband does not like to eat." (*India, WRA)[109]

For adult women, time constraints were also a major factor given their traditional roles in the family and household.[128, 136, 141]

For adolescents, parental support and parenting style had major impacts on obesogenic behaviours. For physical activity, parents were either supportive[133, 141, 162] or dissuasive,[135, 136, 147, 149, 152, 156, 170] financially or emotionally. Overall, adolescents reported that they had limited control over their own schedules and diets. Adolescents' diets were mostly perceived to be positively influenced by parental habits, through the information they provided about healthy diets,[101, 113, 172] the foods provided or prepared at home[117, 120, 158, 165, 167, 168] or meals the adolescents shared together with their families.[146] Mothers prepared most of the food consumed at home[120, 131, 132, 155, 158, 167] and therefore exerted the strongest influence. Overall, mothers cared about their children's diets and prepared food for them for school.[132, 167]

> "*When we are with parents, we eat healthy foods, they don't allow us to eat junk foods when we are at home.*" (India, adolescents)[120]

However, parents were also seen as negative role models with regard to diets[102, 103, 124, 137, 166, 171] or being too busy to prepare food at home.[146, 158, 165]

Academic pressure

Adolescents in all studies seemed to struggle with lack of time due to academic pressure from the school or parents, which affected time available for engaging in

physical activity.[101, 103, 107, 124, 129, 145, 152, 154, 156, 161, 162, 165, 172] They also reported a lack of time to prepare or pack food for school,[141] forcing them to skip meals[107, 120, 164, 166, 168] or displace them with snacks.[111] In addition to the school, parents put pressure on their children to get good grades, prioritizing education over physical activity as a means to help their children escape poverty.[136, 139]

> *"My family that always encouraged me to do exercise from childhood to high school, at the first year of high school told me: now the time for exercise is over. It is the time to study!"* (Iran, WRA)[136]

While lack of time, both generally and related to school, was an issue for adolescents in all three continents, pressure from parents and the education system featured only in Asia.

Peer influence

In most cases, peer pressure to join in with eating and sharing food did not encourage healthy eating.[113, 150, 169] One study found that peer influence was positive when adolescent girls exchanged knowledge about foods that could contribute to weight gain.[141] The amount of time spent with peers affected the increasing influence peers exerted in comparison to parents. Particularly, spending leisure time with friends or studying together was often associated with eating out, eating snacks, street, or fast food,[104, 110, 111, 117, 130, 135, 158] which was often the only thing adolescent girls felt they could control in their otherwise busy, overscheduled lives.[168]

> *Being in the social network of friends was expressed as one of the main factors causing unhealthy eating habits. In some cases, students declared that when they go out with their friends, they eat lot of junk foods as a routine way of social interaction.* (Iran, adolescents)[106]

For physical activity, peers also played an important role in encouraging adolescents to be more active[101, 163] or more sedentary.[165] Meeting friends or making new friends as part of physical activity motivated girls.[101, 139, 162] For adult women, having a social network and friends with whom to engage in physical activity was motivating.[123] Not having a supportive network or friends, could be detrimental to weight loss attempts.[125, 126]

Factors influencing obesogenic behaviours at the physical level

Built environment

Availability of opportunities for physical activity. Physical activity in public spaces, particularly in urban areas, was limited due to vehicular traffic and a lack of open spaces and sidewalks.[128, 161] Publicly accessible spaces were considered unusable as they were dirty,[152, 156, 161] vandalised,[171, 172] or unsafe due to dangerous waste.[156, 161] Poor infrastructure influenced access to sport facilities, which, when available[103, 125,

[138, 145, 149, 152, 154, 162, 171] were lacking equipment,[101,125, 128] were perceived dirty[136] or inappropriate for women in terms of open hours or equipment.[136, 154] Access to sport facilities was also limited due to lack of transport,[166] distance [101] or membership fees.[101, 125, 128, 152, 154, 166]

Safety. Getting to sport facilities or freely moving in public spaces were generally perceived as unsafe. Free spaces, such as parks, beaches were not seen as safe due to crime, dogs, traffic, or human trafficking.[101, 123, 128, 129, 136, 145, 149, 154, 159, 161, 162, 166, 171]

> *The built environment was a major factor as most of the facilities like parks and playgrounds are not accessible or are not well managed. There is hardly any space for footpaths in Kerala, much of which is encroached by vehicle parking. Rain, traffic, and stray dogs are leading people to walk early in the morning and with a companion.* (India, WRA)[128]

For women, girls, and parents there was also a fear of sexual violence, assault[101, 139, 161] or of getting kidnapped.[172]

Two studies reported changes over time, when playing on the street was safe and accessible, compared to the densely built environment of the present.[152, 170] The sensitivity analysis revealed that while rural areas offered more opportunities for active transport, they lacked facilities and opportunities for different types of physical activity.

Availability of and access to food. From most studies, it was apparent that availability of healthy options was perceived as limited while fast and snack foods were widely available.[106, 111, 112, 120, 121, 132, 142, 145, 160, 164, 165, 171, 172]

Fruit and vegetables were perceived as less available in peri-urban and urban areas than in rural areas.[109, 134] Unhealthy foods were also perceived as cheaper,[165, 172] and available in small shops that were easily accessible in most neighbourhoods.[109, 112, 138] Supermarkets and open markets, which had cheaper and healthier options available such as fruit and vegetables were often distant.[112, 138, 160, 166]

> *With large supermarkets located farther away from home, families regularly depend on neighbourhood tienditas and other local vendors for goods.* (El Salvador, adolescents)[160]

Distance to supermarkets was only mentioned in South America and Africa, while in Asia small neighbourhood stores were used to purchase fresh fruit and vegetables.[109] Availability of unhealthy snack food was mentioned mostly in urban studies.

School environment

Availability and accessibility of physical activity. Schools were considered settings with safe and affordable facilities for physical activity.[141, 145, 163, 165] However, sport facilities and equipment were not always available or appropriate.[101]

Availability and accessibility of food. Schools with cafeterias offered healthy choices,[113, 140, 166] but due to long queues, poor food safety, inferior taste, and high prices,[115, 150 158, 167, 168, 169] students felt compelled to buy cheaper snack food from small vendors.

> *A private school girl explained, "I think the fact that we have kiosks inside [the school] does not help, because it induces us to buy and eat junk food*." (Guatemala, adolescents)[145]

Healthy foods, such as fruit and vegetables were either unavailable or unaffordable at schools.[150, 104, 130, 159, 164] While in some countries, students were not allowed to leave the school compound, they had multiple opportunities to buy cheap fast or snack food from small vendors on the way to or from school.[110, 111, 113, 115, 122, 140, 141, 145, 164, 166, 168]

Curriculum and teachers support. While curricula contained nutrition and physical education topics, they were often substituted for other subjects,[101, 136, 162] or relied on teachers' motivation.[128, 145] Girls also stated that physical education in schools primarily focused on competitive sports, in which girls were less interested, and that teachers prioritised boys in sports.[129, 145, 147, 149, 152, 162]

> *"Boys are told to play soccer, jog, or do some kind of sport, but we're just told to sit in any place or do whatever you want."* (Costa Rica, adolescents)[147]

From the sensitivity analysis it was apparent that the above-mentioned gender issues in school were more prevalent in Asia and South America.

Factors influencing obesogenic behaviours at the macro level

Cultural norms and traditions

Several studies reported shifts in food culture. Overall, traditional and home-cooked foods were perceived as healthier than food prepared outside the home,[109, 110, 113, 120 121, 135, 153, 164, 166] and imported food was perceived as unhealthy.[121, 127, 151]

> "*Our own local food is better for health and even for Samoan people to be stronger. If we eat overseas food, we will get fat – it's not good for the body*." (Samoa, WRA)[127]

However, as described above, the taste of non-traditional food,[111,166] as well as the popularity of eating out at international food chains,[146, 166, 167] led to a perceived shift of non-traditional food increasingly replacing traditional or local foods.[113, 127, 168] This shift was also recognised in terms of older generations eating healthier and consuming more unprocessed, local foods,[127, 144] which led to adolescents feeling torn between traditional and modern culture.[168] Cultural norms were associated with certain foods and behaviours. Particularly in South Africa, physical activity and consumption of raw vegetables was associated with white or rich people and not part of "black culture".[166, 170]

On all continents, participants observed a transition from traditional and local to modern and imported foods. This was also apparent in terms of generational

changes in diets between grandparents and the adolescents.[127, 144, 163] However, particularly in South American studies, participants framed this transition in terms of the loss of indigenous, not just traditional foods.

Advertising

Food and beverage advertising was ubiquitous and mostly targeted unhealthy foods[111, 137, 143, 150, 158, 167] across many platforms including TV, newspapers, social media, street flyers, free deliveries or displays within the store.[109, 111, 112, 129, 137, 168] Participants appeared to be subconsciously influenced, stating trustworthiness of certain brands or claiming to use TV advertisements as a source of information.[105, 129, 140]

> "*There are many TV commercials for puffed cheese and crisps but not for healthy snacks such as raisins and fruits*." (Iran, adolescents)[137]

Social media and pop culture seem to exert an increasing influence, pushing adolescents towards more sedentary behaviours. Engaging in social media can also influence their dietary choices.[111, 140, 167]

> *Extensive networks and use of social media infiltrated with information about eateries and snacks are likely contributing to the already strong yearning for snack foods.* (Indonesia, adolescents)[111]

Urbanization

Food availability in urban areas was usually perceived as better than in rural areas.[109, 114, 134] This was more nuanced, as fruit and vegetables in rural areas were perceived as more accessible, available and of better quality,[109, 134, 144, 167] while in urban areas the availability of unhealthy foods was increasing.[144] Urban life was also associated with sedentary lifestyles due to increasing mechanisation and technology.[109, 126, 128, 165, 170] As mentioned above, increasingly built environments were perceived as limiting opportunities for physical activity in urban spaces.[152]

> *"One impact of current technology is that we are not required to move physically. As a result, people become fatter because they are becoming lazier to move."* (Indonesia, WRA)[126]

Economic development, particularly in cities, including increasing consumerism was perceived as a barrier to healthy lifestyles.[103] Furthermore, the busy urban lifestyles with more women in the workforce and reduced appreciation of food preparation[117] impacted on cooking and eating habits. Studies highlighted the increasing need for quick, simple, and convenient meals.[109, 117, 121, 146, 158, 172]

Data-driven framework

Using the a priori meta-framework allowed us to conceptualise the factors that are perceived to directly or indirectly influence obesogenic behaviours by adolescent girls and WRA. After synthesis, the identified themes through both the deductive and inductive approach resulted in the data-driven framework as presented in Figure 2.2 Individual-level factors were prominent in our framework, identifying food safety concerns and attribution in addition to the constructs of the a priori meta-framework. Data on physical and macro level factors were limited and are therefore represented to a limited extent in our framework. Gender was identified as cutting across all four levels in our framework.

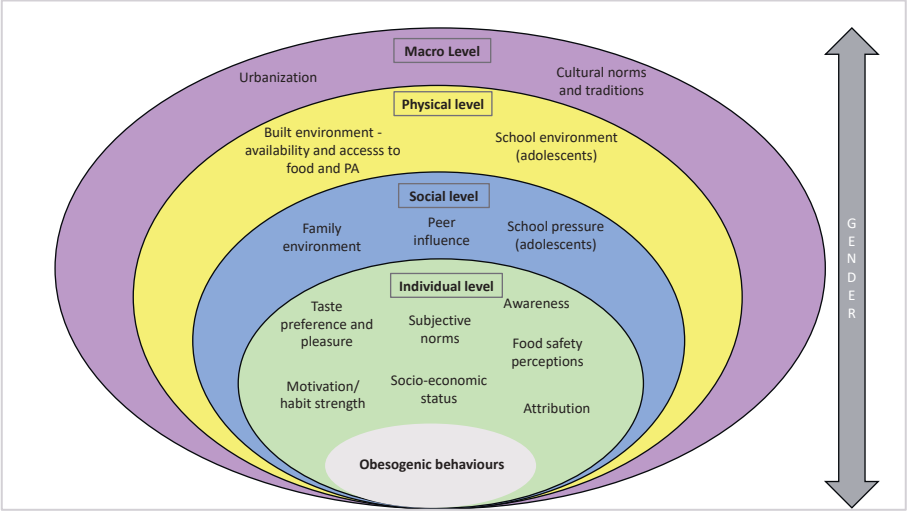

Figure 2.2. Conceptual framework

DISCUSSION

This review sought to synthesise qualitative evidence on factors influencing obesogenic (eating and physical activity) behaviours in adolescent girls and WRA in LMIC. Influencing factors were examined across multiple contexts and within and across social, physical, and macro-levels using an a priori defined meta-framework. The data synthesis revealed a data-driven framework that included influencing factors on adolescent girls and WRA, as well as their obesogenic behaviours. These factors are interrelated and reflect their individual, social, physical, and macro-level influences. The findings of this synthesis provide a greater insight into the obesogenic behaviours of adolescent girls and women in LMIC, which will help to inform design interventions for obesity prevention tailored to different stages of the lifecycle.

Awareness of the value of a healthy diet and physical activity for good health was good overall, but it was overshadowed by a failure to recognise the importance of a healthy behaviours for everyone across the lifecycle. This attribution error appeared relevant for both dietary and physical activity behaviours. Adolescents perceived healthy lifestyles as only relevant for older people and, therefore, not of immediate concern to them, which has also been found in high-income countries.[56,57] Women, on the other hand, often perceived their body weight or health as predestined. Physical activity was considered more appropriate for either children, older people with poor health and/or overweight, professional athletes or men. Reduced engagement with physical activity with increasing age could also be due to life transition periods, competing priorities such as schoolwork,[58] social activities and/or increased workload.[59]

Fear of poor food hygiene and stronger trust in packaged, labelled and/or processed food were most dominant in studies from Africa and Asia. This immediate fear of food safety can overshadow concerns for more long-term concerns related to nutrition.[60] Improving food hygiene of healthier foods and beverages, or even the perception of improved food hygiene, therefore, has a role to play in preventing obesity and related NCD, while taking into account the role that informal vendors and markets play in providing fruit and vegetables.[61]

Changes in diets and physical activity were apparent due to migration from rural to urban areas, and this held true across generations. At the same time, women across studies observed that increasing urbanization increased availability and affordability of unhealthy ultra-processed and snack foods, and reduced access to safe and affordable spaces for physical activity and limited time for healthy behaviours due to busy lives. The shift from traditional to ultra-processed food, limited time to prepare fresh food and the omnipresence and promotion of cheap, unhealthy ultra-processed foods and drinks in school or neighbourhood

environments tempted girls and women to buy them. These dietary shifts, alongside increasing availability and promotion of unhealthy foods, have been well defined as the 'nutrition transition'[14,15] in prior literature on LMIC and in low-income communities of high income countries.[62] Dietary shifts from traditional food towards more eating away from home and consuming convenience food high in sugar has been observed in other LMIC following migration to urban centres.[27,63,64] Participants have also observed changes in urban planning, which caused limited access to aesthetic, safe and secure recreation spaces or facilities. The latter has been associated with crime and fear of sexual harassment[27] as well as lower levels of physical activity.[16]

Pronounced across most identified themes of our framework is the influence of gender norms. Culturally-, socially- and religiously-driven gender roles appear to hinder girls and women from being physically active and from consuming healthy food. Girls and women experienced physical activity and/or clothing restrictions based on familial, societal, or religious norms. Additionally, girls and women have to fulfil roles in the household and family, which further limits their time available for physical activity, especially when added to employment and childcare responsibilities. Busier lives were also described, particularly by employed adult women. However, few studies focused on workplaces, which could have offered valuable insights into possible interventions for adult women given their increasing presence in the workforce. These types of time limitations have been associated with more women classified as having obesity.[65] Furthermore, girls and women might prefer different types of physical activity than men,[66] but school curricula, urban environments and/or gym facilities do not cater for their interests.[58,59,67] Globally, girls and women tend to be less physically active than men/boys,[68] with highest rates of insufficient physical activity in south/central Asia and the Middle East and north Africa.[68] These regions were also identified by our review as most culturally restrictive of public movement of girls and women. Similar to our findings, quantitative studies have identified limited opportunities for safe and accessible leisure time activity.[66,68] Also, the fact that physical education programmes in schools are not tailored to girls' needs, by focusing more on athletic abilities rather than encouragement, was confirmed by other studies in low-income settings of high-income countries.[58,59] The tendency of women in the reviewed studies to conform with their husbands' and children's dietary choices could also affect their own dietary behaviours.[2,26] Poor decision-making power and gender inequality in general appears to expose women more strongly to multiple burdens of malnutrition.[69] Furthermore, women and girls in the reviewed studies, particularly from South America and Asia, also felt pressure to conform to their society's feminine ideals, which for girls mostly meant being thin. This could push them towards dieting rather than eating a balanced diet, while avoiding looking sweaty/dirty from engaging in physical activity to maintain a 'feminine' appearance.[67] For adult women, larger body sizes were associated with maturity,

dignity, wealth, good health, and beauty, which has been acknowledged previously as relevant in poor, rural communities across Africa.[26,27]

As revealed by our sensitivity analysis, the identified factors might differ between urban and rural settings and adolescents and WRA. In rural settings, awareness of underweight and micronutrient deficiencies, as well as the importance of eating food that is filling rather than tasty, were more widespread. Accessing healthy, safe fruit and vegetables was a challenge, particularly in studies from South America and Africa, which could be due to a reduction in urban neighbourhood markets accompanied by a rise in remote supermarkets.[13,70] The perception that healthy foods are expensive is also supported by studies assessing price data in LMIC,[71] making healthy diets difficult to afford for lower socio-economic populations.[72]
For adolescent girls, choosing unhealthy, "modern" foods gave them a feeling of empowerment. Even with the little pocket money they had, as their parents controlled most of their other choices, they were able to buy snacks at and around school based on taste, appearance, and social desirability of their peers. Peer influence towards 'modern' food has also been described in high-income countries, but with more pressure towards expensive and branded products.[56] The increasing availability of mass/social media could make sedentary lifestyles more tempting for adolescent girls. Besides being poor role models for physical activity, parents pressured their adolescent children into studying over being physically active, which was also found in families of low-income settings in high-income countries.[58] For adult women, lack of peer influence, lack of a social network and/or sufficient time besides family and household responsibilities could be limiting factors for physical activity and were also shown to affect women's overall autonomy.[73]

Limitations and implications for future research/programming

Although this review followed a rigorous methodology and we have moderate to high confidence that the review findings are a reasonable representation of the phenomenon of interest,[74] it was not without limitations. Considering solely the perspectives of women and adolescent girls limited findings of this review to the female perspective. Gender norms were identified as a strong cross-cutting issue for almost all the influencing factors. Thus, male perceptions would enrich insights into these societal issues.[28] Only two of the included studies were conducted in low-income countries, which poses an important gap for future research. Furthermore, this review solely included factors influencing obesogenic behaviours, and did not consider factors that influence underweight or micronutrient deficiencies. However, this review does acknowledge the role of early life food shortage as an important influencing factor to later life weight status. In light of the increasing double burden of malnutrition, this may be particularly relevant, as more than half of the included studies (n=48) were conducted in countries with medium, high, or very high double burden of malnutrition.[15]

This qualitative evidence synthesis revealed several implications for future research. Similar to the conclusions of a review on Africa-only studies that included mainly quantitative research, we found that factors related to the physical and macro level are insufficiently studied and require further investigation.[26,27]
This could be due to the fact that participants in qualitative studies are more likely to focus on barriers or facilitators at individual and social levels, and that qualitative studies are less likely to be used to capture the physical food environment and the macro environment.[50] More than 100 studies had to be excluded given a lack of data attributable to participant sex or age; data on the socio-economic status of participants were also inconsistent. Clearer and attributable information on participants' demographic and socio-economic situation would help put research findings into more specific contexts and has significant potential to strengthen the evidence-base and inform future interventions. In most studies, data on individual level factors were predominant.

Finding programme and policy solutions to overcome the growing obesity pandemic is a significant challenge. As has been demonstrated in our framework, the drivers are complex and span multiple individual and environmental levels. Historically, obesity programmes have focused on education interventions targeting individual behaviours and responsibility. Our findings showed that improving education remains relevant, but that education interventions should put a stronger focus on the misconceived association between food safety and nutrient content of food. Furthermore, the importance of promoting healthy diets and physical activity for everyone across the whole lifecycle should be addressed through interventions tailored specifically to adolescent girls and WRA. However, addressing determinants of the broader environment beyond the individual level through novel solutions is also called for. Gender norms need to be addressed with both men and women regarding traditional roles of women and girls in society that negatively impact on nutrition and by supporting employed women through workplace interventions.

Food system innovations[75,76] offer potential solutions to making healthy food more available, affordable, safe, and appealing, while making unhealthy foods less available and affordable. This could be achieved by combining education, regulatory (advertising) and/or fiscal interventions (taxation) while improving implementation of hygiene and food safety standards in all settings, but particularly in schools.[8,77] Transport and urban planning policies could further improve access to healthy food and safe recreation spaces.[78] Education policies should focus more on curricula for nutrition and physical education[33] with the latter aiming to more strongly promote girls' participation. Guidelines for school food supply should not only target potential cafeterias but vendors in and around schools.[79] Given the poor security in many LMIC urban areas, schools could also provide access to safe recreation

facilities for the community, which would encourage physical activity of out-of-school adolescents and women.

In conclusion, some of the identified factors are similar to those identified in high-income countries such as increasing availability, affordability and promotion of unhealthy food; peer pressure; social desirability and time constraints related to food and physical activity, particularly in adolescents of lower income communities. Specific to LMIC is the concern for the food safety of perishable foods that increasingly drives consumption of unhealthy foods. Busier lives influenced by gender norms and limited safe and secure exercise spaces keep girls and women from being physically active. Diverse and flexible solutions, at different levels and for rural and urban settings, are urgently needed to address these obesogenic factors in low- and middle-income countries, where most people with overweight and obesity live.

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Appendix 2.1. Search syntax for Medline

SPICE	No	Pub med Syntax	Search 5/29/2019
Perspective	#1	((Adolescent OR Adult) AND (girl OR woman OR female)) OR (woman OR female)	864580
Phenomenon of interest	#2	Diet, food, and nutrition [MeSH Terms] OR diet OR dietary OR nutrition OR overweight OR obesity OR obesogenic OR obese OR physical activity [MeSH Terms] OR "physical activity" OR sedentary lifestyle	1872517
LMIC	#3	Afghanistan OR Angola OR Bangladesh OR Benin OR Bhutan OR Bolivia OR "Burkina Faso" OR Burkina OR Burundi OR "Cabo Verde" OR "Cape verde" OR Cambodia OR Cameroon OR Cameron OR "Central African Republic" OR Chad OR Comoros OR Comoro OR Comores OR "Democratic Republic of Congo" OR "Republic of Congo" OR Congo OR "Côte d'Ivoire" OR "Ivory Coast" OR Djibouti OR Egypt OR "El Salvador" OR Eritrea OR Ethiopia OR Gambia OR Georgia OR Ghana OR Guinea OR "Guinea-Bissau" Or Haiti OR Honduras OR India OR Indonesia OR Kenya OR Kiribati OR Korea OR Kosovo OR "Kyrgyz Republic" OR Kyrgyzstan OR Kirghizia OR Lao OR Laos OR Lesotho OR Liberia Or Madagascar Or Malawi OR Mali OR Mauritania Or Micronesia OR Moldova OR Mongolia OR Morocco OR Mozambique OR Myanmar OR Burma OR Nauru OR Nepal Or Nicaragua OR Niger OR Nigeria OR Pakistan OR "Papua New Guinea" OR Peru OR Philippines OR Rwanda OR Ruanda OR "Sao Tome and Principe" OR Senegal OR "Sierra Leone" OR "Solomon Islands" OR Somalia OR "South Sudan" OR "Sri Lanka" OR Sudan OR Swaziland OR Syria OR Tajikistan OR Tadzhikistan OR Tadjikistan OR Tanzania OR "Timor-Leste" OR "East Timor" OR Togo OR "Togolese Republic" OR Tunisia OR Uganda OR Ukraine OR Uzbekistan OR Vanuatu OR Vietnam OR "West Bank and Gaza" OR Gaza OR Yemen OR Zambia OR Zimbabwe OR Albania OR Algeria OR "American Samoa" OR Armenia OR Azerbaijan OR Belarus OR Belize OR "Bosnia and Herzegovina" OR Botswana OR Brazil OR Bulgaria OR China OR Colombia OR "Costa Rica" OR Cuba OR Dominica OR "Dominican Republic" OR Ecuador OR "Equatorial Guinea" OR Fiji OR Gabon OR Grenada OR Guatemala OR Guyana OR Iran OR Iraq OR Jamaica OR Jordan OR Kazakh* OR Lebanon OR Libya OR Macedonia OR Malaysia OR Maldives OR "Marshall Islands" OR Mauritius OR Mexico OR Montenegro OR Namibia OR Paraguay OR Peru OR Romania OR "Russian Federation" OR Samoa OR Serbia OR "South Africa" OR "South African" OR "Saint Lucia" OR "Saint	4454035

		Vincent and the Grenadines” OR Suriname Or Thailand OR Tonga OR Turkey OR Turkmenistan OR Tuvalu OR Venezuela	
	#4	"developing country" OR “developing countries” OR "developing world" OR "middle income country" OR "middle income countries" OR "low income country" OR "low income countries" OR “low and middle income country” OR “low and middle income countries” OR lmic OR lmics OR "third world"	139654
Setting	#5	#3 OR #4	4503091
Evaluation	#6	qualitative research OR “focus group” OR “focus groups” OR narrative* OR narration OR “semi-structured interview*” OR ethnograph* OR “lived experience” OR “key informant” OR “key informants” OR “grounded theory” OR “thematic analysis” OR “content analysis” OR “action research” OR “participatory research” OR “mixed method” OR "mixed methods" OR “mixed approaches” OR “mixed study” OR “process evaluation” OR "in-depth interview" OR “in-depth interviews”	267277
	#7	#1 AND #2 AND #5AND #6	2993
	#8	#7 AND English	2886

Appendix 2.2. Framework for coding

Codes		Framework reference	Definition and/or examples
Individual - demographics			
1	SES of the individual	1, 2, 3, 4, 5	Socio-economic aspects of the individual (Wealth, Income, quality of life, food expenditure, food insecurity of the individual, pocket money)
2	Educational level	1, 5	Educational attainment of the individual, not family/HH members, plans for education, studying pressure, health literacy, private/public school, obligatory uniform
3	Employment	1, 2, 3	Employment status of individual, shift work, out-of school,
4	Family situation	1, 2, 3, 4, 6	Marital status, dependency on others, single, having children
5	Cultural characteristics	1, 2, 3	Culturally-defined demography (nationality, ethnicity, migration history)
Individual - biological			
6	Age	1, 2, 3, 4, 5	Age of individual and/or pubertal stage, life experience, life stage
7	Physical health	1, 2, 3, 4, 5, 6	Physical health status, oral system and oral functionality (problems with chewing, wearing dentures, leg power, health status, burden of disease, vision, sleep characteristics), Pathological conditions affecting physical capacity, such as injuries, pain or disabilities, healthy lifestyle
8	Anthropometry	1, 2, 3, 4	Weight status/body composition/overweight, obesity in the past/actual BMI, physical size and shape (BMI, birth weight)
9	Food related physiology	1, 4, 5	Physiological characteristics especially relevant for diet and nutrition that are not covered by other categories (e.g food allergies, obesity-associated genes)
10	Mental health	1, 2, 3, 4	Brain function/functionality, psychological disorders (depression, eating disorder, …), sub-consciousness, compensating for loneliness/boredom
11	Physical capacity	2, 3	Physical function, training response, physical fitness, skills (strength, endurance, coordination, agility, flexibility, energy level, dose/response-training/response)
12	Genetics	2, 3, 5	Genetic predisposition for nutrient intolerances or weight gain, or talent for certain sports, individual metabolism, individual physiology
13	Pregnancy/lactation	1, 2	Past or current pregnancies, family planning, contraceptive use
Individual - cognitive			
14	Appetite and hunger	1, 4, 5	Psychological strategies for regulation of consumption, situational occurrence of feeling hungry, food deprivation and satiety/eating regulation, sensory system and sensory perception (fat liking, taste preferences) related to taste/aroma of food/food appearance
15	Mood and emotions	1, 2, 3, 4	Affective states and stable moods (depressive symptomatology, positive emotions), feeling of inadequacy, teasing, pleasure, frustration)
16	Perception	1, 2, 3, 6	Perception of diet quality/health/food safety/time spent sitting/PA barriers, Perceptions of risks related to physical

Codes		Framework reference	Definition and/or examples
			activity in the environment or in general (fear of falling, safety) or risks related to consumption of unhealthy foods or lack of physical activity, fear of disease
17	Knowledge	1, 3, 4	Knowledge, skills and abilities related to health, nutrition, diet-disease relationship, PA, cooking
18	Body image	1, 2	Body weight perception, body satisfaction, (dis)satisfaction with one's weight or body image, physical appearance
19	Personality	2, 3, 4, 5	Personality traits and styles, temperament, motivation, self-identity, social competence, self-esteem, self-worth, self-confidence, selflessness, laziness, interest in PA/diet
20	Self-regulation	2, 3, 4	Individual-difference traits concerned with controlling the self (impulsivity, self-control), locus of control, life satisfaction, karma, fatalism, decision making power), self-efficacy, temptation, disempowerment
21	Attitudinal beliefs	1, 2, 3, 4, 5	Beliefs, values, personal thoughts and beliefs and attitudes about food, eating, physical activity, dieting to lose weight
Individual - practices and patterns			
22	Diet habits and preferences	1, 2, 4, 5	Preferences, and/or habits and routines and habitual behaviour around food consumption (Snacking, habitual eating, speed of eating, skipping meals)
23	Time management	1, 2, 3, 4	Time constraints, stress, life stressor, perceived fatigue, convenience, pressure, busy lifestyle
24	HH activities	2, 6	Physically active work in the house, cleaning, doing sports at home
25	Occupational activities	2, 3, 6	Capability to combine sport, cooking with education/work, job related energy expenditure
26	PA level	1, 2, 3	Level of activity, type of activity, strength of activity
27	PA habit	2, 3, 6	Regular habits, routines, habitual behaviour related to physical activity and/or sports
28	Addictions	1, 2, 3, 4	Addictions and/or risk behaviours related to alcohol, drugs, self-medication, e.g. diet pills or overweight gain pills; gambling)/related health behaviours, bulimia, anorexia
29	Leisure activity	2	Hobbies, spare time activities that could be active or sedentary (seated, TV watching), holiday activity
30	Eating out vs. at home	1	An activity done regularly in one's leisure time for pleasure, only use when “eating at home” is mentioned in comparison with “eating out”, also refers to homecooked meal vs restaurant cooked/prepared meal
31	SB levels	2	Level of sedentary behaviour
32	Active transport	2, 3, 6	Taking the bike, walking, running etc to work/school, car ownership
33	Sleep pattern	1, 2, 3, 4	Sleep and sleeping patterns (chronotype, sleep duration), also includes sleeping quality/time
34	Intentions	1, 3	Intentions to e.g. lose weight, do physical activity, self-PA monitoring, dieting
Social level			
35	HH composition	1, 2, 4	Composition, cohesion and structure of the family/household (number of children, family size, structure/having a/living with a parent or children, house help)/Food allocation in HH), female-headed household

Codes		Framework reference	Definition and/or examples
36	Family habits and practices	1, 2, 3, 4, 5	Food culture existing in the family / household, family PA behaviours, TV watching, parental food- and eating-related behaviours, parental thoughts and beliefs about food and eating, parental feeding styles (restrictions, pressure-to-eat)
37	Family/HH SES	1, 2, 4, 5	Socio-economic aspects of the family / household (HH food security, HH budget constraints)
38	Family/parent nutritional status	3, 4, 5	Body weight, BMI, (present or past) of family members
39	Family/parent education level	3, 5	Level of education of parent, career, relative
40	Community habits or behaviours	1, 2, 3, 4	Community habits related to diet, PA and health, communal eating, community activities, and programs (also programs from NGO, non-profit)
41	Role modelling	2, 6	Modelling diet or physical activity behaviour of or for others
42	Peer/friend influence	1, 2, 4,	The direct influence on people by peers, or the effect on an individual who gets encouraged to follow their peers by changing their attitudes, values or behaviours to conform to the peer/friend
43	Popular culture	1, 2, 3,	Trends in pop culture, champions promoting healthy diets or physical activity, social media use and influences on diet or physical activity
44	Religious beliefs and practices	1, 2, 5,	Religious practices that restrict certain foods or drinks, or require certain ways of dressing that could impact physical activity
45	Support of family/peers/partner	1, 3, 6	Support/reward/encouragement from community family, peers, partner to be physically active, to eat healthy, to lose weight, parents' expectations, parents' rules and information, parental style, information and advice from parents/peers/partner
46	Teacher influence	From data	Capacity of a teacher to have a positive or negative effect on the habit, behaviour or knowledge of the student related to diet or physical activity
47	Gender norms	1, 2, 3,	Gender divide in society, societal roles for women/men (e.g. women discouraged to leave house or do PA), norms related to food preparation and purchase, Women empowerment
48	Culture	1, 2, 3, 4	Thoughts and beliefs related to one's cultural background (background, norms, view on leisure time, health believes, cultural requirements), national traditions and identity
49	Social networks	1, 2, 4, 5, 6	Social networks, social ties, community recommendations, social isolation, social inclusion, participating/member in social clubs, social climate, social pressure, social judgment
50	Social norms	1, 2, 3, 5	Diet- and eating-related influences from others in the environment, norms and taboos restricting certain foods e.g. from pregnant or lactating women, traditional taboos, Social comparison; Social norms to conform, subjective norms, social roles, stigma, Social class, does not includes gender norms (see code 47)
Physical/Built environment			

Codes		Framework reference	Definition and/or examples
51	Home environment	1, 2, 3, 4, 5, 6	Cooking facilitates, condition, sanitation and hygiene/food availability/type of housing, backyard space, food storage facilities, home gardening, access to garden, land use, number of screens in dwelling, TV in bedroom, facilities/space to do physical activity
52	Built environment	1, 2, 4, 5, 6	Walkability, cycle-ability, public open spaces, green/blue areas/parks, deprivation, hygiene and sanitation, food availability in neighbourhood, safety/crime in neighbourhood, traffic
53	Food outlets	1, 4, 5	Cafes, restaurants, canteens, shops, markets: availability, hygiene and sanitation, distance, density, diversity, types of food available at the outlet (if related to neighbourhood in general, use code 52)
54	Food promotion/advertising	1, 2, 4	Exposure to posters/banners etc on street, in outlets, ads on TV related to un/healthy foods, drinks or physical activity/sports
55	Recreation facilities	2, 3, 5, 6	Health clubs, community activity providers: affordability, availability, sport competitions
56	Transport	1, 2, 3, 5, 6	Public, safety, convenience, infrastructure, access, availability, distance to work/school
57	Product attributes	1, 4	Extrinsic or intrinsic attributes of food items or meals: food adulteration, contamination, texture, shelf life, labelling, packing, portion sizes, preparation method, perishability
58	School environment	1, 2, 3, 5, 6	Healthiness of meals, foods available near school, meal standards, PA guidelines, time spent outdoor, playing spaces, also includes settings such as college and university
59	Health care	2, 3, 5	Availability/accessibility of services, advise from health care staff, food supply at health care facilities, parking, green spaces at health facilities
60	Workplace environment	2, 3, 5, 6	Workplace canteens, sports facilities, parking, transport options
Macro environment			
61	Food supply	1, 3, 4, 5, 6	Production, processing of food, food and agriculture policies, food regulations (labelling, packaging, safety, quality), food and drink advertising
62	Health care system	2, 5, 6	Provides goods and services to treat patients with curative, preventive, rehabilitative, and palliative care, also includes health care industry, pharma industry etc., health care policies
63	Sport industry	3, 5	Exercise, physical activity industry, including recreation industry, sports organizations
64	Information industry	1, 2, 3, 5, 6	TV, media, internet, regulations restricting media, availability of networks, social media policies etc, including entertainment industry
65	Govt PA policies	2, 3, 4, 6	Any guidelines, policies, programs or campaigns, promoting physical activity or reduction in sedentary behaviour for the general population or specific population group (unless they are school related that it would be code 67), would also include promotion of PA through info materials (posters, leaflets etc), public recreation and campaigns

Codes		Framework reference	Definition and/or examples
66	Govt Diet/nutrition policies	1, 2, 3, 4	Any guidelines (FBDG), policies or programs, campaigns promoting healthy diets or aiming to reduce malnutrition for the general population or specific population group (unless they are school related that it would be code 67), would also include promotion of healthy diets through info materials (posters, leaflets etc)
67	School and education policies	3, 5, 6	Educational institutions (school, university): health/diet/PA guidelines/policies/Nutrition/PE curricula/sitting policies
68	Macroeconomy	1, 2, 3, 6	Economic regulations, General taxation of property, investment regulations, food outlets (not foods or drinks that would be under label 65), investments for farmers, shop owners, sport centres/facilities etc, mortgage costs, fiscal advantages for sport clubs
69	Transport policies	1,2, 3, 5, 6	Policies related to mobility, road safety, parking regulations, bike paths etc
70	Social policies	1, 2, 4	Policies and programs designed to reduce poverty and vulnerability by promoting efficient labour markets, diminishing people's exposure to risks, and enhancing their capacity to protect themselves against hazards, programs to strengthen social networks, pension, welfare/social protection policies, health insurance
71	Urban planning	1, 2, 3, 5, 6	Density of outlets/public spaces, architecture and building codes, land use policies, design of public spaces, park policies, urbanization, planning public spaces, use when rural-urban comparison is made and migration from rural to urban areas or when difference between “modern” and “traditional” are discussed
72	Human resources for nutrition	1, 2, 3	Nutritionists, dieticians, Nutrition HR at workplace, school, health services, govt plans/curricula to train nutritionists/dieticians, academic training
73	Prices	1, 2, 4	Prices for food, transport, energy, gas, recreation activities, gym membership, consumerism, luxury
74	Government	1, 2, 4, 5	Broader government policies that are not covered in the other categories
75	Human rights	3	Human rights that could affect diets or physical activity: The right to food, a human right protecting the right for people to feed themselves or the Freedom of movement, mobility rights, right to travel
76	Environment	1, 2, 3, 4	Climate, weather, nature, Seasonality, climate change, extreme weather conditions affecting food production, possibilities to be active outside, weather conducive with physical activity, environmental policies
77	Political in/stability	1, 2, 6	Wars or conflicts in countries or regions, political systems and their (in)stability, crime, safety, also economic stability
78	Nutrition transition	From data	Shifts in dietary intake (from “traditional” to “western”/ “modern” diets) due to demographic, economic or epidemiological changes

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Appendix 2.3. Themes and supporting studies

Theme (Number of studies)	Studies supporting the theme
Individual level	
Attribution (16)	Amiri 2011, Aryeetey 2016, Blum 2019, Caamano 2016, Carrete 2012, Garg 2019, Gavaravarapu 2015, Goncalves 2012, Karimi-Shahanja 2010, Lemamsha 2018, Lipus 2019, Madrigal-2017, Monge-Rojas 2005, Phillips-2016, Walter 2011, Ware 2019
Awareness (56)	Abdelghaffar 2019, Abdi 2016, Atik 2013, Amiri 2011, Aryeetey2016, Bagherniya 2018, Bailey 2018, Bastami 2019, Brown 2015, Blum 2019, Caamano 2016, Carrete 2012, Chan 2015, Chang 2009, Correa 2017, Craveiro 2016, Dapi 2007, De Silva Weliange 2018, Doegah, Draper-2016, Fachruddin 2019, Farell 2019, Garg 2019, Gavaravarapu 2015, Goncalves-2012, Habibie 2019, Islam 2019, Kalani 2017, Kimoto 2014, Kinsman 2015, Kroone 2012, Kurschner 2019, Karimi-Shahanja-2010, Lemamsha-2018, Lipus 2019, Madrigal-2017, Monge-Rojas 2005/2009, Majabadi 2016, Monge-Rojas 2015, Mugo 2016, Pahlm 2013, Peykari 2015, Phillips-2016, Rajaraman 2015, Rodriguez-Ventu-2014, Romero 2019, Saimon 2015, Satija 2018, Sedibe-2014, Sondari 2019, Stupar 2007, Usman 2017, Veeck 2014, Wrottesley 2019, Walter 2011, Ware 2019
Food safety concerns (20)	Abdi 2016, Bailey 2018, Bastami 2019, Blum 2019, Carrete 2012, Chan 2015, Correa 2017, Garg 2019, Hunter-Adams 2019, Islam 2019, Lipus 2019, Atik 2013, Mugo 2016, Pahlm 2013, Sedibe 2014, Sondari 2019, Stupar 2007, Usman 2017, Veeck 2014, Voorend 2013
Subjective norms (43)	Brown 2015, Caamano-2016, Carrete 2012, Chan 2015, Cohen 2017, Dapi-2007, De Silva Weliange 2018, Doegah, Draper-2016, Farell 2019, Garg 2019, Amiri2011, Georgina 2019, Goncalves-2012, Hunter-Adams 2019, Islam 2019, Kalani 2017, Karimi-Shahanja-2010, Kimoto 2014, Kinsman-2015, Aryeetey 2016, Kroone 2012, Kurschner 2019, Lacroix 2019, Lemamsha-2018, Majabadi 2016, Monge Rojas 2017, Monge-Rojas 2015, Monge-Rojas-2009, Mugo 2016, Phillips-2016, Rajaraman 2015, Rodriguez-Ventu-2014, Bagherniya 2018, Saimon 2015, Satija 2018 Sedibe-2014, Stupar 2007, Usman 2017, Voorend-2013, Walter 2011, Ware 2019, Wrottesley 2019
Motivation – habit strength (47)	Abdelghaffar 2019, Amiri 2011, Aryeetey 2016, Baheiraei 2016, Bailey 2018, Bastami 2019, Blum 2019, Caamano-2016, Carrete 2012, Chang 2009, Craveiro 2016, Dapi-2007, Doegah, Draper-2016, Fachruddin 2019, Garg 2019, Gavaravarapu 2015, Goncalves-2012, Hosseini-2013, Islam 2019, Kalani 2017, Karimi-Shahanja-2010, Kimoto 2014, Kroone 2012, Kurschner 2019, Lacroix 2019, Lemamsha-2018, Madrigal-2017, Monge-Rojas 2005/2009, Monge-Rojas 2015, Mugo 2016, Ozturk 2019, Peykari 2015, Phillips-2016, Rajaraman 2015, Rodriguez-Ventu-2014, Saimon 2015, Satija 2018, Sedibe-2014, Ssewanyana 2018, Sondari 2019, Stupar 2007, Usman 2017, Veeck 2014, Voorend-2013, Walter 2011, Ware 2019, Wrottesley 2019
Taste (29)	Abdi 2016, Atik 2013, Bastami 2019, Blum 2019, Bridle-Fitzpatrick 2015, Brown 2015, Caamano-2016, Carrete 2012, Chan 2015, Chang 2009, Craveiro 2016, Dapi 2007, Gavaravarapu 2015, Goncalves-2012, Habibie 2019, Islam 2019, Karimi-Shahanja-2010, Kimoto 2014, Kroone 2012, Majabadi 2016, Monge-Rojas 2005, Mugo 2016, Sedibe-2014, Sondari 2019, Ssewanyana 2018, Stupar 2007, Usman 2017, Veeck 2014, Voorend 2013, Wrottesley 2019
SES (44)	Abdi 2016, Amiri2011, Atik 2013, Bagherniya 2018, Baheiraei 2016, Bailey 2018, Blum 2019, Bridle-Fitzpatrick 2015, Brown 2015, Caamano-2016 Cacavas 2011, Carrete 2012, Chan 2015, Correa 2017, Craveiro 2016, Dapi-2007, De Silva Weliange 2018, Draper-2016, Farell 2019, Garg 2019, Georgina 2019, Goncalves-2012, Hunter-Adams 2019, Islam 2019, Karimi-Shahanja-2010, Kimoto 2014, Kinsman-2015, Lemamsha-2018, Lipus 2019

Theme (Number of studies)	Studies supporting the theme
	Monge-Rojas 2005/2009, Mugo 2016, Ozturk 2019, Pahlm 2013, Phillips 2015, Phillips-2016, Rodriguez-Ventu-2014, Sedibe 2014, Sondari 2019, Ssewanyana 2018, Stupar 2007, Usman 2017, Veeck 2014, Voorend-2013, Ware 2019, Wrottesley 2019
Social level	
Family environment – women (14)	Abdi 2016, Aryeetey-2016, Bailey 2018, Caamano-2016, Carrete 2012, Cohen 2017, Fachruddin 2019, Garg 2019, Kalani 2017, Kimoto 2014, Kurschner 2019, Lipus 2019, Mugo 2016, Phillips-2016
Family environment - adolescents (46)	Abdelghaffar 2019, Abdi 2016, Amiri2011, Atik 2013, Bagherniya 2018, Baheiraei 2016, Bastami 2019, Blum 2019, Brown 2015, Carrete 2012, Chan 2015, Correa 2017, Craveiro 2016, Doegah, Gavaravarapu 2015, Goncalves-2012, Habibie 2019, Hosseini-2013, Islam 2019, Kalani 2017, Karimi-Shahanja-2010, Kinsman-2015, Kroone 2012, Kurschner 2019, Madrigal-2017, Majabadi 2016, Monge Rojas 2017, Monge-Rojas 2005/2009, Monge-Rojas 2015, Ozturk 2019, Peykari 2015, Phillips 2015, Phillips-2016, Rajaraman 2015, Rathi 2016, Rodriguez-Ventu-2014, Saimon 2015, Satija 2018, Sondari 2019, Ssewanyana 2018, Stupar 2007, Usman 2017, Veeck 2014, Voorend-2013, Walter 2011, Ware 2019, Wrottesley 2019
Academic pressure (26)	Abdelghaffar 2019, Amiri2011, Bagherniya 2019, Baheiraei 2016, Blum 2019, Correa 2017, Doegah, Gavaravarapu 2015, Kalani 2017, Kurschner 2019, Madrigal-2017, Monge-Rojas-2009, Ozturk 2019, Pahlm 2013, Peykari 2015, Phillips 2015, Rajaraman 2015, Rodriguez-Ventu-2014, Saimon 2015, Satija 2018, Sedibe-2014, Sondari 2019, Ssewanyana 2018, Stupar 2007, Veeck 2014, Ware 2019, Wrottesley 2019
Peer influence (34)	Abdelghaffar 2019, Bagherniya 2018, Baheiraei 2016, Bastami 2019, Blum 2019, Brown 2015, Cacavas 2011, Chan 2015, De Silva Weliange 2018, Draper-2016, Fachruddin 2019, Habibie 2019, Islam 2019, Kalani 2017, Karimi-Shahanja-2010, Kimoto 2014, Kroone 2012, Kurschner 2019, Lemamsha-2018, Lipus 2019, Monge Rojas 2017, Monge-Rojas 2005, Rajaraman 2015, Rathi 2016, Saimon 2015, Satija 2018, Sedibe-2014, Ssewanyana 2018, Stupar 2007, Usman 2017, Veeck 2014, Voorend-2013, Walter 2011, Ware 2019, Wrottesley 2019
Physical level	
Built environment – PA (27)	Abdelghaffar 2019, Amiri2011, Baheiraei 2016, Craveiro 2016, De Silva Weliange 2018, Draper-2016, Garg 2019, Gavaravarapu 2015, Kalani 2017, Kimoto 2014, Kinsman-2015, Lemamsha-2018, Madrigal-2017, Monge Rojas 2017, Monge-Rojas-2009, Ozturk 2019, Peykari 2015, Phillips 2015, Rajaraman 2015, Rodriguez-Ventu-2014, Saimon 2015, Satija 2018, Sedibe-2014, Stupar 2007, Walter 2011, Ware 2019, Wrottesley 2019
Built environment – food (34)	Amiri2011, Atik 2013, Bagherniya 2018, Bailey 2018, Blum 2019, Bridle-Fitzpatrick 2015, Carrete 2012, Chan 2015, Correa 2017, Craveiro 2016, Dapi-2007, Fachruddin 2019, Habibie 2019, Hunter-Adams 2019, Islam 2019, Karimi-Shahanja-2010, Kimoto 2014, Kroone 2012, Lacroix 2019, Lemamsha-2018, Madrigal-2017, Mugo 2016, Pahlm 2013, Rathi 2016, Rodriguez-Ventu-2014, Romero 2019, Sedibe-2014, Sondari 2019, Ssewanyana 2018, Stupar 2007, Usman 2017, Veeck 2014, Voorend-2013, Ware 2019, Wrottesley 2019
School environment (33)	Abdelghaffar 2019, Atik 2013, Bagherniya 2018, Baheiraei 2016, Bastami 2019, Blum 2019, Brown 2015, Cacavas 2011, Correa 2017, Garg 2019, Gavaravarapu 2015, Hosseini-2013, Islam 2019, Kalani 2017, Karimi-Shahanja-2010, Kroone 2012, Kurschner 2019, Madrigal-2017, Monge Rojas 2017, Monge-Rojas 2005/2009, Ozturk 2019, Phillips 2015, Rajaraman 2015, Rathi 2016, Rodriguez-Ventu-2014, Satija 2018, Sedibe-2014, Sondari 2019, Ssewanyana 2018, Stupar 2007, Veeck 2014, Voorend-2013, Walter 2011, Wrottesley 2019
Work environment (4)	Kalani, Fachruddin, Habibie, Lacroix
Macro level	

Theme (Number of studies)	Studies supporting the theme
Culture (30)	Abdelghaffar 2019, Abdi 2016, Amiri2011, Atik 2013, Bailey 2018, Bastami 2019, Blum 2019, Brown 2015, Carrete 2012, Chan 2015, Correa 2017, Craveiro 2016, Farell 2019, Hunter-Adams 2019, Islam 2019, Karimi-Shahanja-2010, Kroone 2012, Lemamsha-2018, Lipus 2019, Majabadi 2016, Mugo 2016, Ozturk 2019, Phillips-2016, Rathi 2016, Sedibe-2014, Ssewanyana 2018, Stupar 2007, Usman 2017, Veeck 2014, Walter 2011, Ware 2019
Urbanization (16)	Bailey 2018, Correa 2017, Chan 2015, Craveiro 2016, Dapi-2007, Fachruddin 2019, Garg 2019, Hunter-Adams 2019, Kalani 2017, Lipus 2019, Majabadi 2016, Monge-Rojas-2009, Ozturk 2019, Rajaraman 2015, Walter 2011, Wrottesley 2019

Appendix 2.4. Table of all identified themes with relevant quotations

Theme	Illustrative quotations
INDIVIDUAL LEVEL	
Attribution	
Obesity/body weight is destiny	participants who believed that factors such as genetics or even God's will were more influential toward their obesity, than their lifestyle (Amiri 2011)
Obesity/body weight is hereditary	In making a case for heredity, it was argued by the discussion groups that some women were overweight because being overweight is a part of their families. Based on this belief, the weight gained by such women is considered "natural." Some even believed that "nothing can be done about it" when overweight is inherited" (Aryeetey 2016)
Obesity is a problem of the future/older age	Right now, it's not something important that could create a problem for my health. Maybe in the future I need to be more careful about my weight. (16-yearold girl) (Amiri 2011)
Awareness	
Awareness physical activity benefits	participants believed "appropriate regular physical activity is very effective for health" and "inactivity habits result in reversed health outcomes." (Peykari 2015)
Awareness of physical activity for weight loss	Most of the time we join or want to exercise because of weight. I don't remember anybody who I've come across talking about exercising. Only when they want to lose weight then they want to exercise. (Walter 2011)
Awareness of (un)healthy foods	"Avoid eating a lot of junk food, like hamburgers and pizzas; it's not bad to eat them, but not very often." (Madrigal 2017)
Awareness related to the amount	We know we should eat fruits, vegetables, protein from meat and eggs, but the exact amount we do not know (woman, married, merchant, 40-50 years old).(Carrete 116)
Awareness related to diet versus physical activity	some older adolescent girls did not see the independent benefits of being physically active and believed that it was not necessary if they were following a healthy diet: 'I think I would rather eat healthy and not exercise,' (Adolescent girl, 15–17 years) (Wrottesley 2019)
Perceived food safety	
Unhealthy related to unsafe	"A snack which is produced by dirty hands contains microbes and can cause illness. For instance, I have seen hairs in bread and cheese snacks sold at school café. Therefore, I prefer packed puffs and chips to traditional bread and cheese because they are safer". (Bastami 2019)
Eating out versus at home	"We will have the road side vendors food, it's not safe having because it's open food and we don't know how they made it but it just tempts us" [Indian urban high SES normal weight girls]. (Correa 2017)
Food safety being part of life	"Actually, I think food safety is not a big deal. As long as you do not immediately die after eating it, everything is ok. Nothing is safe. What food is safe? Even the vegetables you buy in the market are not safe. They have pesticide on them. Even things cooked at home are not that safe, because the ingredients bought from the market are not necessarily safe. A restaurant may cook with used oil. So what can you do?" (Female 16) (Veeck 2014)
Subjective norms	
Body image related to status	"For a woman, being overweight suggests that her husband takes good care of her, that he is comfortable, he has money." (Cohen 2017)

Theme	Illustrative quotations
Body image related to age, marriage and motherhood	Marriage and pregnancy were two major explanations they provided for this increase of weight. There was a strong belief of weight differences between señoras (Mrs.) and señoritas (Miss); Señoritas should be slim, and señoras could be fat (Kimoto 2014)
Movement of girls and women in public	Do you know what people would call us if I go out for a walk in the late evening with our daughters? We would be considered a bad lot of women. We have to safeguard ourselves and our children from getting bad labels. So, we do not go to the park or the beach unless my husband is able to accompany us." (De Silva 2018)
Gender-appropriate physical activity	Soccer is for men, ballet is for women, this is like saying strength and delicacy . . . ." (Monge-Rojas 2017)
Age-appropriate physical activity	Exercise was seen to be associated with what children and young people did, and it was not acceptable for women (particularly married women) to be seen exercising. Women were discouraged by the —destructive talk of community members (Walter 2011)
Physical activity associated with status	Another important factor was on attitudes that people have towards being 'active for transportation for day to day activities'. People of a certain social strata are expected to use motor vehicles for transportation. Use of personal motorised vehicle was seen as a symbol of social status. (De Silva 2018)
Food associated with status	"… because you feel like an outcast because you are the only one that goes to the cafeteria, so you have to get money and go to the tuck shop." (Brown 2015)
Body image related to income	My family, everybody goes, "Wow, you're so fat. Only poor people get that fat. Why are you like this? Middle class people don't gain weight." You know? It's horrible. You already feel bad about yourself, right? And then a bunch of people go and say those things. You don't need to hear it because you already know. Every day you look at the mirror, you know it. So it's always a slap in the face, right? (Lacroix 2019)
Motivation/habit strength	
Physical activity habits	"I have it [PA] all planned. I cook the meal for the next day every night, so I am free in the morning. My husband wakes me up early and we go together to the park to do exercise." (Kalani 2018)
Dietary habits	It was clear that soft drink consumption was a deep-seated habit that sometimes was perceived by participants as an addiction. The habit of drinking soft drinks was clearly associated with certain occasions in their social life, such as casual encounters, celebrations, or certain meals with a high-energy content, where soft drinks seemed necessary to enjoy the moment. (Caamano 2016)
Motivations to lose weight	"I am a fast food lover but the dream of being skinny forces me to have self-control. In my age, appearance is the most important concern for a girl." (Usman 2017)
Taste and pleasure	
Taste and attractiveness of food	Nowadays people don't like taking the traditional foods, they despise the 'mboga' (green vegetables), they say it's not sweet. So they prefer taking the junk food like pizzas. They take junk food over the traditional food (Ssewanyana 2018).
Pleasure related to physical activity	"I'm enjoying by doing sport," and "I exercise to entertain myself." Having fun was a strong facilitator of adolescent PA. (Abdelghaffer 2019)
SOCIAL LEVEL	
Family environment – adult women	

Theme	Illustrative quotations
Impact of marriage or motherhood	For women, established gender roles as primary care givers (packing lunch for kids and family in the morning and evening, prioritising family's health over their own) deprived them of the opportunity of walking (while men could very well take their health walk or sleep during that time). (Garg 2016)
Family food preferences	…We do not eat green vegetables now. My husband does not like to eat. (Bailey 2018)
Time constraints for physical activity	I used to play basketball. But to be honest, I hardly can go anywhere anymore. I have to care for my two babies now and so it is difficult. The only time I leave the house is for errands. (Kurschner 2019)
Family environment – adolescent girls	
Parental style or support	"When we are with parents we eat healthy foods, they don't allow us to eat junk foods when we are at home" [Indian low SES girls]. (Correa 2017)
Parents as role models	"If we had more healthy snacks than junk foods at home, this would make us choose healthier snacks." (Karimi-Shahanjarini 2010)
Influence of mothers	"My mother does not allow me to go to work if I do not have my breakfast. She also does not want me to eat spicy food" (Habibie 2019)
Academic pressure	
Time constraints to eat	Due to fierce competition for entrance to a prestigious university, most urban school-age children, such as the student quoted above, are expected to spend almost all of their waking hours engaged in study, whether in school, at special "after school cram schools" operated by teachers or private companies or at home. (Veeck 2014)
Parental rules about studying	"My family that always encouraged me to do exercise from childhood to high school, at the first year of high school told me: now the time for exercise is over. It is the time to study!" (21 Y/O university student) (Kalani 2017)
Exhaustion from studying	School hours limited the time available to engage in physical activities. Adolescents mentioned little leisure time and lack of energy after school were barriers to physical activity. (Monge-Rojas 2009)
Peer influence	
Eating together with friends	Being in the social network of friends was expressed as one of the main factors causing unhealthy eating habits. In some cases, students declared that when they go out with their friends, they eat lot of junk foods as a routine way of social interaction. (Bagherniya 2018)
Spending time together	Similarly, another female adolescent stated that even the social influence of peers at school influence her to make unhealthy dietary choices. She stated that "I think just being around school at all like even if you pack your own healthy lunch you still you see people walking around with pies and sweets and Rolly Pops (lollipop); (Brown 2015)
Social network for adults	having strong social networks in the community was thought to have a positive effect on PA. (De Silva 2018)
PHYSICAL LEVEL	
Built environment	
Availability and access to physical activity	
Availability of facilities for physical activity	Limitations in the of community's environment—specifically, lack of facilities for physical activity and the lack of a supportive environment—impeded the adoption of a healthful, active life- style. ''. it depends on where you live you can't go out because there's too much traffic and it's very dangerous.'' (Monge-Rojas 2009)

Theme	Illustrative quotations
Accessibility of public spaces	Built environment was a major factor as most of the facilities like parks and playgrounds are not accessible or are not well managed. There is hardly any space for footpaths in Kerala, much of which is encroached by vehicle parking. Rain, traffic, and stray dogs are leading people to walk early in the morning and with a companion (Garg 2019)
Safety in built environment	"It is not safe to go out around my house because there are many criminals." Girls added that there are not enough green spaces or "natural environments" where they can enjoy physical activities. (Madrigal 2017)
Availability and access to food	
Availability of food	When asked what she thought, for her, was the biggest obstacle to healthy eating habits, she said, "sweets because they are everywhere." (Bridle-Fitzpatrick 2015)
Accessibility to food outlets	With large supermarkets located farther away from home, families regularly depend on neighborhood tienditas and other local vendors for goods. These stores serve as both opportunities and barriers in the context of healthy eating. The juxtaposition of fruits and vegetables, which are often overly ripe and vulnerable to pests such as fruit flies and other insects and animals, and which are placed next to protected, shelf-stable prepackaged chips, cookies, noodles, and similar products, illustrates a dietary health battle in action found within such an important place for youth and their families. (Romero 2019)
School environment	
Availability of facilities for physical activity	Within the school environment, limited sports facilities, lack of qualified coaches, lack of opportunity for unstructured play coupled with an emphasis on elite sports and sport camps, demotivating teachers, and lack of role models were other impediments to activity. Girls additionally felt that they had fewer PA options available at school compared with boys. (Satja 2018)
Availability of food at school	A private school girl explained, "I think the fact that we have kiosks inside [the school] does not help, because it induces us to buy and eat junk food." (Madrigal 2017)
Availability of food around school	Some schools will not allow students to leave their campus during the day. To meet the needs of students restricted to campuses, many restaurants offer delivery services to school-age students. As explained by our informants, these restaurants will deliver food directly to students at their schools. Students can order food by telephone, by text message or through mobile applications during breaks between classes, and then the restaurant will deliver the food via motorbike or bicycle to the school gates for the students to pick up at lunch time. Some of these restaurants are "delivery only," underscoring how the busy lives of students have transformed the retail landscape. (Veeck 2014)
Curriculum and support from teachers	''In schools we have two periods every week for games and physical education, but all games are played only by boys. Nothing is given to girls. If we play, boys tease or make fun of us.'' (Gavaravarapu 2015)
Workplace environment	
Food availability at work	"When I go to work, I have breakfast again, because everyone's eating right? There's no way you can go in without grabbing a cookie, a coffee.." (Lacroix 2019)
MACRO LEVEL	
Cultural norms and traditions	

Theme	Illustrative quotations
Eating out versus at home	Healthy foods were described as home-made due to safety and cleanliness, whereas unhealthy foods contain monosodium glutamate and preservatives or have extreme colours or flavours, are high in oil and fats, and may be unhygienic, with fast, junk, and fried street foods mentioned as examples. (Blum 2017)
Traditional versus modern	Our own local food is better for health and even for Samoan people to be stronger. If we eat overseas food we will get fat – it's not good for the body." (41-year-old participant); (Farrel 2019) It's not in our culture … I've been living without it for such a long time so why should I start now? They'll tell you, hey, in the olden days we were healthy without exercising. If you do your duties at home then you're fit, they'll tell you. Black women aren't meant to exercise, it's for White people. Normally jogging and eating healthy diet or doing sports, it's not in our culture. (Walter 2011)
Sharing meals	a few number of participants preferred eating home-cooked foods because of the emotional atmosphere of eating with family members: "Eating traditional foods with families is better because the family members are together; eating fast food creates a distance between the adolescents and their family" (Majabadi 2016)
Social media and advertising	Extensive networks and use of social media infiltrated with information about eateries and snacks are likely contributing to the already strong yearning for snack foods (Blum 2017) "There are many TV commercials for puffed cheese and crisps but not for healthy snacks such as raisins and fruits." (Karimi-Shahanjarini 2010)
Urbanization	
Food availability	"From my village to Delhi, it's a drastic change. Here we have less milk and other items, here everyone is keen to eat outside food. I was healthier when I was in my village as compared to Delhi." (Bailey 2018)
Sedentary lifestyle	One overweight woman stated that the increasing prevalence of obesity was the result of modern technology. "One impact of current technology is that we are not required to move physically. As a result, people become fatter because they are becoming lazier to move" (OW/OB, 21 years old, unmarried, working) (Fachruddin 2019)
Economic development	"nowadays, both the father and the mother are employed and they do not have much time to cook, so they just buy fast food" (Majabadi 2016)

CHAPTER 3

Assessing factors influencing adolescents' dietary behaviours in urban Ethiopia using participatory photography

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DOI: 10.1017/S1368980020002487

INTRODUCTION

Globally, more children and adolescents are moderately or severely underweight than are obese, but obesity is expected to overtake underweight rates by 2022.[1] Rates of overweight and obesity in 12–15-year-olds in low- and middle-income countries (LMIC) have been reported at 21.4%.[2]

Most research in recent years in LMIC has targeted maternal and child nutrition, aiming to interrupt the intergenerational cycle of malnutrition.[3] More recently, adolescence has been identified as a second window of opportunity for catch-up growth,[4] but also as a period in which nutritional needs increase and lifelong dietary habits and preferences are formed. These habits can influence adolescents' nutritional status as well as that of future generations.[5]

The link between poor quality diets low in diversity with malnutrition has been well established.[6] However little research in LMIC has been conducted on the factors influencing dietary choices.[7-9] Some of these factors are related to increasing urbanization and changes in urban food environments, encompassing food availability, physical and economic access; advertising; and food quality and safety.[10] Increased availability of energy-dense, nutrient-poor, ultra-processed foods is potentially detrimental to adolescent diets and nutritional status, as research from LMIC has shown.[8,11]

Ethiopia has a rapidly growing urban population[12] that is increasingly spending more on animal products, oils and fats, as well as fruit and vegetables, while prices for sugar and oil have been decreasing.[13] However, overweight currently affects <5% of adolescents and is mostly a concern for adult women in urban populations of higher wealth quintiles in Ethiopia.[14] As research from other LMIC has shown, these trends are likely to shift to other age and socio-economic groups.[11]

For adolescents in particular, unhealthy school food environments, as well as parents and peers, can influence their food choices.[15,16] Assessing adolescents' views of their food environment could provide a better understanding of potential factors influencing their food choices.[17] This could further contribute to knowledge related to factors of the personal food environment, such as desirability, affordability and accessibility, which remain understudied.[10] In addition, the use of qualitative research in LMIC has been identified as a gap in adolescent research.[15,18] Photovoice is a participatory action research methodology that has been used previously in food environment studies with adolescents in resource-poor settings of high-income countries or in LMIC.[17,19-21] This Photovoice study will therefore fill a significant gap in understanding the factors influencing dietary behaviours of adolescents in the urban LMIC setting of Addis Ababa, Ethiopia.

METHODS

Participants and Setting

This study was conducted in two schools in Addis Ababa, Ethiopia. Schools are a convenient setting to access adolescents in urban settings for studies that require participants to be gathered on multiple occasions. One private and one government school were selected based on recommendations from the Bureau of Education of the City of Addis Ababa, based on the commitment of the school principals and proximity to each other. The schools are 1.29 km apart and share a similar neighbourhood in the busy, central part of town, called Sidist Kilo. The selection of school types was used as a proxy for socio-economic status (SES).[22] Physical proximity to each other was important to explore how school populations of different SES experience the same neighbourhood environment.

Based on sample sizes of previous Photovoice studies,[23] 15 adolescents were recruited for each school using purposive sampling with the assistance of one teacher in each school. To be eligible, participants had to be between 14 and 20 years old, own a smartphone, and be committed to participate in one meeting each week for the four weeks of the study. The age group of 14 to 20 years was selected as the study methodology required a high level of participation, communication and conceptualization skills, which older adolescents are more likely to provide.[24] In this age group, school attendance in Addis Ababa is higher than 60%.[25] Since the rules of the private school prohibited students from carrying mobile phones on the school premises, digital cameras (Sony DSCW800) were given to the private school students for the period of the study.

Design and Data Collection

This study used the Photovoice method to assess adolescents' perceptions of factors influencing their dietary behaviours, following the three-staged approach of *selecting* (choosing the photographs that best reflect the topic); *contextualizing* (explaining the context of the photographs); and *codifying* (identifying the issues, themes and theories emerging from the photographs).[26]

Data collection in the government school was conducted during October to November 2018 and in the private school during May to June 2019. At the beginning of the study, one-on-one interviews were conducted with all participants to collect information on their demographic profile including age, gender, and residence. After receiving training on the objectives of the study, basic photography, ethics and safety, participants were asked to take photographs during a two-week period on the following two topics: (1) "Challenges in your environment to eat healthy"; and (2) "Opportunities in your environment to eat healthy". Participants were asked to

take a minimum of three photographs per topic but were instructed not to undertake any selection of photographs prior to their interview. The training did not include any information on nutrition or definitions of "healthy diet" to avoid influencing the knowledge and perceptions of participants related to "healthy diet". The four facilitators (three females, one male) had prior experience in qualitative research and/or in working with adolescents and were fluent in the local language, Amharic. They were trained by two researchers on the study protocol and facilitation techniques to guide participants during the study period. All questionnaires and materials for participants were translated into Amharic and then back translated into English to ensure accuracy.

When participants returned with their photographs, individual photo-elicit interviews were conducted, during which participants provided captions for every photograph and selected a maximum of three photographs per topic, for a total of no more than six photographs. Facilitators gently guided participants in the selection process by reminding them of the topics. Interviews lasted on average 50 minutes. The interviews followed a set of interview questions, abbreviated as "SHOWeD" in the Photovoice methodology,[26] which were adapted with supporting questions, to make them more understandable for adolescents:[24] (supporting questions are provided in parentheses) 1. What do you **S**ee here?; 2. What's really **H**appening here? (What might have happened before the photo was taken?; Why did it happen?); 3. How does this relate to **O**ur lives? (Why did you take the photo and what might others see in the photo?; What did you feel about the subject of the photo?); 4. **W**hy does this problem or this strength exist? 5. Why is the situation like this?; and 6. What can we **D**o about this?.

After one week, the photographs selected during individual interviews were printed and then used in focus group discussions (FGDs). For each school, two FGDs were conducted with 5-8 participants and two facilitators in each. In the government school, these FGDs were separated by gender; however, in the private school, FGDs were conducted in one female-only and one mixed gender group, since there were only two male participants in that school. In the FGDs, one photograph was selected for each topic, which was then discussed, following the same "SHOWeD" question guide mentioned above. Combining individual interviews with group discussion enhanced data richness by providing additional insights from individuals on some of the issues raised in the FGDs. Individual interviews also provided an opportunity for participants to share more personal reflections, which adolescents may be more self-conscious of doing in a group setting.

Data Analysis

Descriptive data from questionnaires were double-entered and checked by a second researcher in Windows Excel and analysed with SPSS Statistics V25.0 for Mac. All

interviews and discussions were digitally recorded and simultaneously translated and transcribed from Amharic into English. An a priori codebook was developed based on existing literature and structured by four influencing spheres (individual, social, physical, and macro level environment) of a socio-ecological framework,[15] which has also been adapted to the African context.[28]

All participants were partially involved in data analysis as they selected photographs, identified common themes in the photographs and categorised photographs according to themes. After finalization of the data collection, two researchers independently conducted first cycle open deductive and inductive coding[27] using ATLAS.ti version 8.3.1 for Mac. The researchers then compared findings, merged codes, and examined discrepancies in coding to establish a standardised method.[29] Thematic areas were identified by collating data relevant to each code, code group and the four influencing spheres.[30]

Furthermore, the 130 photographs selected by participants were categorised inductively based on the different environments (school, neighbourhood, home, social) and different types of foods (fruit and vegetables, fried street food, sugar-sweetened beverages and candy, and home cooked meals) visible in the photographs. This analysis of photographs further contributed to identifying themes.

RESULTS

Out of the 30 recruited adolescents, 26 completed the study (female=17; male=9). The participants completing the study were aged 14-20 years old and 15 attended the government school (GS) and 11 attended the private school (PS) (Table 3.1). Reasons for loss to follow-up were: dropping out of the study (n=2) or losing the camera (n=2). Participants took a total of 722 photographs (mean=28), of which they selected 130 photographs (mean=5; Table 3.2). Most of the selected photographs (n=68) were taken on the streets around the school or the neighbourhoods where the participants lived, which was in the same or neighbouring sub-cities of Addis Ababa to the two schools. The foods pictured in these photographs were primarily of fruit and vegetables sold on the street (n=35) or foods prepared on the street, such as fried potatoes, samosas, or donuts (n=22). The home environment was the second most common environment represented in the photographs (n=34), which in some photographs (n=22) depicted the home setting, including home-cooked food, family members or food preparations in their kitchens.

Table 3.1. Demographic information of participants in the Photovoice study

Characteristics	n	Mean ± SD or %
Participants' age (years)	26	17.0 ± 1.8
School		
Private school	11	42%
Public school	15	58%
Gender		
Male	9	35%
Female	17	65%
School year		
9	10	39%
11	4	15%

Table 3.2. Number of photographs taken by participants, by category

Photo Category	n	Mean ± SD or %
Total	722	27.8 ± 21.7
Selected photographs	130	5 ± 1.3
Types of food visible		
Street foods	22	17%
Fruits or vegetables	35	27%
Sugar-sweetened beverages or candy	9	7%
Home cooked food	22	17%
Type of environment		
Home setting	34	26%
School compound, internal	9	7%
Street setting	68	52%
Social setting	18	14%

Individual Level

Knowledge. Knowledge of nutrition and food safety appeared to be an important factor at the individual level. Participants knew about the health benefits of fruit and vegetables, the importance of consuming diverse diets, and that certain foods, such

as meat and sweet foods, should be consumed in moderation. Participants also had good knowledge related to food safety and hygiene and the resulting effects on health and expressed their concerns about cleanliness. Taking photographs of specific outlets that participants frequented made them further aware of how their food is actually prepared (Figure 3.1).

*"...after I do my house chores and my hands get dirty, I wash my hands using tap water. Cleanliness is important. Moreover, clean water is important for cooking healthy food." (*Girl, 16 years, GS)

"I like potatoes and I would eat it even if you prepare it in any way. And the situation on the picture influences me; it got me thinking is this how our food is prepared?" (Girl, 15 years PS) (Figure 3.1*)*

Figure 3.1. "Erteb" [Amharic for fried potato sandwich] (Girl, 15 years PS)

The activity where participants assigned photographs to different themes revealed what they perceived as healthy or unhealthy. Photographs assigned to the "unhealthy food" theme included mostly fried foods prepared on the roadside, but also included three photographs of fruit and vegetables sold in carts on the road, which were therefore perceived unclean. However, fruit and vegetables presented in a clean manner as well as packaged foods sold in shops, were associated with "healthy foods".

Food preferences. Despite their knowledge, participants liked the taste of fried and sweet foods.

"I took this picture because most people I know including me consume such sweets and it has become kind of like an addiction." (Girl, 17 years, PS)

Socio-economic status. Not having the financial means to buy what participants considered healthy food, was summarised well by one boy from the government school:

"It doesn't matter how knowledgeable we are if that knowledge is not translated into money, then it is useless." (Boy, 17 years, GS)

Talking about their own and their families' financial struggles, participants from the government school expressed how important affordability was in influencing their food choices, and how hard it was for them and their families to make a living.

"It is the most important factor that influences my food choice, I wish that I could have more money and be able to eat what I want." (Girl, 17 years, GS)

Due to these financial limitations, certain foods were considered as outside the participants' reach, such as meat and fish, while others, such as "Shiro", a legume-based powder that is used for stews or vegetables sold by "Gulits", informal sellers on the side of the road, were considered more available and affordable.

"Most of us have love for meat and want to eat meat but we can't afford it." (Girl, 18 years, GS)

Social Level

Family influence. Families play an important role in adolescents' food choices, particularly mothers, who do most of the cooking. Mostly in the government school, this influence was perceived as negative, limiting the choices of the adolescents.

"My mom is the one who cooks everything for us. We have no say in what we eat or want to eat. We have to have what she gives us." (FGD, Boys, GS)

Participants from the private school described their mothers' influence as more positive given their concern for their children's health.

"Because mothers usually want the best for their children and want to feed them good food which helps them grow… My mom …doesn't let me eat raw meat because it would make me sick." (Girl, 14 years, PS)

Fathers in the government school were described solely as "breadwinners", while in the private school, fathers appeared to be the ones buying unhealthy foods.

"…my father usually buys me cakes and soft drinks but my mother doesn't let me have that." (FGD mixed, PS)

Food culture. Participants perceived the Ethiopian tradition of sharing food and eating together as positive and motivating to eat healthy.

"I grew up eating like this, social events such as this give me the chance to eat healthy." (Boy, 18 years, GS)

"Since I am an Ethiopian, I enjoy sharing meals and eating together." (Boy, 18 years, GS) –Figure 3.2

Figure 3.2. "Eating together" (Boy, 18 years, GS)

Peer influence. Peer influence was particularly strong in and around school, where the adolescents often ate fried street food.

"My friends like chips and when I'm with them I eat chips too. (…) There is peer pressure around school and peer pressure has the power to change your life and eating at places like this one because friends' influence might have some impact on my health." (Girl, 16 years, PS)

Physical Level

Food availability and affordability. All participants were influenced by what is available and affordable in the physical environment around their schools and their homes. The adolescents and their families purchased most of their foods from outlets that were available in their neighbourhoods. There were no supermarkets in the neighbourhoods where they live, and instead of travelling long distances to supermarkets, the participants and their families bought their food at small kiosks, open markets, and informal vendors. Participants, therefore, faced limited options due to lack of affordable outlets forcing them to buy street foods of inadequate quality.

"Even my friends and I get out of school we sometimes buy and eat this because we don't have other options." (Girl, 15 years, PS)

"In our neighbourhood this place is our marketplace. This is because we can only afford to buy from here." (Boy, 17 years, GS)

Hygiene and sanitation. Participants largely categorised outlets into "good" and "bad" based on cleanliness and the way food items were displayed within the shop. When fruit and vegetables were presented in a clean and neat manner, the adolescents were motivated to buy them. Also, if they or their families trusted that the vendor was "being careful with the products", they would prefer doing their food purchases there.

"Most of us eat fruits and vegetables and the cleanliness of the area and the attractive arrangement is appealing and motivating us to eat healthy food" (FGD, girls, GS)

Informal food outlets, such as marketplaces on the sidewalk, were all considered unsafe and unhealthy by the participants. The poor hygiene in these places due to pollution or public urination was a major concern for the participants.

'No peeing allowed' so it means people pee over here and the vendors when they come here to set up their items, they don't even clean the area and before they set up people would have peed right there." (Boy, 17 years, GS)

When outlets were not clean or the environment around the outlet was dirty, even the sight of such uncleanliness could affect adolescents' appetites and they reported refraining from buying foods that would actually be beneficial for their health.

"This is a marketplace and it is not clean at all. The food sold here might be attractive but because the surroundings are not clean it doesn't entice you to buy and consume it." (Girl, 15 years, PS)

Lack of water in their neighbourhoods as well as their houses could also affect what the adolescents were eating. A participant was concerned about not having water available to wash garlic, which is usually used for stews that are thoroughly cooked. *"We use garlic in our day-to-day diet. If there's no water available when we prepare food, we might just peel the garlic and use it without washing it"* (Boy, 17 years, GS)

Packaged food. Given the poor hygiene of the environment, the outlets, and the food itself, the participants considered packaged foods as a healthier option. The adolescents also appreciated the information related to ingredients and expiry dates on packaged foods.

"You can see the packed food here and you can read their contents and understand what you want to eat." (Boy 17 years, GS) – Figure 3.3

Figure 3.3. "The shops supply" (Boy, 17 years, GS)

Eating out. Eating food that was prepared at home was considered the healthiest, safest, and cheapest option for the participants.

> *"Home is always better in terms of healthy food instead of eating at restaurants cafes or from street food. It is well prepared clean and healthy."* (FGD Boys, GS)

Macro Level

Food safety regulations. There were two main areas where participants expressed the need for the government to intervene. The first was related to food safety and poor hygiene of food outlets. The second referred to banning certain food outlets. Since the participants considered the lack of space and financial means of vendors

as the main reason for poor hygiene, they believed that the government should enforce food safety guidelines as well as provide appropriate, clean, and large spaces for vendors.

> *"Hopefully these kinds of places would be improved and blossom into big shops so that they can accommodate more customers and a variety of fresh vegetables."* (Girl, 14 years, PS)

For some food outlets, particularly the informal vendors selling fruit or vegetables in carts or fried foods outside the school, as well as school canteens, participants called to have them shut down and banned by the government for their lack of cleanliness.

> *"I hope to see that street vending and street food become banned in the city."* – (Girl, 16 years, GS)

Food prices. The second macro-level issue discussed by participants is related to food prices, which they considered high due to the poor economic situation in the country. Participants also remarked that unhealthy foods like sweets and frying oil were cheap, while foods like meat or fish were rarely affordable.

> *"Healthy foods should be cheaper and unhealthy foods should become more expensive so people would stop consuming them…. Healthy foods are expensive mostly and we go for cheap stuff sold on the streets. Had both healthy and unhealthy food been the same price we wouldn't buy cheap food we would have options."* (Boy, 17 years, GS) – Figure 3.4

Figure 3.4. "Sweet food that we can easily buy" (Boy, 17 years, GS)

DISCUSSION

This study used participatory photography (Photovoice) to explore the factors influencing dietary behaviours of adolescents in Addis Ababa, Ethiopia. Findings from the photographs, interviews and group discussions undertaken shed light on several key factors in adolescents' environments, particularly in their social and physical environments. While mothers and peers played an important role in adolescents' food choices, they were mostly influenced by poor hygiene and sanitation of food outlets or their proximal environments. Food prices also appeared to be a key factor for the adolescents attending the government school. However, dietary behaviours of all participants were affected by what is affordable and available in the direct vicinity of their home and school environments.

While participants showed good knowledge related to nutrition, hygiene and food safety, this knowledge did not necessarily translate into their food choices, which could be due to their preference for fried food, possibly related to the taste and appearance of food. Participants further discussed how their choices are limited to what is available and affordable in their neighbourhoods and how they perceived unhealthy foods as cheaper than healthy foods. These observations are supported by previous research from Ethiopia that showed that the price of fruit, vegetables and animal source foods is increasing, while the cost of sugar, oils and fats is decreasing.[13]

Since the participants' knowledge of what is healthy was also skewed towards food safety, their choices were strongly affected by food safety factors in the physical environment. Concerns about the conditions in which foods were prepared or sold and about pollution in general, have been reported from other LMIC. [31-33] Similarly to the participants in this study, mothers in a qualitative study in Addis Ababa expressed their fears related to unhygienic street food, while recognizing that these foods were also inexpensive.[34] Informal sellers and small shops are important in countries like Ethiopia as they often make fruit and vegetables more accessible than supermarkets.[35] The participants of this study suggested banning informal vendors, which could have an impact on the availability of fruit and vegetables.[36,37] Unclean food outlets or environments could therefore keep adolescents from eating healthy foods such as fruit and vegetables. Their concerns could push them to consume more packaged food which may include ultra-processed. Lack of water in the households could aggravate this even further due to the fear of not being able to wash fruit and vegetables properly.

Participants in this study indicated that they had limited decision-making power on the food choices made in their families, particularly by their mother, which is something adolescents also struggle with in other countries.[38] However, even when participants were on their way to or from school, where they were free to decide

what to eat, they still seemed to choose foods that they themselves consider unhealthy (in nutritional terms). This could be due to a preference for fried or snack food[15] but also due to peer pressure.[39] While participants perceived the Ethiopian culture of sharing as positive, sharing food with peers could influence them also negatively if group pressure pushes adolescents into consuming unhealthy foods in and around the school. [38,40,41]

The application of Photovoice in this study was useful, not only to identify factors in adolescents' environments influencing their dietary behaviours, but also because it helped adolescents to record and reflect about their community, and to promote critical dialogue about important issues.[26] Participants of this study reported that they appreciated expressing their "*feelings using photographs rather than talking*", and that the study helped "*create awareness*" and made them "*look deeply inside the environment*". Photovoice could be a useful method to give adolescents an opportunity to have their voices heard and to critically look at their environments.[43]

While the sample size is appropriate compared to other Photovoice studies[23] and provides important insights into influences of adolescents' dietary behaviours in LMIC, the findings cannot be generalised to all adolescents in urban Ethiopia. Sampling in the private school was biased towards girls, who were more committed to the study in general, but did not express themselves as much despite the gender-separated focus group discussions. In the government school, the selection criteria of owning a mobile phone could have biased the sample to higher socio-economic groups, even though mobile phone ownership in urban Ethiopia is at 70%.[14]

Application of some SHOWeD questions proved initially to be challenging when photos were taken of issues or food items that did not show an obvious problem. This required the facilitators to follow up with questions to understand the story behind the photograph. Following the first round of individual interviews, the supporting questions were therefore added to the FGDs if participants struggled to respond.

The findings of this study contribute to a better understanding of the factors influencing food choices of adolescents in urban Ethiopia. Adolescents' knowledge related to nutrition and food safety, their concerns about affordability and hygiene in the physical food environment and food outlets, as well as their families and peers all contribute to their choices. These choices in the long-term could also contribute to the disease burden of overweight, obesity and nutrition related-non communicable diseases in Ethiopia.

Our study identified different ways in which researchers and practitioners could apply the findings in future work. Adolescents in this study confirmed that they are competent citizens and knowledgeable about their lives, their environment, and

potential problems in their neighbourhood, and are able to identify solutions and should therefore be consulted and involved in future research and programming.[44,45] Capitalizing on the existing knowledge of adolescents should be key, not only for themselves, but also to educate their peers, families, or street vendors. Nutrition is currently only integrated into the biology curriculum in Ethiopian schools. Addressing nutrition as part of practical projects across the curriculum, with outreach to parents, vendors and the wider community would provide an entry point to establish healthy dietary patterns not only for the adolescent, but also for other members of the community. Parents should also be closely involved in any nutrition interventions for adolescents, while mothers, as the ones who habitually prepare foods at home, have been targeted traditionally, fathers should also be involved due to their role in food purchasing.

Our findings also identified the need to increase access to healthy, affordable, and safe foods in and around schools, which could be achieved through enforcing food safety guidelines for informal sellers[37] and for school canteens,[46] taxing unhealthy foods such as sugar-sweetened beverages,[47] and/or directly providing or subsidizing healthy foods such as fruit and vegetables.[48,49] Restricting energy-dense nutrient-poor snack foods from school compounds could help reduce consumption of such foods.[48] In addition, the national food-based dietary guidelines that are currently under development could be another opportunity to improve adolescent diets.[50] Offering individual pieces of fruit or vegetables around schools has been shown to increase fruit consumption as well as sales of fruit for the vendors[51] and should be considered more widely with free or subsidised schemes within schools.

Future studies should investigate the role that these different interventions could have on the safety, availability and affordability of foods and drinks in urban Ethiopia and how adolescents and their families would respond to them.

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Coca-Cola
Coca-Cola

CHAPTER 4

Influencing factors of the school and home environment on adolescents' dietary behaviours in Addis Ababa, Ethiopia

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Frontiers in Public Health
doi.org/10.3389/fpubh.2022.861463

INTRODUCTION

Dietary behaviours within populations are highly dependent on which food and beverages are available, affordable, safe or convenient in their surroundings (food environment).[1] Food environments can be defined as the spaces where individuals interact with the food system and encompass availability, promotion, quality, convenience and physical and economic access.[2] Availability and cost influence adolescents' dietary behaviours, as well as their appeal and aspirational association.[3] Food environments are changing globally due to expanding urbanization, technology, trade and labour markets. These changes are leading to increased availability of energy-dense, nutrient-poor, ultra-processed foods and beverages associated with the 'nutrition transition'.[4] This in turn can negatively affect dietary quality, with high consumption of ultra-processed foods and beverages, such as sugar-sweetened beverages (SSB). SSB are associated with poor nutrition and health outcomes, including overweight and obesity and diet-related non-communicable diseases.[5]

The nutrition transition has taken place in high-income countries over the last few decades and is well underway in low- and middle-income countries (LMIC),[5,6] including in Africa.[7]
Changing food environments can influence the dietary habits of adolescents,[8] who spend a lot of their time at school and are at a critical time of habit formation and increasing autonomy.[9-11] The promotion of ultra-processed foods and beverages often targets children and adolescents to generate brand awareness, preference and loyalty, securing a future consumer base.[12] Hence, food environments around schools can play a critical role in adolescents' diets.[9;13,14] As studies from mostly high-income countries but also LMIC have shown, the availability of unhealthy food or beverages inside or around schools, in the absence of parental supervision, negatively affects dietary choices.[9;15-18] In LMIC, parental education and occupation were also found to be associated with better nutritional status and dietary behaviours.[19,20]

Adolescents' diets in LMIC seem to be inadequate: predominantly cereal-based and limited in terms of animal-source foods, fruit and vegetables.[21] Particularly in urban areas, increased consumption of processed energy-dense and nutrient-poor foods and drinks has been reported.[8] In Ethiopia, up to a third of adolescents consume SSB on a daily basis.[22] Whether these dietary behaviours are related to the food environment surrounding schools in Ethiopia remains unknown. Pupils in many countries, including Ethiopia, have limited pocket money to spend and their caregivers act as 'gatekeepers' of their choices.[10] However, how Ethiopian adolescents from different socio-economic backgrounds are exposed to food outlets on the way to and from school and how this can affect their dietary and purchasing behaviours and nutritional status requires exploration. Therefore, this study

assessed whether food environments in and around schools in urban Ethiopia influence dietary diversity, quality, body mass index (BMI) status or adolescents' perceptions of their school and home food environment.

METHODS

Study design and context

A cross-sectional study was conducted, including school food environment audits as well as interviews with students of private and government schools. The selection of private and government schools was used as a proxy for socio-economic status, based on the rationale that private schools charge tuition fees.[23] The schools were selected in collaboration with Addis Ababa Bureau of Education and the Addis Ababa sub-city administration using a list of all middle and high schools in the city. Our aim was to identify a pair of one private and one government school that had less than a 0.5 km distance between them to ensure that participants from both schools shared the same food environment. Twelve schools fulfilled this criterion and were located in six different sub-cities of Addis Ababa, Ethiopia (Arada, Bole, Kality, Kirkos, Kolfe-Keranio and Laphto).

Participant recruitment

Given the scarcity of data on adolescents in schools, and the multiple outcomes of interest, the sample size was calculated to detect a medium effect size (Cohen's *d*; 0.5 SD) difference between two means, assuming $\alpha = 0.05$ and power = 0.95. Lists of all enrolled students and their ages were obtained for all the sampled schools. From these lists, containing a total of 1500 students/school on average, 20 adolescents (aged 15–19 years) were randomly selected. In every school, a teacher assisted with identifying adolescents and informing them and their parents about the study. This resulted in a total target sample of 240 adolescents who were invited for interview.

Data collection procedure

Enumerators with experience in data collection and with an excellent command of the local language, Amharic, were recruited and trained for three days on interviewing skills, dietary intake assessments and anthropometric measurements. The training was followed by a pre-test of the adolescents' questionnaire and the food environment audit tools, which permitted adaptations when necessary. Using interview-administered questionnaires, information on socio-demographic characteristics and food consumption was assessed for the recruited adolescent participants in all schools. Moreover, height and weight were measured to assess

the BMI status. As a next step, the external and internal food environment in and around all 12 schools was assessed using protocols from the International Network for Food and Obesity/Non-Communicable Diseases Research, Monitoring and Action Support (INFORMAS) network to measure food environments that contain elements on food promotion (advertising) and types of food outlets.[24] Data were collected between March and June 2019.

Socio-economic variables and purchasing behaviour

Since adolescents were not able to provide information on family income, they were asked about 13 different assets that their family owned, based on the family affluence scale[25] and the asset list included in the Ethiopian Demographic Health Survey (yes = 1, no = 0).[26] From the responses, we calculated the sum of all scores by assigning one point to each asset (min–max score = 0–13). Additionally, we asked if adolescents had their own bedroom, received pocket money and how they commuted to school. If they received pocket money, we asked for the amount they received per week and if they spent it on SSB, sweets, fruit or fried foods.

Adolescents' perceptions of their school and home food environment

We assessed adolescents' perceptions in terms of the availability of fruit and vegetables or snacks at their homes, as well as their perception of availability and advertising of (un)healthy foods in the school food environment. We used tested statements previously used in studies with adolescents[20] or in studies assessing perceptions of the food environment.[27,28] The statements were read to the participants and they reported their agreement with each statement using a five-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*).

Dietary intake assessment

Interviewers used an open-ended qualitative 24-hour recall, starting with an unstructured listing of all foods and beverages consumed, followed by memory cues to assess consumption over the previous 24 hours.

Anthropometric measures

Height and weight were measured with standardized measurements in triplicate. Height was measured with stadiometers (SECA 213) in a standing position without shoes and was recorded to the nearest 0.1 cm.[29] Electronic weighing scales (SECA 872) with a weighing capacity of 10–140 kg were used to assess the weight of all participants to the nearest 0.1 kg.

Food environment assessment

For each school, the external food environment around the school within a radius of 0.5 km was assessed for visibility and advertising of foods and beverages using the INFORMAS protocol for 'Promotion – Outdoor Advertising', which has been used in other LMIC.[24] Food advertisements were categorized as advertisements promoting food or beverage brands on stationary objects, such as posters, banners, bus-stop advertisements, flags, furniture, umbrellas, tables, fridges or free-standing signs in public spaces. For every advertisement, the category, location (GPS code), size (small, medium or large) and type of food or beverage advertised were recorded. Food outlets were assessed in terms of outlet categories, location (GIS code), presence of advertising and display of fruit, vegetables or SSB. Enumerators did not enter any stores but walked up and down every single street in the defined radius.

The data collection tool for the food environment assessment was pre-tested in October 2018, in central Addis Ababa (Arat Kilo), in an area close to two of the schools. During the pre-test 12 categories of food outlets were identified, as any shop, café or restaurant selling food or beverages, and categorized as 'informal' if the shop's structure (if any) was movable and not permanent (see appendix 4.1 for the 12 categories). The tool was tested on each food outlet type and the findings were used to amend the tool. The food environment of the first two schools was assessed by two independent teams of enumerators to align the data collection procedure and assess inter-rater reliability. Within the school compound, we assessed any presence of food or beverage advertising and whether SSB were sold at the school cafeteria.

Data quality control

All tools were translated into Amharic, a local language. The quality of the translation was checked by back-translating the questionnaires into English. All data from the individual interviews and the food environment were entered on tablets (Lenovo TAB 7 essentials) and questionnaires were programmed with Skip Logic using the Open Data Kit, which is an electronic data collection program. Data were uploaded daily on a secure, centrally managed server, allowing daily quality checks from the first author. Daily debriefs with enumerators were conducted by the first and third authors to discuss and resolve any potential challenges.

Data analysis

All consumed food items and beverages from the previous 24 hours were categorized into 10 food groups following the Minimum Dietary Diversity for

Women (MDD-W) approach, which is useful to reflect the micronutrient adequacy of diets and is recommended for use in LMIC.[30] In addition, foods and beverages were assigned to one of four categories of the NOVA classification based on their level of processing.[31] However, our study only focused on whether the foods and beverages consumed fell into the fourth NOVA category of ultra-processed foods. Dietary data were also categorized into Global Dietary Recommendations (GDR) scores, which in addition to the MDD-W add value as indicators of dietary quality.[32] Diet patterns were assessed in terms of their adherence to global dietary recommendations for fruit and vegetables, dietary fibre, free sugars, saturated fat, total fat, legumes, nuts and seeds, whole grains and processed meats.

The GDR score is composed of two subcomponents: GDR-Healthy, which is an indicator of the recommendations on nine groups of 'healthy' foods; and GDR-Limit, which is an indicator of the recommendations on eight dietary components to limit, such as snacks, ultra-processed foods/beverages and deep-fried foods.[32] Dietary data are presented in terms of mean dietary diversity scores based on the number of food groups (min–max score = 0–10), the mean GDR-Healthy, GDR-Limit and GDR total (calculated by subtracting GDR-Limit from GDR-Healthy and adding 9 to transform the indicator to a range of 0–18), the percentage of adolescents consuming different food groups and ultra-processed foods (based on the NOVA classification). The BMI-for-age *z*-scores were calculated using WHO AnthroPlus v 1.0.4 to assess the nutritional status of the participants.

IBM SPSS Statistics v25.0 was used for data analysis. Continuous variables are presented as mean ± SD and counts as frequency (percentage). To estimate the relationship of food environment and socio-economic indicators with dietary and nutritional outcomes, we performed a multiple linear regression analysis with dietary diversity scores, diet quality (GDR-Healthy, GDR-Limit) scores or BMI *z*-scores as the dependent variable and number of outlets around the school, SSB advertising or sale within the school compound, number of assets in the household and pocket money of the student as independent variables. Education level of the parents was included in the model as a potential confounding factor. We dichotomized the food environment variables (number of outlets) into low density (defined as equal or below the median) or high density (values above the median) so that the estimated coefficient was not influenced by outliers.

Perceptions of the school and home food environment were also dichotomized by collapsing 'strongly agree and agree' together and 'strongly disagree and disagree' together. We then performed a binary logistic regression of the perception variables with the same food environment and socio-economic variables as independent variables. Statistical significance was set at $\alpha = 0.05$ and all tests were two-sided.

RESULTS

Description of sample

From a total of 240 eligible adolescents, 217 completed the study; the average age of participants was 17.2 (SD 1.0) years and slightly more than half (59%) were female (Table 4.1). More adolescents from private schools received pocket money and the amounts were also higher for private school students. Over three-quarters of adolescents (79%) walked less than 10 minutes from a car or bus to the school gate. Only private school children reported travelling to school in their parent's car (data not shown).

Table 4.1. Socio-demographic and anthropometric characteristics of study participants (total and separated by school type)

	Total ***(n = 217)***	**Private schools** ***(n = 107)***	**Government schools** ***(n = 110)***	***P* value**
	Mean ± SD or *n (%)*			
Age (years)	17.2 ± 1.0	17.1 ± 1.1	17.2 ± 0.9	0.25
Gender				
Female	128 (59)	59 (55.1)	69 (62.7)	0.27
Socio-economic indicators				
Number of assets[2]	10.1 ± 1.6	10.8 ± 1.4	9.5 ± 1.5	<0.001
Own bedroom	88 (40.6)	63 (58.9)	25 (22.7)	<0.001
Receives pocket money	161 (74.2)	93 (43.3)	68 (31.6)	<0.001
Weekly pocket money amount (Ethiopian Birr)[1]	94.8 ± 87.2	110.9 ± 101.0	72.9 ± 57.4	<0.001
Nutritional status				
BMI-for-age ***z***-score (mean)	–0.7 ± 1.2	–0.6 ± 1.3	–0.8 ± 1.1	0.15
Underweight[3]	28 (12.9)	16 (14.9)	12 (10.9)	0.21
Overweight[3]	16 (7.4)	11(10.3)	5 (4.6)	0.21
Obesity[3]	4 (1.8)	2 (1.9)	2 (1.8)	0.21
Normal weight	168 (77.8)	78 (72.9)	90 (82.6)	0.21

[1] Ethiopian currency. [2]Min–max score = 0–13.[3]Underweight, *z*-score < –2; overweight, *z*-score > +1 and < +2; obese, z-score > +2.

BMI, dietary diversity and quality of adolescents

Over three-quarters of adolescents (77%) had a normal weight, whereas 13% were classified as underweight and 9% as overweight or obese (Table 4.1); the mean BMI *z*-score was –0.7 (SD 1.2). The mean dietary diversity (DD) score of adolescents was 3.6 (SD 0.9) out of 10 food groups (Table 4.2). Adolescents from private schools had

significantly higher mean DD than their peers from government schools ($P < 0.05$). With regard to the GDR, on average, adolescents consumed 3.4 out of the 9 health-promoting food groups (GDR-Healthy) and less than 1 food or drink of the 8 groups that should be limited or avoided (GDR-Limit). Private school adolescents had higher GDR-Limit scores. In the 24-hour period before the interview, most adolescents consumed grains (99%), vegetables (mostly onions: 98%) and pulses (77%), but eggs (3%), dairy foods (5%) or nuts (6%) were rarely consumed. Dark-green leafy vegetables and other vitamin A-rich fruit or vegetables were consumed by less than one-third of adolescents. In contrast, ultra-processed foods and beverages, basically sweets and SSB, were consumed by almost a quarter (23.5%) of adolescents. Meat consumption was higher in private school adolescents (24.3% vs. 6.4% in government schools).

Three-quarters of adolescents (74%) received pocket money, which they spent on fried food (55%), sweets (25%) or SSB (19%). While this was the case for all adolescents receiving pocket money, private school attendance was associated with purchasing more SSB.

Adolescents' perceptions of their home and school food environment

Adolescents from both schools agreed that food outlets around the school sell snack foods, although they also perceived healthy food to be available. While most of them perceived the advertising to be of unhealthy foods or beverages, most also disagreed that there was a lot of advertising in the neighbourhood (Table 4.3). Having fruit and vegetables available in their homes, in addition to unhealthy snacks, was more likely to be reported by private school adolescents.

Table 4.2. Dietary and purchasing behaviour of study participants: consumption and purchase by food group and level of processing (total and separated by school type)

	All schools ***(n = 217)***	**Private** ***(n = 107)***	**Government** ***(n = 110)***	***P* value**
	Mean ± SD or *n (%)*			
Dietary diversity				
Mean dietary diversity score	3.6 ± 0.9	3.7 ± 1.0	3.4 ± 0.8	<0.001
GDR				
GDR Total	11.72 ± 1.26	11.64 ± 1.36	11.80 ± 1.16	0.34
GDR-Healthy	3.35 ± 1.03	3.34 ± 1.14	3.28 ± 0.90	0.29
GDR-Limit	0.64 ± 0.75	0.79 ± 0.79	0.48 ± 0.67	<0.001
Consumption of different food groups				
Grain	216 (99.5)	107 (100)	109 (99.1)	1.00
Pulses	168 (77.4)	82 (76.6)	86 (78.2)	0.87
Nuts	14 (6.5)	10 (9.3)	4 (3.6)	0.10
Dairy	11 (5.1)	6 (5/6)	5 (4.5)	0.77
Meat	33 (15.2)	26 (24.3)	7 (6.4)	<0.001
Egg	6 (2.8)	5 (4.7)	1 (0.9)	0.12
Dark-green leafy vegetables	44 (20.3)	27 (25.2)	17 (15.5)	0.09
Vitamin A-rich fruit or vegetables	56 (25.8)	27 (25.2)	29 (26.4)	0.88
Other vegetables	213 (98.2)	105 (98.1)	108 (98.2)	1.00
Other fruit	11 (5.1)	5 (4.7)	6 (5.5)	1.00
Ultra-processed foods or beverages	51 (23.5)	29 (27.1)	22 (20)	0.26
Use of pocket money for[1]				
SSB	31 (19.3)	25 (26.9)	6 (8.8)	0.01
Sweets	40 (24.8)	25 (26.9)	15 (22.1)	0.84
Fruit	9 (5.6)	6 (6.5)	3 (4.4)	1.00
Fried food	89 (55.3)	57 (61.3)	32 (47.0)	0.20

[1]*n* = 161: *n* = 93 for private schools; *n* = 68 for government schools. GDR = Global Dietary Recommendations; SSB = sugar-sweetened beverages.

Table 4.3. Adolescents' perception of the school and home food environment

Statement	All schools *(n = 217)*	Private *(n = 107)*	Government *(n = 110)*	*P* value
		n (%)		
In my house we always have fruit and vegetables				
(Strongly) disagree	105 (48.4)	35 (32.7)	68 (64.8)	<0.001
(Strongly) agree	105 (48.4)	63 (58.9)	33 (31.4)	
Neither agree nor disagree	7 (3.2)	9 (8.4)	9 (8.2)	
In my house we always have fast food, sodas and snacks				
(Strongly) disagree	174 (80.2)	76 (71.0)	98 (89.1)	<0.001
(Strongly) agree	30 (13.8)	23 (21.5)	7 (6.4)	
Neither agree nor disagree	13 (6.0)	8 (7.5)	5 (4.5)	
There are lots of shops selling snack food in the school neighbourhood				
(Strongly) disagree	29 (13.4)	16 (15.0)	13 (11.8)	0.79
(Strongly) agree	184 (84.8)	89 (83.2)	95 (86.4)	
Neither agree nor disagree	4 (1.8)	2 (1.9)	2 (1.8)	
Healthy foods are available in the school neighbourhood				
(Strongly) disagree	27 (12.4)	12 (11.2)	15 (13.6)	0.47
(Strongly) agree	176 (81.1)	90 (84.1)	86 (78.2)	
Neither agree nor disagree	14 (6.5)	5 (4.7)	9 (8.2)	
There is a lot of food advertising in the school neighbourhood				
(Strongly) disagree	127 (58.5)	63 (58.9)	64 (58.2)	0.99
(Strongly) agree	84 (38.7)	41 (38.3)	43 (39.1)	
Neither agree nor disagree	6 (2.8)	3 (2.8)	3 (2.7)	
The advertising is mostly promoting unhealthy food and drink				
(Strongly) disagree	77 (35.5)	36 (33.6)	41 (37.3)	0.81
(Strongly) agree	127 (58.5)	65 (60.7)	63 (56.4)	
Neither agree nor disagree	13 (6.0)	6 (5.6)	7 (6.4)	

Description of the internal and external food environment

Within the school compound, we found that all but two private schools sold SSB at their cafeteria and three government schools had advertising for SSB on the school compound. In the 0.5 km radius around a private or a public school, we found an average of 436 (SD 366) food outlets, but with large differences between sub-cities, ranging from 113 to 924 food outlets. The schools in the Kality and Arada sub-cities had the highest numbers of food outlets surrounding them (Table 4.4), which is due to the dense inner-city location of Arada and the large market area in Kality. Consequently, the absolute exposure to outlets selling fruit and vegetables was highest in Kality. Display of SSB was highest in food outlets in Arada. Kiosks were the most common food outlets, representing 21.9% of all outlets in all clusters, and they had the largest proportion of advertisement and displays of SSB (46.9% and 60.0%, respectively). The absolute number of advertisements was also highest in Arada (*n* = 720) and Kality (*n* = 405). However, in all sub-cities most of these advertisements promoted SSB (89.9%). Most advertisements were positioned on food outlets (89.1%) and presented as posters, boards or banners. The second most common form of advertising was as part of the food outlet's equipment, such as umbrellas, tablecloths or fridges (20.0%). The least common forms of advertisements were large billboards (0.9%).

Factors influencing adolescents' diets and BMI status

Dietary diversity was higher in adolescents with assets in the household when considering both food environment and socio-economic variables; this was also the case for the GDR-Healthy score (Table 4.5). This association remained when including parents' education into the model. No other associations were found with consumption of unhealthy food groups (GDR-Limit) or BMI-for-age and socio-economic indicators. Factors in the food environment were neither associated with dietary scores nor BMI-for age *z*-scores.

Adolescents' perceptions of the home environment were also associated with assets and pocket money (data not shown). Adolescents from households with more assets or pocket money were more likely to perceive that, at their homes, they always had fruit and vegetables as well as snacks, which could be an explanation for the positive association of assets with dietary outcomes.

Table 4.4 Food outlets (type, characteristics) and advertising in and around (0.5 km radius) schools (private and government) in the respective sub-city of Addis Ababa, Ethiopia, n (%)

	Mean, all sub-cities	Arada		Bole		Kality		Kirkos		Kolfe-Keranio		Laphto	
School[1]		PS	GS	PS	GS	PS	GS	PS	GS	PS	GS	PS	GS
SSB sold at school		y	y	n	y	y	y	y	y	y	y	n	y
SSB advertised at school		n	y	n	n	n	n	n	n	n	y	n	y
Type of outlet													
Outlets, total	436	832		134		924		155		460		113	
Kiosks	93	121 (14.5)		26 (19.4)		193 (20.9)		46 (29.7)		136 (29.6)		38 (33.6)	
Supermarkets	5	9 (1.1)		3 (2.2)		4 (0.5)		0		4 (0.9)		9 (7.9)	
Sweet seller, informal	35	100 (12.0)		7 (5.2)		39 (4.2)		0		63 (13.7)		0	
Fruit and vegetable stall	39	34 (4.1)		7 (5.2)		156 (17.2)		8 (5.2)		23 (5.0)		4 (3.5)	
Local café	101	313 (37.6)		38 (28.4)		116 (12.5)		51 (32.9)		70 (15.2)		18 (15.9)	
Other	163	255 (30.6)		53 (39.6)		416 (45.0)		50 (32.3)		164 (35.7)		44 (38.9)	
Outlets with food or beverage visibility/advertising													
FV visibly displayed in outlet	78	28 (3.4)		21 (15.7)		295 (31.9)		19 (12.3)		85 (18.5)		21 (18.6)	
SSB visibly displayed in outlet	115	353 (42.4)		82 (61.2)		145 (15.7)		41 (26.5)		48 (10.4)		20 (17.7)	
Food and beverage advertising on outlet	103	234 (28.1)		41 (30.6)		195 (21.1)		48 (30.9)		74 (16.1)		25 (22.1)	
Food and beverage advertising													
Advertising, total	246	720		87		405		99		126		44	
Advertising of ultra-processed food or beverages	222	628 (87.2)		77 (88.5)		388 (95.8)		92 (92.9)		113 (89.7)		34 (77.3)	
Position of advertising on food outlet	220	648 (90.0)		80 (92.0)		359 (88.6)		90 (90.9)		105 (83.3)		40 (90.9)	
Advertising type (poster, board or banner)	176	401 (55.7)		74 (85.0)		359 (88.6)		91 (91.9)		89 (70.7)		33 (88.6)	

[1]PS = private school, GS = government school. y = yes; n = no; FV = fruits or vegetables ; SSB = sugar-sweetened beverages.

Table 4.5. Potential influencing factors on dietary diversity, quality or nutritional status by applying multiple linear regression

	Dietary diversity			GDR-Healthy			GDR-Limit			BMI-for-age		
Predictors	Beta	S.E.	*P*	Beta	S.E.	*P*	Beta	S.E.	*P*	Beta	S.E.	*P*
Food environment												
High number of food outlets (> 460)	-0.18	0.16	0.25	-0.11	0.17	0.52	0.04	0.12	0.73	0.14	0.19	0.48
SSB sold at school	0.09	0.21	0.67	0.21	0.23	0.36	0.25	0.16	0.14	0.43	0.26	0.09
SSB advertised at school	0.07	0.17	0.67	-0.98	0.18	0.59	0.04	0.13	0.76	0.16	0.21	0.45
Socio-economic												
Asset score	0.11	0.05	0.04	0.12	0.06	0.03	0.02	0.04	0.65	0.09	0.06	0.15
Receiving pocket money	-0.83	0.18	0.64	0.23	0.19	0.23	0.13	0.14	0.37	0.22	0.22	0.31
Education of parents	-0.04	0.08	0.63	0.01	0.09	0.94	0.12	0.06	0.06	0.01	0.10	0.96

S.E. = standard error; GDR = Global Dietary Recommendations; BMI = body mass index; SSB = sugar-sweetened beverages.

DISCUSSION

The aim of our study was to examine food environments in and around schools in urban Ethiopia and to explore how they might influence dietary diversity, quality, BMI status or adolescents' perceptions of their school and home food environment. We observed that high dietary diversity as well as higher consumption of healthy foods was associated with adolescents from households with more assets. For both groups of students, our study found a high density of food outlets within the 0.5 km radius around the schools, as well as widespread promotion and display of ultra-processed foods and beverages in and around the schools. While such an environment is not conducive to promoting healthy dietary behaviours, we cannot conclude that these environmental factors directly explain adolescents' diet or weight status.

The differences between private and government-school adolescents in terms of their dietary diversity and purchasing of SSB could be explained by the socio-economic status of their families, which we assessed using the number of assets or the amount of pocket money the adolescents receive. Parents who give pocket money without spending stipulations could create financial autonomy, but the lack of supervision could also potentially worsen the unhealthy dietary behaviours of adolescents.[33] Studies have shown the different roles that parents play in food consumption. Mothers preparing food at home have been described as a positive influence, whereas high-income parents who are too busy to prepare food may become negative role models.[33-35] In our sample, adolescents from households with more assets also perceived that both healthy and unhealthy foods were available in their households. Globally, consuming SSB is socially stratified, with high-income groups consuming them in LMIC and shifting to lower income groups as a country's income level increases.[5] Our data support this, as purchases of SSB in Ethiopia were greater among participants with more household assets.

We observed that adolescents who spent their pocket money on food/beverages were more likely to spend it on fried foods, sweets or SSB rather than on fruit. Purchasing little or no fruit on the way to or from school, even though it is widely available, could also be due to food safety concerns related to fruit sold in unhygienic conditions or lack of clean water to wash it.[36] Furthermore, adolescents' purchasing choices provided an insight into their preference for fried food, sweets or SSB over fruit. As opposed to fresh fruit, adolescents could consider packaged ultra-processed foods or beverages to be a safer and socially more acceptable and desirable option.[33,36]

Ultra-processed food and beverages, such as sweets and SSB, were found to be widely advertised and displayed visibly in the food outlets surrounding schools. A recent review found that in high-income countries, unhealthy retail food

establishments are increasing and tend to cluster around schools.[16] Furthermore, in LMIC, food companies are developing extensive distribution networks, providing point-of-sale advertising materials or free distributions,[5] and using spaces with the highest consumer traffic to tempt consumers into buying ultra-processed foods or beverages.[37] Unlike other studies from LMIC, we did not find that unhealthy food environments around schools were directly linked with poorer dietary quality[9] or higher BMI.[38,39] This could largely be due to the fact that students take their own lunch to school, with their parents acting as 'gatekeepers' of their choices.[10] Therefore, parental and social norms could have a stronger influence on adolescents' diets than the physical food environment. However, adolescents are at a critical stage in life, learning to make their own dietary choices, and with decreasing influence of parents and increasing financial autonomy their dietary behaviours could be more strongly influenced by the food environment.[10]

Schools provide a well-defined and preferred setting for prevention strategies to improve the diets of children and adolescents.[14] The external and internal school environment assessed by our study was not conducive to healthy food choices. Current Ethiopian school policies are limited to school feeding and food safety and lack actions on the availability or advertising of food in and around schools,[40] which are needed to extend policy action to focus on addressing all forms of malnutrition.

Strengths and limitations

To our knowledge, this is the first study to map food environments in and around schools in urban Ethiopia and explore how this is associated with the dietary behaviours and weight status of adolescents. Due to its cross-sectional nature, the study only provides a snapshot of the prevailing food environment and diet diversity at the time of the survey and therefore does not allow causal inferences to be made. Assessing only the school environment might have been a limitation because the home environment can also play an important role. Considering the limited amount of pocket money that students reported receiving and also the 'gatekeeping' role of parents, adolescents' interaction with the food environment in and around the school was limited. Given this limited interaction with the food environment, adolescents' perceptions of the food environment could be a better proxy for their potential behaviour. Furthermore, reducing our food environment measures to the number of food outlets might have simplified the complexity of the study. Measuring specific elements of the food environment that we identified as relevant for adolescents' purchasing behaviour, such as availability, price and vicinity of fried food, could have been a better indicator. However, such a detailed assessment of the food environment was not feasible with the resources available. Despite this limitation, our detailed description of the food environment in and around the schools, the auditing of advertising by food group and by processing level, along with the diet characterization and perceptions of the adolescents, make this study

uniquely important in light of the limited data on school food environments and adolescents' diet in Ethiopia, Africa and beyond.

Conclusions and implications

Our study found a high density of food outlets within the 0.5 km radius around the schools, as well as widespread promotion and display of ultra-processed foods and beverages in and around the schools. Such an environment is not conducive to promoting healthy dietary behaviours. While our study could not conclude that these environmental factors directly explain adolescents' diet or weight status, the influence of socio-economic and family backgrounds appeared more relevant.
These findings suggest that parents need to be directly involved in school interventions so that the home food environment can also be addressed. To ensure that adolescents make healthy dietary choices with their own pocket money, education on dietary quality through multiple channels is necessary. In addition, the currently widespread unhealthy choices in the school food environment need to be regulated. Advertising of unhealthy food and beverages in and around schools should be restricted and food and beverages offered in school cafeterias should follow food-based dietary guidelines,[41] which are currently being drafted and validated in Ethiopia.[42]

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Appendix 4.1 Food outlet categories

1. Supermarket/small shop: Modern retail outlet with checkout counters, big selection of food items. Examples include supermarket chains called Bambis, Hirut or Fresh corner
2. Kiosk: usually tiny house/hut on the road, usually only one or two sellers. Not possible to enter. Selling sodas, snacks, sometimes eggs, matches, phone credit etc
3. Fruit and vegetable stall: mostly selling fruits and vegetables, sometimes also other small food items.
4. Open market: open space, with multiple stalls for different food items, such as Shola or Merkato.
5. Informal street seller mobile: has a cart with one or two different fruit or vegetable items. Not at the same place at regular times.
6. Informal street seller immobile: has a small space on the sidewalk with for instance onions, chili, tomatoes or candy. Not at the same place at regular times. Categorized into:
    a. Fruit or vegetable
    b. Candy
7. Bakery: only selling bread, rolls, sometimes cakes or even eggs.
8. Butcher: sells only beef meat
9. Kebele shop/cooperative: sells subsidized food items like oil, sugar, flour
10. Street food: sells different types of fried foods on the side of the road or as part of another shop
11. Café:
    a. Traditional/shybet: traditional Ethiopian coffee, also some Ethiopian food
    b. Modern/Kekbet: chains that sell cakes as well as fast food
12. Restaurant: serves hot meals, such as lunch and dinner


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CHAPTER 5

Benchmarking policy goals and actions for healthy food environments in Ethiopia to prevent malnutrition in all its forms using document analysis

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Under review

INTRODUCTION

Until recently, the greatest nutrition challenges in Ethiopia were the high burden of undernutrition and micronutrient deficiencies.[1,2] However, overweight and obesity rates, particularly in adult women in urban areas, are slowly but steadily increasing, leading to a double burden of malnutrition.[1-3] In Ethiopia, diets poor in iron or vitamin A and/or high in sodium or low in fruit or whole grains are a major risk factor for malnutrition in all its forms and disability-adjusted life years.[4] Previous research has shown that diets are largely shaped by the surrounding food environment,[5] including the availability and affordability of healthy/unhealthy foods and beverages[6,7] and the food safety and hygiene of food vendors.[8] The food environment can be defined as the physical and social space where consumers interact with the wider food system, thereby including what food is available, promoted, safe, convenient and accessible.[5]

Food environments in Ethiopia have changed in recent years:[9] prices of nutrient-dense foods, such as fruit and vegetables and unprocessed meat, have increased over the period 2007–2016, while prices of sugar, oils and fats have declined.[10] Food retail outlets in Addis Ababa, the capital of Ethiopia, include a mix of private modern retail, public cooperatives and informal micro-sellers.[11] A study assessing urban food environments in Ethiopia revealed that most food or drink advertising was on food outlets and promoted ultra-processed beverages, such as sugar-sweetened beverages (SSB).[12] In 2010, the upper-middle class in Eastern and Southern Africa reportedly spent up to 80% of their food and drink expenditure on processed foods, of which 60% were ultra-processed.[13] Perceived lack of food safety related to fresh fruit and vegetables could further increase the consumption of ultra-processed foods among urban Ethiopian adolescents.[14] In addition, food-borne illnesses pose an immediate risk to Ethiopian consumers due to the unhygienic food preparation practices and poor environmental health conditions of the food outlets.[15]

Policy actions to improve food systems by increasing the availability, affordability and acceptability of safe and nutritious foods in food environments have been proposed,[16] some of which have been introduced in several countries.[17-20] Examples include taxes and incentives to reformulate sugary drinks and foods high in fats, sugars and salt in order to discourage their consumption while also promoting healthy foods,[21,22] public food procurement policies, provision of free meals in schools, introducing nutritional standards or menu labelling in school cafeterias[23] and incentive-driven training and certification initiatives in informal markets.[24] The policy component of the Healthy Food Environment Policy Index (Food-EPI) tool developed by the International Network for Food and Obesity/Non-Communicable Diseases Research, Monitoring and Action Support (INFORMAS) has been used to identify critical gaps in national policy actions by comparing these with international good practices.[19,25,26] The Food-EPI framework has been applied in several countries,[19,25] including within Africa,[27,28] but not previously in Ethiopia. Our research will therefore contribute novel insights on the application and scope of the Food-EPI tool and its indicators of good practice in low- and middle-income countries (LMIC).

Policy actions addressing the food environment require attention from different sectors (e.g. health, agriculture, trade, education, social protection, finance), which could affect the

food environment. While evidence suggests that multisectoral policymaking is taking place in Ethiopia, effective coordination and collaboration remains a challenge.[29] Furthermore, the extent to which different domains of the food environment have been addressed in Ethiopian policies has not yet been assessed. Prior research on food and nutrition policies in Ethiopia has either focused on food supply,[30] multisectorality,[31-33] nutrition sensitive agriculture,[34] infant or child nutrition,[35,36] nutrition governance and implementation,[37,38] or the evidence base for nutrition policies in the health sector.[39] No study has yet systematically analysed all nutrition-relevant policies in Ethiopia to understand how the different domains of the food environment are addressed.

To close this gap, the objective of this study was to assess how different food environment domains have been addressed in Ethiopian policy goals and actions over time and how they compare with global good practice benchmarks. We also explored how the food environment policy actions are linked with setting goals for potential dietary or nutritional outcomes, and how this has evolved over time. Our study therefore provides an important overview of the food environment policy context in Ethiopia and a good entry point for policy prioritization.

Theoretical framework

We developed a theoretical framework for our study (Fig. 5.1) based on the food environment domains of the INFORMAS Food-EPI framework,[26] which we complemented with insights from other food environment frameworks in order to cover all relevant domains of the food environment in the Ethiopian context.[40-45] INFORMAS identifies eight different food environment domains in the Food-EPI tool, encompassing food composition and processing, labelling, promotion, provision, retail, prices, trade and investment.[26] Based on the assumption that these domains are largely shaped by government action regarding the accessibility, availability and affordability of healthy food choices, the Food-EPI tool has been used to rate policy actions in countries against global benchmarks, which are based on international best practice examples relevant for each of the food environment domains.[19]

Following the development of the Food-EPI tool, the conceptualization of food environments has further evolved in terms of its scope and place in the wider food system. Food safety was identified as an important domain of the food environment, given its influence on consumers' food consumption.[40-42] Frameworks developed for the African and LMIC food environment also highlighted food safety and its importance with regard to the sanitation and hygiene of vendors, food adulteration and contamination, especially in informal retail in African urban food environments.[43, 44] Food-EPI studies in Ghana and Kenya integrated food safety as good practice examples of either trade or retail.[27, 28] However, food safety cuts across the whole food environment, especially the domains of food production, composition, provision, trade and retail,[40] therefore we included it as an additional, individual domain in our framework (Fig. 1).

The reviewed frameworks also recognize that the food environment interacts with the whole food system and is not a stand-alone box within a system but overlaps with food

supply chains, consumer behaviours and dietary and health outcomes.[41, 42, 45] Considering the interlinkages of the food environment with food production,[41, 42, 46] we have also included policy actions in the food supply chain such as agricultural production, which can influence the food environment in terms of availability, safety, processing, composition and provision.

Positioned as a central component within food systems, food environments have been recognized as the space where people directly interact with the wider food system by purchasing, preparing and/or consuming food.[41, 43, 44, 47] We therefore also wanted to assess if and how food environment policy actions in Ethiopia are coherent with their goal setting for diets and nutritional status (Fig. 5.1).

The influence of food environments on diets has been recognized since the early conceptualizations of food environments in 2005.[48] More recently, the potential of policy actions to shift consumption towards high quality safe, nutritious foods and away from nutrient-poor refined foods high in sugars, fats and/or salt and ultra-processed foods and beverages has been highlighted.[16] The different dimensions of the food environment can affect diets in terms of quantity, quality, diversity and safety, which can influence the nutritional status of populations, manifested in different forms of malnutrition (overweight, obesity, underweight, wasting, stunting, micronutrient deficiencies).[41] We included these concepts as potential outcomes of unhealthy food environment policy actions in our framework and used them to assess goal setting in the included policy documents.

In this assessment, we distinguish between policy goals and actions. Policy actions, also referred to as policy instruments, are interventions designed to achieve desired outcomes and impacts. Policy goals are defined as the adoption of an objective related to a specific issue within a policy document[49] and can inform the issues dominating the policy agenda.[50] Analysis of the goals set in the policy documents can therefore shed light on the food environment outcomes that are being recognized as concerns in Ethiopian policymaking.

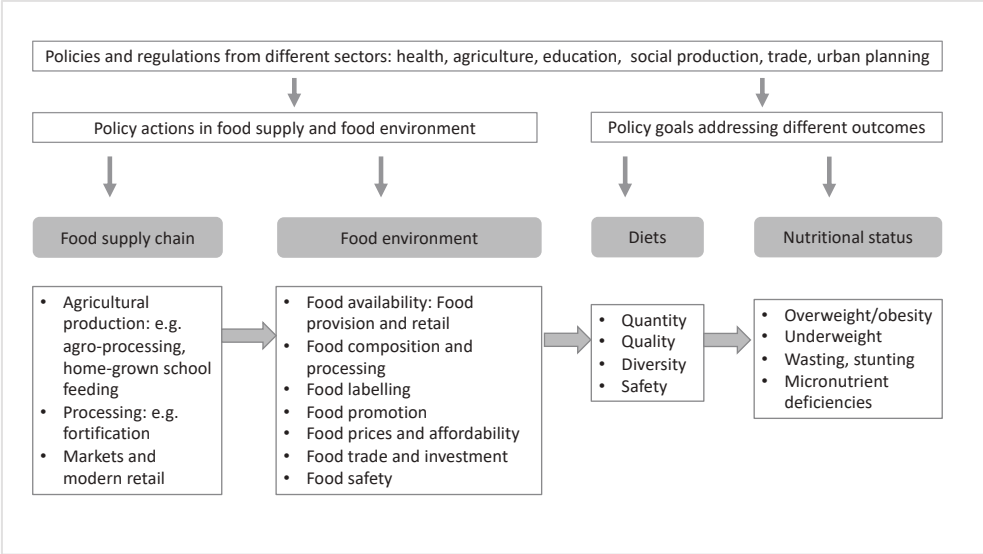

Figure 5.1. Theoretical framework of food environment policy actions and goals.

METHODOLOGY

This study analysed Ethiopian policy documents with regard to policy goals and actions addressing food environments and related goals for diets and nutritional status over the last decade (2008–2020). The documents were outputs of decision-making in the form of published strategies, plans or policies[51] and included legal outputs (from the highest to lowest hierarchy: proclamations, regulations, or directives), documents stating overarching government plans (policies and strategies) and sectoral documents proposing policy actions to implement policy goals (sectoral strategies, action plans, programme documents or guidelines).[52]

Our study followed a document analysis focused on the policy component of the Food-EPI tool and the first three steps of its process: analyse context; collect relevant documents; and extract the evidence from the policies and actions.[53] As part of the document analysis, content was analysed by identification of the themes related to the food environment domains.[54]

Data collection

Delineating policies addressing 'food environments' proved to be challenging, given that numerous policies could affect any domain within food environments[55] and given the current lack of explicit intentionality of Ethiopian policies to improve food environments.[56] We therefore could not conduct searches for policy documents that were explicitly labelled as 'food environment' policies but followed an institutional approach instead. We define institutions as: the sectoral entities within which rules and norms for food and nutrition are

set in Ethiopia and which have been involved in food and nutrition policymaking since the first National Nutrition Strategy in 2008.[55, 57-59] This included ministries and related institutions that committed themselves to nutrition-specific and nutrition-sensitive policymaking (Ministries of Agriculture; Finance and Economic Development; Labour and Social Affairs; Transport; Urban Development and Construction; Water, Irrigation and Energy; Women's, Children and Youth Affairs; Youth and Sport; Education; Health; Trade and Industry; Food Beverage and Pharmaceutical Industry Development Institute; Disaster Risk Management Commission; Food and Drug Administration; Standards Agency).

We first searched the websites of these ministries and institutions for policy outputs. Subsequently, representatives of 16 ministries or governmental institutions were contacted in early 2020 and invited to discuss policy action around food environments. Eight (of 16) key stakeholders agreed to meet and share additional policy documents. IFPRI-Ethiopia also provided policy documents that were collected as part of one of their projects; additionally, the websites of UN agencies, such as the World Health Organization Global Database on the Implementation of Nutrition Action (GINA) and the Nutrition Policy Landscape Information System (NLiS), the Food and Agriculture Organization Food and Agriculture Policy Decision Analysis and the United Nations Children's Fund (UNICEF), were searched to identify policy documents on food environments (Fig. 5.2).

Inclusion criteria for policy documents

This search resulted in a total of 127 documents, which were then screened based on eligibility criteria. Policy documents were selected based on their goals, which had to be related to any food environment domain, or outcomes on diets or nutritional status, as defined by our framework (Fig. 5.1). Policy outputs had to be published between 2008 and 2020, since Ethiopia's first National Nutrition Strategy was adopted in 2008. Inclusion of documents was restricted to national-level policies published in English or in Amharic, one of the official languages and *lingua franca* in Ethiopia. Documents had to be available as soft (digital) or hard copy. If documents were published only in Amharic, they were reviewed by an Amharic-speaking team member (T.G.) and partially translated. Evidence collected for this study comprised governmental intentions to act; we did not capture government funding for actions that were already implemented.[53]

Data extraction and analysis

Data extraction included information related to type and title of document, year of publication, timeline and main institutions. All selected documents were then imported into Nvivo (Version 12.6.0) to conduct a content analysis. The framework developed for our study (Fig. 5.1) was operationalized into a codebook (Appendix 5.1), including codes for the food environment domains (food composition and processing, labelling, promotion, provision, retail, prices, trade and investment, food safety) and for the different outcomes influenced by the food environment: dietary quantity, quality, diversity and safety, and different types of malnutrition (overweight or obesity, underweight, wasting, stunting or micronutrient deficiencies). Policy documents were uploaded in Nvivo and coded using the codebook. These *a priori* codes were complemented with additional codes revealed from

the policy documents. A code for 'food availability', for instance, was added for policy actions that were not specific to food retail or provision but were more generally about availability. For the analysis, coded data were collated by codes and emerging sub-themes that were either linked to the Food-EPI good practice indicators or to additional themes linked to the food environment domain.[60] For instance, for data on food composition, information related to the Food-EPI good practice indicator 'food composition standards/targets for processed foods' was collated, as well as data related to food fortification. Data were also collated by year of publication to identify potential changes in policy actions and goal setting over time. Data coding and analysis was conducted by the first author (UT), who sought advice from co-authors in cases of doubt to align the approach for coding or analysis.

We then defined the proposed policy actions in comparison with global indicators of good practice, which have been developed for the Food-EPI tool globally but also adapted to the LMIC context.[28, 61] With regards to food safety, no global indicator of good practice exists.[62] We therefore used the one from the Food-EPI study in Ghana, defined under food retail as 'robust food hygiene policies'.[28] All data relevant to a domain were coded and analysed for the results section, since the global indicators only address selected policy actions. We also conducted a historical analysis for which we sorted the coded data by year to identify potential changes and patterns in how food environment domains have been addressed over the period 2008–2020.

RESULTS

This section describes how Ethiopian policy outputs addressed the food environment over the period 2008–2020, in terms of the individual domains as defined in our framework and how policy goals addressing food environments and potential outcomes were defined in the documents.

Of the 127 policy documents identified, 89 were excluded for the following reasons: they were published before 2008 (*n* = 7); they were neither available as soft (digital) nor hard copy (*n* = 7); they had no policy goal or action addressing any domain of the food environment (*n* = 71); or they did not include a policy output (*n* = 4) (Fig. 5.2). The screening process described above resulted in 38 included documents (Table 5.1). Most policy outputs were issued by the Ethiopian Food and Drug Administration (EFDA) (*n* = 11 out of 38), followed by multisectoral outputs issued by the federal government (*n* = 9 out of 38) and the Ministry of Health (*n* = 6 out of 38). Almost half of the policy documents were published in 2016 or 2017 (*n* = 16 out of 38) (Table 5.1).

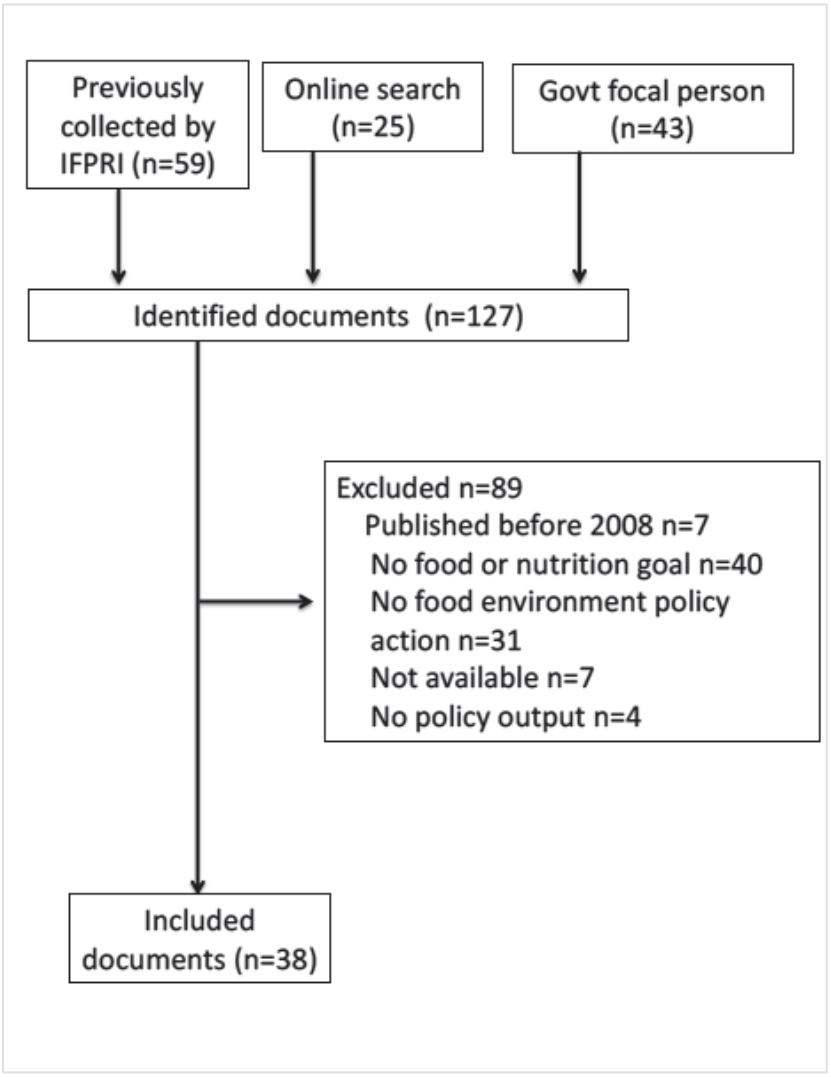

Figure 5.2. Overview of policy document collection

Table 5.1. Overview of the 38 policy documents included

Category	Number of policy documents
Type of document	
Legal documents	14
Strategies	7
Action plans	6
Programme documents	6
Guidelines	4
Policy	1
Institutions leading the policy document	
Food and Drug Administration	11
Federal Democratic Republic of Ethiopia	9
Ministry of Health	6
Ministry of Education	5
Ministry of Agriculture	3
Ministry of Finance and Economic Development	1
Ministry of Labour and Social Affairs	1
Ministry of Trade and Industry	1
National Planning Commission	1
Year of publication	
2008	2
2009	1
2010	1
2012	2
2013	3
2014	4
2015	3
2016	8
2017	8
2018	3
2019	2
2020	1

Historical analysis of policies addressing food environments

Over the period 2008–2020, policy outputs for food and nutrition have not only increased in number but also in terms of content and explicit intentionality.[56] The different domains of the food environment have also been increasingly addressed over the last 12 years (Fig. 5.3). Policy goals have broadened from a focus on undernutrition, mostly in children <5 years old and women of reproductive age, to recognition of the double burden of malnutrition across the lifecycle.

Our historical analysis over more than a decade (2008–2020) revealed three major phases (Table 5.2): the 'starting out phase', the 'nutrition-sensitive phase' and the 'food systems phase'. During the first phase between 2008 and 2012, nutrition was put on the agenda

with the first National Nutrition Programme (NNP I) calling for multisectoral and nutrition-sensitive approaches, which resulted in the School Health and Nutrition Strategy in 2012.63 The focus of food processing in this phase was mostly on agro-processing, for instance of sugar, with the objective to increase economic growth rather than public health nutrition.[64] Policy actions related to food labelling and promotion targeted infant formula and breastmilk substitutes. While taxes on soft drinks were already in place then, it was unclear if this was motivated by public health objectives. Food provision policy action solely focused on schools.

The efforts of the first phase intensified in the second phase, which we defined as the 'nutrition-sensitive phase' between 2015 and 2017, with nutrition-sensitive programmes applying multi-sectoral approaches in agriculture,[65, 66] social protection,[67] education,[68] and water supply[69] and a reinforced food fortification initiative to reduce micronutrient deficiencies.[59] With the NNP II, this phase was also marked by a broadened focus on the nutrition of different population groups along the lifecycle and a recognition that factors in the physical food environment influence diet. This led to the first calls for regulatory actions in the food environment from the NNP II.[59]

The 'food systems phase' from 2018 is defined by a more systemic approach towards nutrition, consolidating the nutrition-sensitive efforts into a comprehensive food and nutrition policy.[70] Furthermore, the proposals to improve the food environment in the NNP II[59] had been articulated more clearly in the National Strategic Action Plan (NSAP) for the Prevention and Control of Non-Communicable Diseases (NCDs).[71] Reformulating foods high in saturated fats, sugar and salt was identified as a policy action to achieve the consumption of healthy foods and a reduction in overweight and obesity. At the same time, a more comprehensive excise tax on foods high in saturated fats, sugar and salt was introduced. Despite the achievements in food environment policy actions, the proposal for a policy of food sold in or around schools in the School Health and Nutrition Strategy in 2012[63] has not yet been taken forward in subsequent policy action, and other gaps compared to global indicators of good practice remained. While food safety has been the most constant and dominant component throughout the whole decade, in this third phase both the Food and Nutrition Policy (FNP) and the second Growth and Transformation Plan (GTP II) proposed a system-wide approach to food safety, including all actors along the entire food chain.[70, 72]

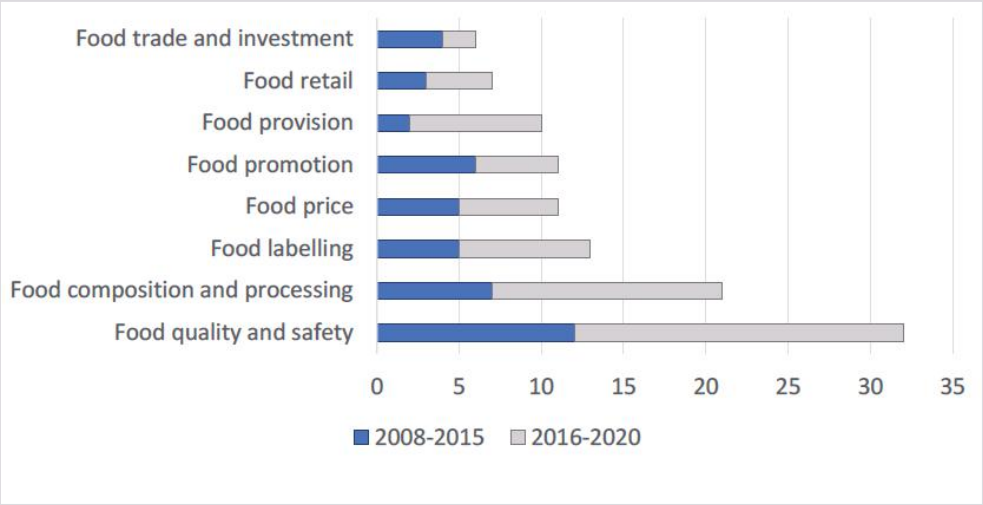

Figure 5.3. Number of policy documents addressing food environment domains between 2008 and 2020.

Table 5.2. Historical overview of food environment-related national policy documents in Ethiopia

Phases	Year	Policy documents	Food environment domains and goals related to nutritional and dietary outcomes
'Starting out phase': putting nutrition on the policy agenda	2008	1. Excise Tax (Amendment) Proclamation No. 570/2008 2. National Nutrition Strategy	**Overall food environment interventions:** Policy outputs include explicit food environment goals and actions. Nutrition-sensitive interventions for food industry and trade only related to fortification and food safety. Schools are recognized as platforms for healthy eating promotion but focus on hunger and micronutrient deficiencies. Physical environment mentioned as crucial but only for physical activity promotion and NCD prevention, not specific to food. **Individual food environment domains:** Food composition and processing: agro-processing focus on sugar production. Food labelling: infant formula labelling should not discourage breastfeeding. Food promotion: unsafe promotion and use of breastmilk substitutes is prohibited. Food provision: interventions for nutrition services, education and food provision, but also mention of regulating food safety in and around schools. Food prices: 30% excise tax on soft drinks introduced, 20% on bottled water, but not clear if motivated by public health objective. Food safety: any imported, packaged, processed, fortified food or nutritional supplements should comply with international and national safety standards; ensure equitable access to safe and affordable water for all. Goals related to nutritional and dietary outcomes: related to nutritional status (underweight/wasting/stunting) of children and women of reproductive age, multisectoral and lifecycle approach, stunting and food fortification new objectives. *Who is targeted by policy action:* children (mainly under-fives, but schoolchildren too) and women of reproductive age. *Main paradigm*: multisectoral and lifecycle approach; food fortification introduced.
	2009	1. Food and Medicine Administration Proclamation No. 661/2009	
	2010	1. Growth and Transformation Plan I	
	2012	1. National School Health and Nutrition Strategy 2. Regulation Investment Incentives No. 270/2012	
	2013	1. Infant formula, follow-up formula and formulas for special nutritional purpose directive 2. National Nutrition Programme I 3. ONE WASH National Program Document	

Phases	Year	Policy documents	Food environment domains and goals related to nutritional and dietary outcomes
'Nutrition-sensitive phase': nutrition-sensitive approaches reaching out into different sector	2014	1. Food Exporters, Importers and Wholesalers Directive 2. Regulation for Food, Medicine and Health Care Administration and Control No. 299 3. Agriculture Growth Program II 4. Homegrown School Feeding Program	**Overall food environment interventions:** First mention of unhealthy school food environment potentially contributing to unhealthy choices. General call for regulatory interventions in the food environment for NCD prevention and in the school environment (for physical activity only) to prevent childhood obesity; involvement of industry and trade sector limited to food fortification and food safety measures. **Individual food environment domains:** Food composition and processing: food fortification initiative reinforced by creating awareness of food industry related to micronutrient deficiencies, promoting fortified food and ensuring safety of fortified food. Food promoted for agro-processing is expanded to meat, milk and honey, while previously sugar was singled out for agro-processing. Food promotion: focus on nutritious infant food, but also on protection of children in general, and restricting marketing of foods high in sugar, salt or fat to children. Food provision: school food provision through school meals introduced to create a 'conducive environment'; promote healthy school environment and school feeding to 'provide students with energy to participate in school activities, have protein content' to prevent undernutrition; safe food preparation and water supply; create market linkages/collaborate with local farmers and food industry for fortified food production. Social protection programmes to improve food security with cash or food transfers for most vulnerable households. Food prices: sugar price stabilization introduced. Food safety: safety of different food products that are imported, exported and distributed; also addressing adulteration and vitamin or mineral supplements; mention of food system in terms of food safety risks along the food chain; making school environment healthy, safe and sanitary; safe water for consumption and food safety in manufacturing but also for food service providers and vendors.
	2015	1. Food Advertising Directive 2. Health Sector Transformation Plan 3. Productive Safety Net Programme IV	
	2016	1. Food Supplement Directive 2. National Nutrition Programme II 3. Seqota Declaration Implementation Plan 4.National Nutrition-Sensitive Agriculture Strategy 5. National Hygiene and Environmental Health Strategy 6. National Guideline on Adolescent, Maternal Infant and Young Child Nutrition 7. National Social Protection Strategy 8. Growth and Transformation Plan II	
	2017	1. Cereal and Cereal Product Manufacturers Internal Quality Control Establishment Directive 2. Edible Oil Good Manufacturing Practices 3. Food Manufacturing Factories Pre-Licensing Directive 4. Emergency School Feeding Program Implementation Guideline	

Phases	Year	Policy documents	Food environment domains and goals related to nutritional and dietary outcomes
		5. National School Feeding Strategy 6. School Water, Sanitation and Hygiene Strategy and Implementation Action Plan 7. School Health Program 8. National Food Fortification Program Plan of Action	Goals related to nutritional and dietary outcomes: stunting, wasting and underweight; improve household dietary diversity. First reference to all forms of malnutrition. *Who is targeted by policy action:* children (infants/schoolchildren) and women of reproductive age; general population in fortification/food safety actions. *Main paradigm*: First reference to all forms of malnutrition.
'Food systems phase': food environment and nutrition outcomes addressed in wider food system	2018	1. Milk Product Factory Internal Quality Management System Guideline 2. Baby Food Control Directive 3. Food and Nutrition Policy	**Overall food environment interventions:** Food environment mentioned in terms of safety of food provided through food outlets and vendors. More systems-oriented thinking for food safety along the value chain. The built environment was addressed but only with regard to physical activity. Proposals for food processing, prices and front-of pack labelling. More specific calls for reformulation compared to previous more generic proposals. **Individual food environment domains:** Food composition and processing: reformulation of foods containing saturated fats or salt. Food promotion and labelling: advertising and labelling of breastmilk substitutes, other infant food and fortified food; proposals for front-of pack labelling. Food prices: up to 60% excise tax introduced on foods and beverages high in saturated and trans-fats, sugar and sodium. Food safety: safety, availability and affordability of healthy, sustainable food; systematic approach towards food safety along the value chain. Goals related to nutritional and dietary outcomes: in addition to stunting, wasting and underweight goals, first dietary goal related to unhealthy (in nutrition terms) foods and first goal regarding overweight. *Who is targeted by policy action:* general population at 'all stages of life' and, for NCD prevention, adults above 15 years. *Main paradigm*: food systems approach; more explicit goals addressing the double burden of malnutrition.
	2019	1. Food and Medicine Administration Proclamation No. 1112/2019 2. National Strategic Action Plan for the Prevention and Control of Non-Communicable Diseases	
	2020	1. Excise Tax Proclamation No. 1186/2020	

Proposed policy goals and actions addressing the food environment overall

While individual domains were addressed through specific policy actions (Table 5.3), policy documents also referred to the food environment more generally. Market access, availability and accessibility of food were mentioned as important areas of intervention for healthy diets.[70, 73] The most recent agriculture policies promoted the production of diverse crops for consumption, while also trying to ensure diversity available at market and household level.[65, 66] The National Guideline for Adolescent, Maternal, Infant and Young Child Nutrition (AMIYCN) stated that '*availability and access in urban and semi urban areas to fast food outlets, school truck-shops, food stores and vendors in the vicinity may play a role in adolescents' decision-making*'.[74]

Only the NSAP for the Prevention and Control of NCDs formulated specific goals to 'create a supportive, health-promoting environment'.[71] The FNP defined goals of improving multiple domains of the food environment with regard to availability, accessibility and safety of food.[70] Increasing year-round availability of nutrient-dense foods was also the aim of agricultural policy outputs.[65,66,73] Goals related to the school food environment included improving access and educational achievement through health and nutrition interventions, such as school feeding and child-friendly, safe, hygienic and healthy school environments.[59,63,73,75,76]

Table 5.3. Food environment domains in Ethiopian policy documents against global indicators of good practice*

Food environment domain (no. of policies)	Good practice indicators	Status in Ethiopian policies
Food composition and processing (*n* = 21)	Food composition standards/targets set for content of the nutrients of concern (trans-fats, added sugars, salt, saturated fat) in industrially processed foods.	Standards or targets are set for several (mostly unprocessed) food items, not with the aim of minimizing the nutrients of concern but to replace trans-fat and saturated fats with mono and polyunsaturated fats and to reduce salt.[71]
	Food composition standards/targets set for the content of the nutrients of concern (trans-fats, added sugars, salt, saturated fat) in out-of-home meals from food service outlets.	No evidence on policy action found.
Food labelling (*n* = 13)	Ingredient list/nutrient declarations of all packaged foods.	Packaged food is required to include an ingredient list.[77-81]
	Regulations in place for health and nutrition claims to protect consumers against unsubstantiated and misleading nutrition and health claims.	Nutrition and health claims should comply with FAO Codex Nutrition and Health Claims.[82-84]
	Front-of-pack labelling system (examples are Nutri-score or traffic lights).	Front-of-pack labelling of salt and sugar content of packaged/processed foods and drinks only proposed.[85]
	Menu board labelling system.	No evidence on policy action found.
Food promotion (*n* = 11)	Restrict promotion of unhealthy food to children, including adolescents in broadcast media (TV, radio).	Not allowed to advertise any food that has high level of sugar, salt and fat on children's programme using known personalities.[82]
	Restrict promotion of unhealthy food to children, including adolescents in non-broadcast media (online or social media).	No evidence on policy action found.

Food environment domain (no. of policies)	Good practice indicators	Status in Ethiopian policies
	Restrict promotion of unhealthy food in settings where children, including adolescents, gather (e.g. preschools, schools, sport and cultural events).	Limited evidence on proposed measures to regulate advertising at schools on food linked with obesity.[86]
	Restrict marketing of breastmilk substitutes.	Some provisions of the International Code of Marketing of Breastmilk Substitutes being adopted.[80,82,87]
Food prices (*n* = 11)	Reduce taxes on healthy foods (e.g. low or no sales tax, excise, value-added or import duties on fruit and vegetables).	No evidence on policy action found.
	Increase taxes on unhealthy foods (e.g. sugar-sweetened beverages, foods high in nutrients of concern).	In 2009, excise tax on all types of soft drinks, water and other beverages; in 2020, tax on beverages and foods high in salt, sugar, trans-fats and saturated fats.[88]
	Existing food subsidies favour healthy foods.	No evidence for subsidies favouring healthy foods.[72]
	Food related income support is for healthy foods	Food-related support through food vouchers or cash transfers to food-insecure households.[67,89]
Food provision (*n* = 10)	Policies in schools/early education services for food service activities (canteens, food at events, fundraising, promotions, vending machines, etc.) to provide and promote healthy food choices.	Only proposed in terms of a national standard for food procurement and food handlers in and around school for food safety control.[63,68]
	Policies in public setting for food service activities (canteens, food at events, fundraising, promotions, vending machines, etc.) to provide and promote healthy food choices.	No evidence on policy action found.
	Support and training systems to help schools and other public sector organizations and their caterers meet healthy	As part of school feeding, standard training for all actors on food processing, safety, handling and preparation.[68]

Food environment domain (no. of policies)	Good practice indicators	Status in Ethiopian policies
	food service policies and guidelines.	
Food retail (*n* = 7)	Zoning laws on the density/location of healthy/unhealthy food service outlets.	No evidence on policy action, but mentioned food environment may play a role in adolescents' food choices.[74]
	In-store availability of healthy/unhealthy foods regulated to promote in-store availability of healthy foods and limit in-store availability of unhealthy foods.	No evidence on policy action found.
Food trade and investment (*n* = 6)	Trade agreement impacts on population nutrition and health assessed.	No evidence on policy action found.
	Protect regulatory capacity regarding public health nutrition.	No evidence on policy action found.
Food safety (*n* = 32)	Food hygiene policies are robust enough and are being enforced, where needed, by national and local government to protect human health and consumers' interests in relation to food.	Food safety policy documents are numerous and robust, but enforcement is limited.[77,78,80,87,90] Regulations on food safety of imported foods are in place[78,79] and training in food safety for food vendors in and around schools, hotels, restaurants, street vendors and catering.[63,70]

*Adapted from Refs 28 and 61.

Proposed policy actions addressing specific food environment domains

Food composition and processing

For the Food-EPI good practice indicators of setting 'food composition standards/targets for content of the nutrients of concern (trans-fats, added sugars, salt, saturated fat) in industrially processed foods' or 'out of home meals from food service outlets', limited evidence was found in the policy documents. The Ethiopian Standards Agency set standards for several food items, most of them related to unprocessed fruit, vegetables or cereals, but only a few are for processed foods and beverages (such as soft drinks, palm oil and sweets) and not with the aim to reformulate these foods by minimizing the nutrients of concern. Both the NNP II and

the NSAP for the Prevention and Control of NCDs proposed actions with regard to reformulating nutrients of concern.[59,71]

We identified policy action relating to processing that went beyond the Food-EPI good practice indicators, such as agro-processing and food fortification. While policy documents focused on agro-processing of nutrient-dense foods such as meat and milk, they also included honey and sugar, not motivated by objectives related to public health but to economic development, job creation and international trade.[64,72] The agriculture policy documents that were already sensitive to nutrition tailored the agro-processing actions more towards '*ensuring consumption of nutritious and diverse foods*'.[65] This was proposed by focusing on nutrient-rich value chain crops in production and processing, post-harvest handling, value addition and preservation.[59,65,65,70] Fortification of edible oil, flour and salt was also an important policy action in different policy documents.[57-59,70,73]

Food labelling

Food labelling is mandatory and regulated by the EFDA. It should include a list of all ingredients for commercially produced or imported foods, '*declaring in numerical form the amount of nutrients present in the per portion of the product as recommended for daily consumption or amount per unit for single use*'.[59,81] The food label should not include any health claims,[79] which are particularly regulated for infant formula and '*may not be described or presented on any label or in any labelling in a manner that is false, misleading or discouraging breastfeeding*'.[80] For the front-of-pack labelling or menu board labelling system, we found limited evidence in one document proposing front-of pack labelling of salt and sugar content of processed foods and drinks without specifying its proposed format.[71]

Food promotion

We found evidence for policy actions restricting the promotion of breastmilk substitutes targeted at infants but limited evidence of marketing restrictions of unhealthy food for children on broadcast media, although not for non-broadcast media or specific settings. The Food Advertising Directive does not allow advertising of '*any food which has a high level sugar, salt and fat on children's programmes using known personalities and other similar ways*',[82] but no nutrient profiling threshold is provided to determine foods with high levels of sugar, salt or fat. The NNP II further called for regulations to prevent the exploitation of children, young people and families by advertising unhealthy foods and beverages.[59]

For the indicator regarding 'promotion of unhealthy food in settings where children, including adolescents, gather', we only found proposals to regulate advertising at schools, such as prohibiting promotions on soft drinks, sweets, and foods due to their impact on obesity.[86]

Marketing of breastmilk substitutes is restricted because some components of the International Code of Marketing of Breastmilk Substitutes have been adopted.[80,82,87] Advertising food for infants, such as formula, is prohibited.[78,89,82,87] Furthermore, '*it is forbidden to give infant food samples or any food description gift, material or similar thing for pregnant women, infant mothers or family members*' or show any pictures of children or mothers in child food advertisements.[82]

Food prices

Good practice indicators related to food prices include reduced taxes or subsidies on healthy food and increased taxes on unhealthy foods. The identified policy actions related to food prices appear incoherent with nutrition objectives and across policy documents. Instead of subsidizing healthy food, the GTP II proposed price stabilization interventions for sugar, edible oil and wheat to low-income households.[72] The NSAP for the Prevention and Control of NCDs was the first document proposing increased taxes for SSB.[71] Excise tax on SSB was already in place in 2002 but was reduced from 40% to 30% between 2002 and 2009.[91] In 2020, this tax was expanded to foods and beverages high in salt, sugar, trans-fats and saturated fats.[88] Edible animal or vegetable fats/oils with ≥ 40 g/100 g of saturated fat, or > 0.5 g/100 g of trans-fat, are taxed at a rate of 30–50%.[88]
Food related income support is provided by the fourth Productive Safety Net Programme (PSNP IV), through conditional cash transfers or direct support in terms of cash or food to vulnerable households and individuals,[67] but this support is not specific to healthy foods.

Food provision

We identified some policy actions in schools for food service activities, but only in the context of school feeding programmes targeted at primary schoolchildren from poor and food-insecure households.[59,63,73,86,89] The School Feeding Program aimed to reduce hunger and reduce deficiencies in Vitamin A, iodine and iron.[63] School meals should therefore contain energy and macro- and micronutrients by including protein-rich cereals, oil and iodized salt.[75] We found no evidence of policy action in school feeding programmes or procurement policies that encouraged healthy foods while discouraging or banning unhealthy foods or beverages.

Evidence for 'Support and training systems to help schools and their caterers meet healthy food service policies and guidelines' was only identified as part of the School Feeding Program, which draws on a team of experts and trainers from teacher training colleges and federal/regional Ministries of Education and Health to provide training in health and nutrition.[63]
In addition to the good practice indicators, we identified relevant information in the policy documents regarding the sourcing of foods through school gardens,

smallholder farmers,[86,92] market linkages or collaborations with the food industry.[68]

Food retail

We found no evidence on 'Zoning laws on the density/location of healthy/unhealthy food service outlets' or in-store availability of healthy/unhealthy foods. It was recognized that the '*availability and access to fast food outlets, school tuck-shops, food stores and vendors in the vicinity may play a role in adolescents' decision-making*',[74] but no action was specified on how to address this.
In addition to the Food-EPI indicators, we identified policy action to improve the availability of safe and healthy foods at markets. The AGP II aimed to build market centres, particularly for perishable foods such as fruit and vegetables, animals, milk and honey collection and processing.[66]

Food trade and investment

We found no evidence for the good practice indicator that 'trade agreement impacts on population nutrition and health should be assessed'. The GTP II aimed to undertake negotiations with the World Trade Organization, while strengthening existing regional partnerships within East Africa,[64,72] but the impact of trade agreements on population nutrition was not addressed.

Food safety

The good practice indicator for food safety refers to the robustness of food safety and hygiene policies. We identified strong policy action on food safety (including hygiene) in numerous documents, which also highlighted the limited enforcement of food safety regulations. Food safety standards are regulated by the EFDA through registration, licensing and inspection of food.[79,81,85,90,93] The EFDA stated that '*no food unfit for human consumption or not complying with appropriate safety and quality standards may be manufactured, imported, exported, stored, distributed, transported or made available for sale or use to the public*'.[90]

All food items were covered under the Food and Medicine Administration Proclamation 2009,[77] which was then replaced with the more detailed Proclamation in 2019.[78] Following the proclamations, directives have been published specifically for safe production, processing, packaging and distribution of milk, cereals, edible oil, micronutrient supplements and infant formula/complementary food.[57,80,81,83,84,94] However, some policy documents highlighted that enforcement of existing food safety standards needs strengthening in specific contexts (imported foods, school feeding foods prepared in hotels, restaurants or by street vendors).[58,70,73] The NNP (I and II) and different directives of the EFDA proposed strengthening the inspection of imported food.[58,59,79] The NNP II suggested

preparing a manual to inspect and regulate food items, strengthen the capacity of the Ministry of Trade for regular inspections and monitoring and also strengthen and equip laboratories.[59]

In addition to the good practice indicator, we found evidence related to water safety in specific settings, such as the school environment. Several policy documents envisioned an adequate, safe, uninterrupted and inclusive water supply[57,73] for all households and schools.[58,60,74,76,95] For school environments, interventions such as training to control safe and hygienic storage and the preparation and handling of food in and around schools were proposed[63, 68, 73, 92] for fast food outlets, school tuck shops, street vendors, hotels, restaurants and food catering services.[70, 74]

Policy goals addressing outcomes related to diets or nutritional status

Most policy goals referred to dietary outcomes related to safety, quality and diversity. Dietary quantity was rarely mentioned. Improving dietary diversity was a goal of the FNP, the PSNP IV, the AGP II and the Nutrition Sensitive Agriculture Strategy.[65-67, 70] The School Feeding Strategy aimed to provide children with vitamins and minerals.[68] More specific dietary goals to reduce salt intake and increase fruit and vegetable consumption were only set for the prevention of NCDs.[71] Dietary quantity was only mentioned in terms of having sufficient food available for consumption.[65, 73]

Reducing stunting and wasting in children and underweight in women of reproductive age were the goals of several policy documents.[57-59,65,70,73,74,96] In the NNP II in 2016 and the FNP in 2018, these goals were broadened to the reduction of malnutrition in different age groups at all stages of life (children, women of reproductive age, adolescents and the general population).[59, 70]

Ending all forms of malnutrition was a goal of the Seqota Declaration, in addition to stunting reduction.[73] The NSAP for the Prevention and Control of NCDs specifically aimed to reduce the proportion of people with overweight and obesity.[71] Reducing micronutrient deficiencies among vulnerable populations, especially in women of reproductive age and children, was the goal of the National Food Fortification Plan.[97]

DISCUSSION

The objective was to assess how different food environment domains have been addressed in Ethiopian policy documents over time and how this compares to the Food-EPI good practice benchmarks. We also aimed to understand if food environment policy actions were coherent with dietary or nutritional goals, and how this has evolved over time. In the policy documents, we identified policy actions addressing diets, different forms of malnutrition and food environments. Over the time period 2008–2020 these efforts have intensified, both in the number of policy documents but also in terms of focus and content.[56] Comparing government action over this twelve-year period with global best practices has revealed gaps in all food environment domains but also relevant policy actions that could be added when benchmarking food environment policies in the context of multiple burdens of malnutrition.

Policy actions addressing the food environment in Ethiopia were dominated by food safety, with less evidence identified for other domains. Food processing and trade were regulated in terms of food safety but not with regard to nutrient content, with the exception of food fortification efforts. The prioritization of food safety on the political agenda could be explained by the high burden of food-borne diseases,[98] the acute nature of food safety issues and potential market disruptions for exports.[99] While food safety actions were included in different policies and legal documents and covered different types of foods, researchers pointed out that food safety regulations are not updated sufficiently and identified the need for a comprehensive food law.[100, 101] However, focusing policies mostly on food safety could limit food environment policymaking to a 'short-term crisis narrative', ignoring more long-term public health concerns such as overweight and obesity.[102] For food prices, marketing, provision, labelling and reformulation, we found limited or conflicting evidence. For instance, fiscal policies included subsidies for flour, sugar and oil in 2016, as well as taxation of foods high in salt, sugar, trans-fats and saturated fats introduced in 2020. Subsidies for flour seem coherent with the focus of agricultural policies on cereal production, which accounts for more than 80% of energy production in Ethiopia.[103]

Unintended consequences of such policy actions should be considered, as research from Egypt showed that subsidies on bread and flour led to increased overweight and obesity in children and women.[104] However, subsidies for healthy foods, such as fruit and vegetables, do not seem to be in place but are urgently needed in view of their escalating price,[10] which prevents particularly the poorest households in Ethiopia from consuming the recommended amounts of fruit and vegetables.[105] Restrictions on advertising and the promotion of foods and beverages on children's programmes are in place for breastmilk substitutes or complementary foods,[79, 82, 87] as well as foods high in sugar, salt and fat. However, they do not exist in settings

where children gather, such as schools. Defining (un)healthy foods through food-based dietary guidelines, which are currently under development,[106] would allow a more coherent, integrated approach towards food prices, promotion, labelling, processing and provision.

The policy goals set in the policy documents appear to be coherent with specific proposed food environment policy actions. We identified that Ethiopian policy documents mostly aimed at reducing wasting and stunting, which is aligned with the policy focus on food safety.[107, 108] Policy actions addressing food promotion, processing, labelling or trade of unhealthy foods, which could contribute to reducing overweight, obesity or diet-related NCDs,[16] are only in the early stages in Ethiopian policymaking. This was also well reflected in goal setting, which has only addressed multiple forms of malnutrition and obesity as a risk factor for diet-related NCDs since 2014, which also aligns with the observed increases in overweight and obesity from 2011.[1, 109] The first policy actions on diet-related NCDs were also aligned with goals to reduce overweight and the consumption of unhealthy foods such as salt.[71]

We argue that addressing multiple forms of malnutrition should also be reflected in benchmarking food environment policy actions. In our analysis, we compared food environment policy action in Ethiopia with the Food-EPI good practice indicators, but also searched for additional policy action on the food environment domains. This helped us to identify policy actions relevant for the food environment that could be considered in global benchmarks in the future. Food processing and composition in the Food-EPI indicators is limited to food reformulation, but we argue that policy actions on agro-processing and food fortification are also of importance and could influence what types of foods are available, processed and promoted in value chains and at markets. A good practice indicator could be related to increasing the agro-processing of healthy foods. We also found that good practice indicators related to food retail were too narrowly focused on formal food outlets, which is not where most consumers in LMIC purchase their food.[110] Policy action addressing informal vendors, as well as open markets, should be analysed in LMIC settings. Potential good practice examples for food safety policies could include incentive-driven training and certification initiatives for informal vendors or policy action beyond the current focus on standards, inspections and control.[24] Also, a food safety commitment index has been proposed to monitor the level of commitment that LMIC governments are making to food safety.[62]

Regarding food prices, subsidies on unhealthy foods should also be monitored and benchmarked as they could incentivise the consumption of energy-dense unbalanced diets.[104] Furthermore, policy actions targeting schools appeared prominent in our analysis. The school setting is ideal to address multiple forms of malnutrition[23] and probably more feasible to manage and regulate than the community food environment (although action is required in both). Therefore,

defining good practice indicators specific for the school food environment would be an important stepping stone to implementing food environment policies on a larger scale. Lastly, benchmarking food and water safety, especially in public settings, would be crucial. In conclusion, we recommend expanding the current Food-EPI good practice indicators to policy actions relevant for LMIC, which address multiple burdens of malnutrition more comprehensively, as well as adding policy actions earlier in the food supply chain, which influences the food environment.[16]

This study provides an overview of the food environment policy context in Ethiopia and proposals for context-specific benchmarks in other LMIC. However, it does not come without limitations. The main limitation of this study is that it only considered government documents that were available online or electronically, therefore documents may have been missed that were only available as hard copy. In addition, it only captured national government commitments outlined in policy documents and not the entire policy process. We therefore cannot make any conclusions in terms of the extent of policy implementation or regional variability.

Our study focused on the document analysis part of the Food-EPI tool because the situation with the Covid-19 pandemic did not allow expert interviews or workshops to be held. Therefore, we could not include a rating or priority setting of policy actions by experts, which is an important next step to making food environments in Ethiopia healthier.

Our analysis could also provide useful insights for Ethiopian policymakers. Positioning food environment policy actions into the wider food system is crucial for more sustainable transformation, considering that actions in the food supply chain before food reaches the food environment can influence whether food is safe, available, or affordable to consumers. Only in recent policy documents from 2018 has an approach to safer food systems been observed. However, this food systems approach would be crucial for all domains of the food environment and could put them into context with food supply actions.[9]

In order to address the double burden of malnutrition, the focus on food safety should be linked to healthy diets more generally, given that food safety, security and nutrition security are all compatible and important parts of a healthy food system.[99] The existing legal actions for food safety could be broadened to promote nutritious food and discourage the consumption of unhealthy food. The excise tax is a step in the right direction, but expanding such efforts to regulating the promotion and availability of unhealthy foods would help leverage efforts to promote healthy diets.

Applying a food systems approach in policymaking is still in the early stages in most countries; the policy dialogues in Ethiopia as part of the preparations for the UN Food Systems Summit and the Ethiopian Food System Roadmap 2030 have been

important steps to put food systems thinking on the agendas of high-level government officials.[111, 112] However, the proposed actions strongly focused on agricultural production and less on food environments. Furthermore, the extent to which the discussed policies are influenced by the current armed conflict in certain regions and the impact of Covid-19 in Ethiopia remains to be seen. Food environments are already negatively affected by interrupted supply chains and it is likely that acute malnutrition interventions could be prioritized in Ethiopian policymaking as a consequence. An important next step following this assessment would be a deliberative priority-setting exercise to generate a set of actions[19] to address the identified gaps in food environment policy actions in Ethiopia. For global benchmarking of food environment policy action, additional indicators should be considered to address important issues in the context of multiple forms of malnutrition.

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Appendix 5.1. Code book used for food environment policiy analysis

Code	Description
Food environment domains	
Food composition and processing	Food composition targets/standards/restrictions for processed foods: to ensure that, where practicable, processed foods minimise the energy density and the nutrients of concern (salt, saturated fat, trans fat, added sugar). Also including agro-processing and fortification
Food labelling	Consumer-oriented labelling on food packaging and menu boards in restaurants for consumers to make informed food choices and to prevent misleading claims
Food promotion	Promotion of unhealthy foods to children including adolescents across all media (print, on stores, in environment, social media, TV…), including food promotion, branding, sponsorship and advertising, including actions related to promotion of breastmilk substitutes
Food provision	Food provided in schools, early childhood education services, hospitals, and other public institutions for food service activities (canteens, food at events, fundraising, promotions, vending machines etc.)
Food retail	Availability of unhealthy foods in communities (outlet density, locations), types of outlets (small (informal) vendors, supermarkets, open markets etc) and in-store (product placement).
Food prices	Food pricing policies (e.g., taxes, subsidies)
Food trade and investment	Global or regional trade agreements, foreign direct investments
Food safety	Potential contamination (microbiological, chemical, metals). Includes food and water (safe drinking water). Regulations, standards to ensure safe production, processing, sale of foods.
Food availability	This refers to foods or drinks availability more broadly, it could include schools, retail, the wider community or if policy documents do not specify the setting or what they mean with availability.
Dietary and nutritional goals	
Dietary quantity	Diets that contain adequate food energy, macro- and micronutrients to meet nutrition and health needs, support physical activity and achieve and maintain a healthy body weight.
Dietary quality	Diets that contain the necessary macro- and micronutrients without unhealthy additives such as transfats. Diet quality is associated with malnutrition but also with noncommunicable diseases, including diabetes, heart disease, stroke or cancer.
Dietary diversity	Diets that include a variety of nutrient-dense foods, which are usually grouped into (Vitamin A rich or dark green leafy) vegetables, (Vitamin A rich) fruits, grains and cereals, dairy foods and animal-source foods and plant-based protein foods such as legumes.

Code	Description
Dietary safety	Diets that contain foods and beverages that are safe to consume with foods and beverages free from contamination with pathogens, mycotoxins or chemicals.
Micronutrient deficiencies	A form of malnutrition caused by deficiencies of individual nutrients (Vit a, iodine, iron etc) or combinations of nutrients.
Overweight and obesity	Reflects excess dietary energy with a body mass index above 25m2/kg or in children with weight greater than 2 standard deviations above normal weight for their height.
Undernutrition	Wasting (acute malnutrition, reflecting recent or severe weight loss associated with lack of calories, defined as child's weight two standard deviations below normal weight for their height), stunting (or chronic malnutrition reflects long-term effects of dietary deficiencies, defined as a child's height being two standard deviations below the normal height for their age)

CHAPTER 6

General discussion

INTRODUCTION

Multiple factors can lead to overweight and obesity but unhealthy diets remain one of the key contributors. Diets in turn are influenced by diverse factors. Using the example of Ethiopia, especially with regard to adolescents, we aimed to assess these factors and how they are addressed in Ethiopian policies. The first chapter provides an introduction to the key issues covered in the research.

The research consisted of an evidence synthesis of dietary behaviour in all low- and middle-income countries (Chapter 2), focused on adolescents and school food environments in Chapters 3 and 4 and Ethiopian policy actions in Chapter 5. This thesis has contributed to understanding the factors influencing dietary behaviours of adolescents in Ethiopia and how policies address the different factors of the food environment. This last chapter summarises the main findings per chapter and presents the key synthesised results. Furthermore, after methodological reflection, several recommendations for future research and programming are suggested.

Summary of main findings

A summary of the key findings can be found in Table 6.1.

The evidence synthesis found that obesogenic behaviours of adolescent girls and women of reproductive age are influenced by factors at individual, social, physical, and environmental levels (**Chapter 2**). The study identified gender norms and failure to recognise the importance of healthy behaviours across the lifecycle as important factors. The abundance and promotion of affordable but unhealthy food, food safety concerns, taste preferences and social desirability of foods also drive the consumption of unhealthy foods.

Findings from the Photovoice study (**Chapter 3**) indicated that concerns over food safety, hygiene, and affordability appear to be the major influencing factors for adolescents' dietary choices. Participants considered the foods available in their environments to be generally unsafe. Adolescents' concerns, together with limited nutrition knowledge and preference for packaged foods, could make cheap, ultra-processed packaged foods appear more desirable to them.

The study on school food environments found pervasive advertising and availability of unhealthy foods and beverages around urban schools in Ethiopia (**Chapter 4**). Almost all the advertisements were of ultra-processed foods, mostly sugar-sweetened beverages. The dietary diversity of adolescents was low and ultra-processed foods and beverages were consumed by 23.5% of adolescents 24 hours prior to the assessment. Our analysis found that higher assets in adolescents' households were associated with higher dietary diversity and consumption of

healthy food groups. We found no association between the food environment and dietary indicators or BMI status.

The results of the analysis of Ethiopian policy documents (**Chapter 5**) showed that all food environment domains have been addressed to some extent but that gaps remain compared to global best practice, especially in food promotion, processing, retail, price, and trade. Since 2018, policy has begun to embrace the wider food system, with more explicit food environment interventions becoming apparent.

Table 6.1. Summary of main findings

Chapter	Objectives and main findings
2.	Objective: To synthesise the qualitative evidence on factors influencing obesogenic behaviours among women and adolescent girls in LMIC Main findings: • Good awareness of the value of a healthy diet and physical activity for good health, which was also perceived as beyond an individual's control or a potential concern for adolescent girls in the future • Unhealthy food was associated with 'unsafe', leading to the perceived safety of packaged food but concerns over fresh fruit and vegetables and street food • Strong preference for taste of snack and fast food • Modern foods and sedentary lifestyle associated with higher social status; traditional and homecooked foods perceived as safer and healthier • Husbands and children strongly influenced dietary choices of women; parents, mostly mothers, influence adolescents' diets • Healthy foods perceived as unaffordable and unavailable in neighbourhoods and within and around schools • Advertising was mostly associated with unhealthy food but also used as a source of information
3.	Objective: To assess factors influencing dietary behaviours of adolescents in Addis Ababa, Ethiopia Main findings: • Good knowledge about dietary diversity and healthy/unhealthy foods; healthy is associated with 'safe' • Fried food, fruit and vegetables sold on the side of the road perceived as unsafe; packaged food with visible expiration date perceived as safe • Homecooked food perceived as safe, healthy, and clean but street food is still consumed due to taste preferences and lack of safer/affordable options • Parents, especially mothers, do most of the cooking and are perceived as a strong influence • Peers are a strong influence, especially in buying fried snack food around school • Healthy foods, such as fish and meat, are perceived as unaffordable and fried food/sweets as cheap • Bigger, more affordable, and safer outlets are difficult to access, therefore no choice but to purchase affordable but potentially unsafe food in the neighbourhood

4.	Objective: To assess whether food environments in and around schools in urban Ethiopia influence dietary diversity, quality, BMI status or perceptions of adolescents Main findings: • Average dietary diversity of adolescents was 3.6/10 food groups, with most consuming grains, pulses, and vegetables but few consuming eggs, dairy, fruit, or green leafy vegetables; 23% consumed ultra-processed foods • Private school adolescents and adolescents with more assets in the household had higher dietary diversity and consumption of meat and healthy food groups • Adolescents spent their pocket money mostly on fried food, SSB or sweets • Adolescents perceived that unhealthy snack food and healthy food was available around the school; they perceived most advertising as unhealthy and private school adolescents reported always having fruit, vegetables, SSB and snacks in their homes • Within the compounds of the 12 schools, all but 2 sold SSB on the premises and 3 schools advertised SSB • In a 0.5-km radius around the schools, 113–924 food outlets were identified, of which most were kiosks. Kiosks had the most SSB adverts and displays. Around the schools, 44–720 food and beverage adverts were identified, of which 89.9% were for SSB • Density of the food environment in terms of outlets and advertising was not associated with the adolescents' diets, BMI, or perceptions
5.	Objective: To assess how different food environment domains have been addressed in Ethiopian policy goals and actions over time and how they compare with global good practice benchmarks Main findings: • Policy goals have broadened from a focus on undernutrition to a recognition of the double burden of malnutrition across the lifecycle • All the 8 food environment domains were addressed to some extent, but gaps remain in food promotion, processing, retail, price, and trade • Food composition and processing: proposal to replace trans-fat and saturated fats with mono- and polyunsaturated fats, and to reduce salt • Food labelling: packaged food must include an ingredient list; proposal to label salt and sugar content on front of packaged foods and drinks • Food promotion: provisions of the International Code of Marketing of Breastmilk Substitutes adopted; restrictions on advertising of food with high levels of sugar, salt, and fat (on children's TV programmes) • Food prices: no subsidies on healthy foods; tax on food and beverages high in salt, sugar, trans- and saturated fats; food-related support for food-insecure households • Food retail: no policy action for zoning laws on density/location of un/healthy food service outlets or in-store availability of un/healthy foods • Food trade: regulations on food safety and quality but no assessment of impact of trade agreements on nutrition and health • Food safety: numerous policy actions, but enforcement is limited • Since 2018, policy began to embrace the wider food system, with more explicit food environment interventions becoming apparent

SYNTHESIS OF FINDINGS

The influencing factors of dietary behaviours are diverse, including individual preferences, environmental factors, and cross-cutting issues such as gender norms. Below, specific factors cutting across the different chapters are discussed and, where applicable, compared with the policy actions identified in Chapter 5.

Food safety concerns can overshadow issues related to food and nutrition security

Fear of food safety was an important factor identified in Chapters 2 and 3. This fear was mostly related to fresh, perishable food such as fruit and vegetables. A multi-country study found that adolescents did not trust vegetables sold in larger markets,[1] which could be linked to the unhygienic surroundings of the vendors or a fear of pesticides.[2] Studies included in our evidence synthesis (Chapter 2) hint towards the risk of these concerns leading to a higher consumption of ultra-processed foods, which were preferred due to their hygienic packaging and labels displaying expiry dates. A recent systematic review of food safety concerns found that these concerns can shift purchasing and consumption behaviours away from fresh fruit and vegetables or animal-source foods towards packaged, ultra-processed foods.[2] A potential solution identified by study participants of the Photovoice study (Chapter 3) was to ban informal food outlets and replace them with more modern, safer outlets. However, in Addis Ababa these small outlets may contribute to the easy access and availability of fruit and vegetables.[3] Supermarkets might be considered safer due to private food safety standards and management systems,[4,5] which has led Asian governments especially to introduce the modernization of food retail through 'supermarketization'.[6] However, studies from Vietnam have shown that policy action aiming to ban or formalise informal vendors or markets into modern markets has negatively affected the affordability and desirability of vegetables in particular.[7]

Furthermore, if food safety policies punish informal vendors without providing sufficient support or training on how to comply with the regulations, they could harm the vendors' livelihoods.[8] Street vending can help to alleviate poverty,[9] especially for women, who have an important role in many traditional food value chains.[10] For instance: in Harare, Zimbabwe, about 81% of people involved in street food vending are women; and in Pretoria, South Africa, most informal vendors involved in the sale of ready-to-eat chicken and chicken by-products are women.[11] Informal food production, processing and marketing is therefore very important to women's livelihoods. Participants in the Photovoice study (Chapter 3) also talked about women's struggle in the informal sector, the harassment caused by policy and the limited options for women to make a living.

Our policy analysis (Chapter 5) identified food safety as a dominant area of food environment policy action. While data on the food-borne disease burden in Ethiopia are limited, sub-Saharan Africa is the WHO region with the highest estimated food-borne disease hazards.[12] Policy action on food safety is therefore crucial, but investments in food-borne disease management are insufficient and skewed to issues of lesser health importance, such as food exports, formal markets and chemical hazards,[13] and are overfocused on control and command approaches (such as harassment of small-scale farmers or traders by authorities, bribes to police or confiscation of equipment).[14] In Kenya, attempts to enforce the pasteurization of milk threaten the livelihoods of smallholder farmers and small-scale value chain actors, while also reducing the accessibility of milk to poor households.[14,15] Policies should therefore broaden their current focus on standards, inspections and trade control to also empower consumers and vendors while avoiding unintended consequences for food and nutrition security outcomes.[13] Incoherent food safety policymaking could also distract from equally pressing issues related to the dietary transition and result in an increase in overweight and obesity.[6]

Gender norms are obstacles to healthy dietary behaviours

Existing gender roles in society and also physical obstacles due to safety appear to hinder girls and women from being physically active and from consuming healthy food (Chapter 2). In the reviewed studies, women tended to conform to their husband's dietary choices, which kept them from eating the healthy food they would have preferred. The traditional gender roles that women have to fulfil in the household can limit their time and further affect their dietary behaviours. Both the evidence synthesis (Chapter 2) and the Photovoice study (Chapter 3) identified that mostly women prepared the food while fathers earned most of the household income. These findings were consistent between government and private schools.

Although fathers were identified as the breadwinners, half of the mothers reportedly were employed in our study (Chapter 4). Women in urban areas often carry the double burden of earning an income while also taking care of the children and the household.[16] Time constraints of urban women who also face less family support compared to rural areas, leave little time for these women to prepare healthy food for their children.[17] To compensate the lack of time, women are tempted to purchase more convenient, often ultra-processed food for their children.[17,18] Furthermore, women's physical access to food can be limited due to poor safety and gender-based violence in urban built environments and public transport.[19,20] Women therefore face multiple burden trying support healthy diets for their children and themselves.

Women also face pressure from the media and society to fit into certain body ideals. Girls and women from urban South America and Asia reported pressure to conform

to their society's feminine ideals, which for girls mostly meant being thin (Chapter 2). Contrary to urban areas, rural women, especially in Africa, associated larger body sizes with maturity, dignity, wealth, good health, and beauty.[21] Our study in urban Ethiopia also found that mothers might push girls to fit into an ideal body image which in African countries is refers to larger and in Asia and South America to thinner bodies. (Chapter 3).

Socio-economic status influences obesogenic behaviours

Our qualitative evidence synthesis (Chapter 2) identified specific perceptions associated with different socio-economic backgrounds: wealth was associated with the consumption of 'modern' unhealthy food, a larger body image and a sedentary lifestyle. Data show that people of higher socio-economic status living in urban areas are more likely to be obese, but a shift to lower socio-economic groups in rural settings becoming overweight and obese is already taking place in countries with an increasing income level.[22,23,] Although in Ethiopia it is still mostly the wealthy and urban populations that are affected by overweight and obesity,[24] this could shift as in other countries.[22] Also, in our Photovoice study (Chapter 3), the issue of an ideal feminine body image was discussed only by private school students but not government school students.

In our study on the school food environment (Chapter 4), we found that adolescents from households with more assets had higher dietary diversity and a higher consumption of healthy food groups. They also reported always having both healthy foods (fruit and vegetables) and unhealthy foods (snacks and SSB) in their homes, which might explain their more diverse diets. A national survey of Ethiopian households in 2011 found that urban households of the higher and middle socio-economic strata had higher dietary diversity but were also more likely to consume sweets, meat, fruit and eggs.[25] Government school students from poorer households with fewer assets reported that certain foods such as meat and fish were unaffordable for their families (Chapter 3), which is not surprising given that prices of healthy foods such as fruit, vegetables and unprocessed meat in Ethiopia have increased by 21–74% between 2005 and 2018.[26] This phenomenon of people spending more money on alternative, more diverse food sources as they become wealthier is not new.[27] The shift from starchy staples towards more sugar, fat and animal products as finances increase has also been defined as the 'nutrition transition'.[28]

In terms of the food environment, both private and government school students agreed that unhealthy foods were widely available (Chapter 4). Contrasting studies found different perceptions of the food environment based on socio-economic status, with more disadvantaged people in more disadvantaged neighbourhoods having more negative perceptions of healthy foods being available.[29] In our studies

the findings imply that, in the neighbourhoods, the food environment might not be that different because private and government school students mostly lived in similar neighbourhoods. Government students in the Photovoice study (Chapter 3) stated that supermarkets with safe and healthy foods were too far away and therefore difficult to reach, whereas more private school students reported having a car so this should be less of an obstacle (Chapter 4). Study participants in the evidence synthesis (Chapter 2) reported limited access to safe pavements and transport, therefore this could be a crucial obstacle for government students to access affordable food. A literature review found that in cities in LMIC, a high proportion of the poor either walk or use non-motorised transport, which in Addis Ababa accounts for about 40% of trips.[30] However, in many cities there are few pavements and pedestrians have to share the crowded roads with vehicles, which further limits the physical food access of people with low socio-economic status.

Policy actions to improve the affordability of or access to healthy foods have not been identified in our policy analysis (Chapter 5). On the contrary, instead of subsidizing healthy foods, policy actions included subsidies for sugar, flour, and oil. The Productive Safety Net Programme of the Ethiopian government includes conditional cash transfers or direct support in terms of cash or food to vulnerable households and individuals, but this support is not specific to healthy foods.[31] If such transfer programmes directly provide or subsidise foods high in energy, sugar, fat and salt, or are implemented in the context of unhealthy food environments, the cash could be used to purchase unhealthy foods.[32] While studies on cash and food transfer programmes found that beneficiaries had more diverse, nutrient-rich diets, they also reported increased consumption of processed foods high in energy and saturated fats.[32,33] Some programmes could therefore undermine healthy diets and even lead to increased overweight in beneficiaries[34-37] if factors in the food environment are not addressed.

Good nutrition knowledge is not sufficient to make healthy choices

The studies identified by the evidence synthesis (Chapter 2), as well as our studies in Addis Ababa (Chapters 3 and 4), showed that adolescents had good knowledge of the importance of dietary diversity, food safety and the healthiness of foods such as fruit and vegetables. Other studies also reported that adolescents had good knowledge and awareness of the importance of healthy diets.[38-40] However, exercising agency to make decisions and choices depends on the context, relationships and the social power dynamics that an adolescent faces.[41,42] Food choice is therefore an expression and negotiation of agency between the supervised spaces of home and school.[38] Our studies found that exercising agency in food purchases was restrained by parents' decisions, financial means, lack of food availability, safety and affordability in the environment that adolescents interacted with (Chapters 2 and 3).

Weller et al.[39] defined influencing factors for adolescents' diets in terms of opportunity (depending on the surroundings), resources (depending on financial as well as environmental factors) and autonomy (depending on the debate or negotiation between adolescents and their caregivers). Negotiations between parents and children seem more apparent in urban areas, where dietary choices were more abundant and adolescents had more autonomy over their purchasing choices.[39] However, in our study (Chapter 3), adolescents reported having debates with parents because the parents seemed to be deciding most of what the adolescents ate, leaving them little room to make their own choices. This influence from parents was described as positive from mothers, who were perceived as more health conscious and aware of food safety risks (Chapter 3).

Furthermore, caregivers often underestimated adolescents' health-related knowledge. A study in LMIC showed that adolescents had greater understanding of diets and health than their parents.[39] Participants in our Photovoice study (Chapter 3) also expressed that they felt not listened to by their parents, who wanted to teach them what they knew. As well as parents, adolescents' agency to make choices is defined by their wider social and physical environment. Similar to our study, a study on adolescents in Ethiopia[43] found that affordability was a major factor in their dietary choices. Furthermore, knowledge translation into the consumption of healthier foods is affected by the social aspect of eating together with peers and the lack of trust in food safety and hygiene.[38] Adolescent participants in our studies were also influenced by the hygiene in their environment and by their peers, both of which affected their healthy choices despite the knowledge they had (Chapters 2 and 3).

Despite these factors in adolescents' physical or social surroundings that prevent them from acting on their knowledge, our evidence synthesis (Chapter 2) further revealed that even when adolescents were able to decide, they might have lacked the motivation to do so. A study on adolescents' aspirations to eat healthily found that eating healthily was seen as a vehicle to achieving a goal, such as a good future, but less as something to aspire to.[44] Eating healthily might therefore feel more like a 'must' than in line with their preferences. However, having a more positive outlook for the future about possible outcomes, for instance in terms of their health goals, could help adolescents with long-term goal setting.[45]

The dietary transition is taking place in Ethiopia, but policy actions are limited

The nutrition transition has been associated with an increasing availability of unhealthy foods, such as ultra-processed foods. Furthermore, annual growth in the retail value of ultra-processed food sales during 2013–2018 was highest in rural and traditional food systems like that in Ethiopia.[46,47] This transition has been described by studies in the evidence synthesis (Chapter 2) in terms of a rural–urban transition but also as a transition across generations, with the grandparents' generation preferring more traditional foods and the younger generation favouring so-called 'modern foods'.

Traditional dishes have been associated with social stigma in some countries (Chapter 2). However, traditional Ethiopian food and eating has a positive connotation due to sharing food with family and friends from one plate, which adolescents perceived as positive (Chapter 3). Ethiopian dishes can also provide a healthy diversity of legumes and green leafy vegetables. However, the preparation of Ethiopian food can be cumbersome and convenience options are appearing in the market, such as dried *injera* or powders for the sauces.[48] Despite the cultural and traditional importance of Ethiopian dishes, ultra-processed convenience food could replace these traditional meals, as has been the case in other countries.[49]

Consuming non-traditional foods outside the home can also be considered prestigious by adolescents, and something they aspire to.[38,44] Adolescents in our study mostly spent the little pocket money they had on fried food, SSB and sweets (Chapter 4). Other studies from LMIC found that as soon as adolescents had any financial means, they chose to spend it on unhealthy foods, which were also more affordable, accessible and desirable to them.[38] These aspirations to be more modern might be further triggered by the advertising of non-traditional foods.[38]

Advertising of unhealthy foods such as SSB has been found to be omnipresent within and around schools in Addis Ababa (Chapter 4). Participants from different studies identified in the evidence synthesis (Chapter 2), including our studies in Chapters 3 and 4, agreed that unhealthy food was more available, affordable, and advertised. However, in the school food environment study (Chapter 4), students did not perceive advertising to be very prominent around the school, even though objective assessment of the food environment found a high number of adverts (246 in a 0.5 km radius around schools), with 89.9% promoting SSB. This percentage is higher than that found in similar studies: 48% in urban Kenya and Ghana[50] and 25% in urban Mozambique.[51]

Changes in the retail environment, especially the increase in supermarkets, have also been associated with the nutrition transition. Supermarkets were often associated with more diversity but also with more unhealthy food.[4] However, the

number of supermarkets in rural and traditional food systems such as that in Ethiopia is low,[47] which we also found in our study (Chapter 3), with supermarkets being the least common food outlet category in the areas around the schools. Furthermore, in sub-Saharan Africa, the proportion of households shopping at supermarkets is reportedly low.[52] Also in our study (Chapter 4), adolescents reported that their families purchased most food at markets, speciality stores such as butchers or bakeries, or small kiosks. Considering the amount of advertising and the availability of SSB that we found at kiosks, which dominate in the retail sector of Addis Ababa, outlets other than supermarkets could contribute to the nutrition transition in Ethiopia.

However, policies in Ethiopia are not yet sufficiently addressing the nutrition transition. The policy analysis (Chapter 5) found that while advertising of unhealthy food was recognised as a challenge, measures to ban it were limited to children's TV programmes. No regulations were proposed to limit or restrict advertising of unhealthy foods or beverages around schools or social media, which is increasingly popular with adolescents in LMIC.[40] Furthermore, most policy goals in Ethiopia still only refer to reducing stunting or wasting or improving dietary diversity. Only three policy documents aimed to end all forms of malnutrition, mentioning overweight or obesity solely as a risk factor for diet-related non-communicable diseases (NCD). Policy actions addressing food promotion, processing, labelling or trade of unhealthy foods, which could contribute to reducing overweight, obesity or diet-related NCD, are only in the early stages in Ethiopian policymaking.

METHODOLOGICAL REFLECTIONS

Strengths and limitations

This study adopted a mixed-method approach and included a wide range of methods. Collecting both qualitative and quantitative data and combining different methods and sources of evidence allowed the data to be triangulated and integrated.[53] The qualitative analysis allowed a deeper understanding of the complex reality of food environments and adolescent behaviours, providing insights that quantitative assessment of the school food environment by itself would not have shown.

Starting with a global perspective of obesogenic behaviours helped to position the Ethiopian data in a broader context. The two studies described in Chapters 3 and 4 then focused on specific settings in urban Ethiopia, both in terms of quantitative mapping of the food environment as well as qualitative assessment of adolescents' perceptions. An important strength of this thesis is that the analysis of Ethiopian policy documents allows some of the findings to be linked to the policies that address these aspects.

The four research projects were mostly independent, as data collection of one did not depend on the findings of another. However, the findings from the qualitative evidence review helped to shape the data collection of the two projects in Addis Ababa. We applied both the socio-ecological framework originating from public health disciplines, which has also been adapted to the African context[54] and linked to the studies in Addis Ababa and the policy analysis, and the wider food systems approach as part of A4NH 'Food Systems for Healthier Diets' flagship programme.[55] This allowed an interdisciplinary view, which was a major strength of the studies.

Despite these strengths, this thesis does not come without limitations. One limitation was the design of the study described in Chapter 4. A cross-sectional design can only provide a snapshot of the prevailing food environment and dietary diversity at the time of the study, which does not allow causal inferences to be made. The food environment is a dynamic space that changes with the seasons, the time of day or even exact location in the case of mobile vendors. Dietary behaviours also differ throughout the year and adolescents' behaviours and preferences can change quickly. Our study was not able to assess these variabilities in diets and the food environment, which could be the reason why no associations were found between dietary behaviours and the factors in the physical environment. However, time and financial constraints did not allow for more than a cross-sectional study. However, considering that our study was the first to assess the school food environment in Addis Ababa, we considered it worthwhile to search for potential associations.

The design of the policy analysis was limited by only considering documents that cover intentions rather than actual implementation of policy actions. Furthermore, the evidence synthesis only focused on adolescent girls and women, which could have limited the scope of the findings. In the studies in urban Ethiopia, we therefore included boys and girls to allow for different perspectives.

Lastly, our focus solely on obesogenic behaviours and environments, especially in the first study (Chapter 2), might have limited the findings related to factors influencing underweight, bearing in mind that countries such as Ethiopia (i.e. LMIC) still suffer from a high burden of chronic and acute malnutrition, which was not addressed. It is therefore important to look at influencing factors of malnutrition more broadly, which we attempted in the Photovoice study by not being restrictive about the types of dietary behaviours of interest. Limiting our scope to solely overweight and obesity would have prevented the crucial findings related to food safety and hygiene. Also, in the policy analysis, we extracted data relevant to under- and overweight, in terms of both goal setting and actions related to the food environment.

Assessment of diets and nutritional status in adolescents

Our study used the Minimum Dietary Diversity for Women (MDD-W) and Global Dietary Recommendations (GDR) scores to describe the adolescents' diets. Indicators such as the MDD-W can be used to assess nutrient adequacy or diet quality.[56] However, although it has been validated for women of reproductive age, which includes the age range of 15–19 years, the cut-off point of a minimum of 5/10 food groups is not appropriate for adolescent boys.[56] Therefore, we calculated the average number of food groups consumed.

Because the MDD-W does not indicate risk related to NCD, we also categorised the dietary data using the GDR score, which is a proxy for NCD risk and can be administered to 15–19-year-olds.[57] The GDR scores compare consumed food groups with recommendations for healthy foods as well as foods that should be limited, such as snacks, ultra-processed foods/beverages and deep-fried foods.[57] In addition, foods and beverages consumed by our study participants were assigned to one of the four categories of the NOVA classification based on their level of processing.[58] Our study focused on diet quality using these three different indicators to describe adolescents' diets in the absence of validated indicators for the study population.[59] Considering how little is known about optimal diets during adolescence, which is a key period of growth and development, our study contributed to that knowledge.

For our study we measured the weight and height of adolescents to calculate the 'BMI for age' score, using WHO Anthro software to compare the mean height and BMI with the median of the WHO growth reference for 5–19-year-olds. The BMI has been suggested for post-pubertal adolescents[60] and is the reference currently used for international comparison.[61] It is an anthropometric measure of the quality of nutrition and healthiness of the living environment during childhood and adolescence and therefore is predictive of health and developmental outcomes throughout life.[62] However, the references for adolescents (unlike those for children under 5 years of age) are not based on a multi-country sample but on a mostly healthy, well-nourished sample,[61] which could underestimate overweight rates in a population facing stunting and wasting and exposure to infectious diseases. Furthermore, growth spurts and age of puberty onset in adolescents can influence weight gain and complicate assessment of the true prevalence of over- or underweight, requiring careful interpretation.[63] With WHO growth references only applicable up to age 19 years and BMI cut-offs applying to adults over 20 years,[61] study participants older than 19 years had to be excluded.

Besides diet, the BMI can be influenced by various factors contributing to energy expenditure that our study did not assess, such as physical activity at home (including heavy workloads), and by intergenerational factors such as exposures and

experiences during pregnancy, mediated through birth length and weight or the occurrence of infections.[62]

Furthermore, as identified by our evidence synthesis (Chapter 2), adolescent girls in LMIC face several obstacles to being physically active. Assessing these factors as part of our study in Ethiopia could have helped in the interpretation of data on the nutritional status of the adolescents. However, because data on factors influencing adolescents' dietary behaviours in urban Ethiopia are lacking, we decided to focus solely on diets.

Assessment of the food environment

Our assessment of the food environment around schools was limited to the density of food outlets and advertising. We did not conduct any food inventories to measure the types of foods and beverages sold by an outlet in order to categorise outlets into healthy and unhealthy. Only focusing on outlet type and ignoring other store characteristics did not allow a detailed assessment of the food environment or the specific factors influencing individuals:[64] for instance, a study in urban Kenya found that food outlet types differed based on the foods sold and advertised.[50] However, detailed store inventories are costly and time intensive,[62] and were not possible in our study. Categorizing food outlets solely as healthy or unhealthy is important but might still be insufficient to reflect the heterogeneity of the different outlets.[64,65] Our study also identified mobile vendors, for which GPS approaches would have been helpful to monitor their movements[66] as GIS-based measures of store locations do not describe the food environment sufficiently. Furthermore, the dimension of access does not solely refer to store locations but also to access to transport,[64] which we also found to be relevant, especially for lower socio-economic groups (Chapter 4). Overall, the methods that our studies applied were mostly developed in high-income countries and were not developed, adapted or validated for the informal retail environment in LMIC.[67]

We combined and adapted different methods to capture the complexity of the food environment and also tried to combine the purely density-based measures with adolescents' perceptions and questions about their transport options. However, different environmental assessment techniques could also have been considered, such as a mix of store audits and GIS-based methods, as well as GPS to capture the mobility within the food environment.[64]

Mobility is also an important factor regarding adolescents as they move between their homes, schools, friends and work and consume a lot of their energy outside the house.[68,69] Traditional methods describing residential neighbourhoods could therefore be misleading or limiting.[69] Furthermore, exposure within a food environment can be contaminated by other elements, such as the household food

environment, social factors, behaviours and preferences.[70] Our study was therefore focused on schools, where adolescents spend a major part of their day.

At the same time, we assessed the adolescents' perceptions of the school and home environment. However, our method did not account for their mobility and potential movement outside the area that we assessed around the school. Using GPS approaches would have been more appropriate to assess adolescents' mobility than the traditional neighbourhood approach.[71]

Lastly, the interaction of adolescents with the food environment was limited, given the little pocket money they had available. Other methods, that assess perceptions of the food environment as a mediating factor of dietary behaviours, could therefore be more informative. However, no standardised tool has been validated for perceptions in LMIC.[72] In our studies, we therefore combined elements of different tools to assess perceptions of the home and school environment but also several other issues related to adolescents' dietary behaviours. In essence, validated tools with key questions specific for adolescents about the food environment would be useful to better triangulate the information.

Implications for future research

Our studies have identified entry points for future research on adolescents' dietary behaviours and food environments.

Assessing dietary behaviours of adolescent girls and boys in LMIC.

This will contribute to filling existing data gaps in dietary data and influencing factors.[59] While data collection on dietary diversity of adolescent girls (15-19y) is planned as part of national DHS,[59] for adolescent boys and adolescents 10-14 years old, dietary data gaps remain. Reporting data attributable to the participants' demographics and socio-eocnomic situation would be an important starting point to better understand influencing factors on the individual and household level. Better knowledge on their behaviours and respective influencing factors further will help translate the Ethiopian FBDG into appropriate age-specific educational messages.[73]

Engaging adolescents as active participants using participatory, creative methods.

Adolescents in our studies have shown good knowledge of nutrition and food safety but often cannot act on their knowledge to translate it into healthy behaviours. Research should go 'beyond the perspectives' of the adolescents and aim to understand the factors that influence their agency to make decisions depending on

their socio-cultural system in which they live.[41] Research should also contribute to empower adolescents by including them in the design, data collection and analysis.

Applying more mixed-method studies in food environment research

Mixed-methods approaches will allow more comprehensive and nuanced assessments of food environments.[72] Specific aspects of the food environment, such as food safety, have been lacking in food environment definitions and typologies;[47] there is also a need to benchmark food safety policy actions as part of food environment policies.[74] Socio-ecological processes need to be considered more in food environment research and there is a need to develop validated assessments of perceptions of availability and accessibility to accurately depict the food environment.[72] Policy actions targeting the food environment could have negative outcomes for women, sustainability or livelihoods, therefore studies are needed to assess the potential unintended consequences of such policies and interventions on.[8]

Implications for policymaking and programming

Our research identified different entry points for policymaking and interventions.

Recognizing adolescents' agency to improve their diets

Global goals currently have a limited focus on adolescents.[75] The disconnect between the amount of investment on improving nutrition for children under 5 years and investments for older children or adolescents[62] needs to be addressed with interventions targeting the whole lifecycle.[75,76] Adolescents should be part of the programming and policy process because they can be effective agents of change, influencing their family's and community's diet and health.[1] Programmes must recognise and leverage adolescents' agency to make healthy choices, limiting nutrient-poor and energy-dense foods[38] and should also help adolescents to strengthen relationships and skills within the positive networks of supportive adults, allowing them a more positive view of their future and motivating them to work towards their health goals.[45,77] Schools are an important setting for adolescent nutrition, where most interventions aim to increase the availability of healthy food while removing unhealthy food items from vendors within and outside the school property.[70] Nutrition guidelines and standards that go beyond the energy and micronutrient requirements for food served within schools are crucial to ensure that school food programmes address the double burden of malnutrition.[78] Comprehensive, multicomponent school programmes are therefore needed to promote healthy school food environments with safe and nutritious meals, inclusive and sustainable food procurement and food and nutrition education throughout the

school system, supported by regulations on the foods sold and advertised in and around schools.[38,78,79]

Equality issues need to be addressed comprehensively

Women seem to be stuck in traditional gender roles in the household, leaving them little time to look after their own health. Interventions solely targeting women through empowerment or income generation activities could add further pressure on their already limited time. However, policy actions to improve nutrition should not reduce female employment but address social protection and workplace policies that promote work–life balance and provide care services. Gender equality therefore needs a societal approach, with men and fathers being involved and playing their part.[8] Our findings related to food affordability, especially of people with low socio-economic status, need to be coherently addressed by policies. Healthy foods that are missing in Ethiopian diets, such as fruit, vegetables, and animal-source foods, should be subsidised and social protection programmes providing cash or food need to consider access to healthy foods.[8]

Taking a systems approach to address all forms of malnutrition

Our studies identified multiple factors influencing dietary behaviours that would need to be addressed using a systems approach. The example of food safety showed that solely improving the safety and hygiene of food might neglect other important issues. Food policies overfocused on regulatory approaches or formalization of the retail sector to improve food safety could have detrimental effects on the livelihoods of vendors and also on food affordability and availability.[5,6] Risk analysis frameworks with risk communication to help people make informed judgements about food safety hazards and risks are crucial in view of the many concerns that our studies revealed.[80] A food systems approach to policymaking would consider potential interlinkages or unintended consequences of policies on different outcomes while identifying appropriate policy actions.[81] However, governments also have competing roles and have to navigate with different power dynamics between public health and the interests of the food industry, which could have positive impacts on economic development.[82,83] A systems approach to policymaking that is tailored to address the double burden of malnutrition could save money and also be more efficient than single-duty interventions.[32,84]

CONCLUSION

Our findings show that the influencing factors of dietary behaviours are diverse and include individual-, social-, physical- and macro-level factors. Our research found that food safety concerns could negatively affect diets and therefore deserve coherent policy action to address the relevant public health risks without doing harm. Body ideals, socio-cultural norms, media influence and limited time to prepare healthy food could push adolescent girls into unhealthy dieting behaviour[85] and expose women more strongly to multiple burdens of malnutrition.[86] Therefore, unless gender norms and beliefs are addressed, women's increased access to resources will neither solve gender inequalities nor reduce the burden of women.

Perceptions related to the unhealthy diets and larger body images of wealthy people, combined with healthy food being more difficult to access or afford, are major challenges for people of low socio-economic status to eat healthily. Our findings also conclude that adolescents' agency to make dietary choices depends not only on their knowledge but also on the complexity of their physical and social surroundings and the confidence they have in their future.

The nutrition transition is taking place in Ethiopia with a high presence and advertising of ultra-processed foods and beverages. Such unhealthy food environments, combined with concerns about food safety and adolescents' aspirations for "modern" foods, could tempt adolescents to consume packaged, often ultra-processed foods. Policies in Ethiopia are not yet sufficiently and coherently addressing the food environment to promote healthy and safe diets in Ethiopia. A food systems approach to food environment policymaking would facilitate identifying potential interlinkages or unintended consequences of policies on different outcomes while identifying appropriate policy actions.

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SUMMARY

Background

Multiple factors can lead to overweight and obesity but unhealthy diets remain one of the key contributors. Diets in turn are influenced by diverse factors. Using the example of Ethiopia, especially with regard to adolescents, we aimed to assess these factors and how they are addressed in Ethiopian policies.

Objectives

The overall objective of this thesis is to understand the factors influencing dietary behaviours of women and adolescents in low- to middle-income countries, and specifically of adolescents in Ethiopia. Additionally, it aims to explore how these adolescents perceive their food environment and how policies address the different factors of the food environment.

Methods

This thesis applied a mixed-method research approach, employing both quantitative and qualitative methods. For **Chapter 2**, a qualitative evidence synthesis (QES) was used to bring together the different types of qualitative evidence. This systematic review followed a framework synthesis methodology to extract, analyse and synthesise the qualitative data from primary research studies. For **Chapter 3**, we applied participatory action research using the Photovoice method, which is a community-based participatory method in which participants take photographs of their local environment to document and represent their community in relation to a specific topic. A cross-sectional approach was used in **Chapter 4**. Using interview-administered questionnaires, adolescent participants were interviewed on socio-demographic characteristics and food consumption. Height and weight were also measured to assess the body mass index (BMI) status. In addition, the external and internal food environment in and around 12 selected schools was assessed using protocols from INFORMAS (the International Network for Food and Obesity/Non-Communicable Diseases Research, Monitoring and Action Support). For **Chapter 5**, a policy analysis was conducted using the INFORMAS Healthy Food Environment Policy Index (Food-EPI) framework as a basis. This study analysed Ethiopian policy documents with regard to policy goals and actions addressing food environments and the respective dietary and nutritional outcomes.

Results

The review in **Chapter 2** sought to synthesise qualitative evidence on individual-, social-, physical- and macro-level factors influencing obesogenic behaviours (eating and physical activity) in adolescent girls and women of reproductive age in LMIC.

Healthy food is often associated with food safety and hygiene, which in an LMIC setting could lead to a preference for packaged foods at the expense of fresh fruit and vegetables. Despite the fears of poor hygiene, street food was often preferred for its taste and convenience. Adolescent girls and women associated social status with modern snack food and a sedentary lifestyle; thus, consuming traditional foods, was risking ridicule, even though homecooked meals were associated with healthier, safe, and clean food. Women's dietary behaviours were strongly influenced by their husbands or children, to the extent that instead of their preferred healthy foods they purchased snacks that they perceived as tasty but unhealthy. Mothers, who cook most of the food, are seen as a positive influence on adolescents' diets. Healthy foods were generally perceived as unaffordable and inaccessible in the neighbourhoods, with safer, healthier, more affordable foods from supermarkets usually out of reach. Food at school cafeterias was described as healthy, but neither safe nor tasty, which made snack food around schools a more attractive choice. Food and beverage advertising was mostly associated with unhealthy food but also used as a source of information.

The study described in **Chapter 3** assessed factors influencing dietary behaviours of adolescents in Addis Ababa using a participatory method called Photovoice. The interviews, focus group discussions and photographs revealed that adolescents had good knowledge about the importance of a diverse, healthy diet while also realizing that foods such as meat and sweets should be consumed in moderation. However, food safety appeared to be a bigger concern than nutrient content: healthy fruit and vegetables sold on the side of the road were perceived as unhealthy due to the poor hygiene of their surroundings and packaged foods with a visible expiration date as safe. Adolescents recognised fried street food as unsafe and unhealthy, but they liked its taste and associated it with the company of their peers after school; they also perceived that they had no safe, affordable alternatives. However, homecooked food was considered safe, healthy, and clean. Mothers did most of the cooking and were therefore a strong influence, perceived as positive by private school students but negative by some government school students. Affordability also played an important role: healthy foods (e.g. fish and meat) were seen as too expensive but fried foods and sweets as affordable; and bigger, more affordable, safer outlets such as supermarkets were difficult to access, leaving no choice but to purchase the affordable, potentially unsafe food in the neighbourhood.

Chapter 4 describes a study on whether food environments in and around schools in urban Ethiopia influence dietary diversity, quality, BMI status or adolescents' perception of the food and home environment. The mean dietary diversity of adolescents was only 3.6/10 food groups: most consumed grains, pulses, and vegetables; hardly any consumed eggs, dairy, fruit, or green leafy vegetables; and 23% consumed ultra-processed foods such as SSB. Private school adolescents were more likely to have pocket money, which they mostly spent on fried food, SSB or

sweets. Assessing adolescents' perceptions of their home and school environment revealed that they perceived unhealthy snack food as well as healthy food to be available around the school. They also recognised most advertising as unhealthy but did not consider there to be a lot of advertising. Private school adolescents reported always having fruit, vegetables, SSB and snacks available in their homes. Within the premises of the 12 assessed schools, SSB were advertised in three schools and available in all but two schools. Within a 0.5-km radius around the schools we identified 113–924 different food outlets (mostly kiosks, with SSB on display and advertised) and 44–720 food and beverage adverts (89.9% for SSB). Our study could not find an association between the density of the food environment (outlets and advertising) and adolescents' diets or BMI. However, having more assets in the households was associated with the higher consumption of a diverse diet and healthy food groups.

The policy analysis in **Chapter 5** aimed to assess how different food environment domains are addressed in Ethiopian policy goals and actions over time and how they compare with global good practice benchmarks. The analysis identified 38 policy outputs (published strategies, plans or policies) from nine different government ministries or institutions. All eight food environment domains (food composition and processing; labelling; provision; retail; prices; trade and investment; food quality; food safety) were addressed but gaps remained in food promotion, processing, retail, price and trade: no policy actions identified for minimizing nutrients of concern (trans-fats, added sugars, salt, saturated fat); replacing trans- and saturated fats with mono- and polyunsaturated fats and reducing salt was proposed in only one document; regulations on ingredient lists and health claims on food products were found; and a proposal for front-of-pack labelling of salt and sugar content of packed foods and drinks was identified. Food promotion is restricted regarding breastmilk substitutes and foods high in sugar, salt, and fat on children's TV programmes but not for online media or at schools. None of the policy documents included subsidies or reduced taxes for healthy foods but in 2020 an excise tax was introduced on food and beverages high in salt, sugar, and trans-/saturated fats. Ethiopia also has a social safety net programme in place, providing food-related support for food-insecure households. Our analysis could not identify policy actions on zoning laws regarding density or location of (un)healthy food outlets or in-store availability of (un)healthy foods. No policy document referred to the potential negative impact of trade agreements on nutrition and health. We identified strong policy action on food safety and hygiene in numerous documents, which also highlighted the limited enforcement of food safety regulations. Between 2008 and 2020, the different food environment domains have been increasingly addressed, along with policies to embrace a wider food system approach with more explicit food environment interventions. Policy goals have also broadened, from a focus on undernutrition (mostly in children <5 years and women of reproductive age) to recognition of the double burden of malnutrition across the lifecycle.

Conclusion and Implication

Our findings suggest that the influencing factors of dietary behaviours include individual-, social-, physical- and macro-level factors. Food safety concerns, body ideals, socio-cultural norms, media influence and limited time to prepare healthy food could negatively influence diets and increase exposure to multiple burdens of malnutrition. Perceptions related to the unhealthy diets and bigger body images of wealthy people, combined with healthy food being more difficult to access or afford, are major challenges for people of low socio-economic status to eat healthily. Our findings also suggest that adolescents' agency to make dietary choices depends not only on their knowledge but on the complexity of their physical and social surroundings and the confidence they have in their future. A nutrition transition is taking place in Ethiopia, with the high presence and advertising of ultra-processed foods and beverages. However, policies are not yet sufficiently in place to coherently address this unhealthy dietary transition in Ethiopia.

This thesis has identified several entry points for future research and policymaking related to the dietary behaviours of adolescents and their food environments. Future research should aim to engage adolescents as active participants in research using creative participatory methods and to empower adolescents by including them in the design, data collection and analysis. Adolescents should also be part of the programming and policy process as they can be effective agents of change, influencing the diet and health of their family and the community. Comprehensive, multicomponent school programmes are needed to promote healthy school food environments with safe and nutritious meals, inclusive and sustainable food procurement and food and nutrition education throughout the school system, supported by regulations on the foods sold and advertised in and around schools. Future studies on food environments should apply further mixed-method studies for more comprehensive and nuanced assessments of food environments. Specific aspects of the food environment, such as food safety and socio-ecological processes, have been limited in food environment research. Our studies identified multiple influencing factors for dietary behaviours that would need to be addressed using a systems approach. A food systems approach to policymaking would consider potential interlinkages or unintended consequences of policies on different outcomes while identifying appropriate policy actions.

SUMMARY IN AMHARIC

ዓላማዎች

የመመረቂያ ጥናቱ ዎና ዓላማዎች የአዎቂ ሴቶችና በጉርምስና ወቅት የሚጉኙ ወጣቶች የአመጋገብ ስረዓትን የሚወስኑ ምክኒያቶችን በኢትዮጵያ ብሎም በታዳጊ የዓለም ሃገራት መረዳት ነዉ።። በተጨማሪም ወጣቶች የምግብ ከባቢያቸዉን እንዴት እንደሚረዱ ብሎም የሃገሪቱ ፖሊሲዎች የምግብ ከባቢ ጉዳዮችን በምን መልኩ እንደሚዳስሱ ማጥናት ነዉ።።

የጥናቱ ዘዴዎች

ይህ የመመረቂያ ጥናት አይነተታዊና ምጣኒያዉ ቅይጥ የአጠናን ዘዴን የተከተለ ነዉ።።
ምዕራፍ ሁለት የአይነታዊ የአጠናን ዘዴን በመከተል የተለያዩ የጥናት ዉጤቶችና መረጃዎችን በመለየት፤ በማጠናቀር፤ ሳይንሳዊና ስልታዊ መንገድ በመከተል ይተነትናል።።
ምዕራፍ ሶስት ፎቶቮይስ የሚባል አሳታፊ የጥናት ስልት በመከተል የጥናት ተሳታፊዎች በከባቢያቸዉ የምግብ ምርጫቸዉን ይወስናሉ ብለዉ የሚያስቡአቸዉን ጉዳዮች በፎቶ የገለጹበት ጥናት ነዉ።።
ምዕራፍ አራት በቃለ መጠይቅ የተደገፈ የመስክ ጥናት ዉጤትን ያቀርባል።። ጥናቱ ወጣት ተማሪዎችን ስለ አጠቃላይ የኑሮ ሁኔታቸዉ፤ አመጋገባቸዉና በትምህርት ቤታቸዉ ወስጥና ዉጭ ያለዉን የምግብ ካባቢ የኢነፎርማስ መስፈርትን በመከተል አጥንትዎል።። በተጨማሪም የወጣት ተማሪዎቹን የቁምትና ክብደት ልኬት በመዉሰድ የዉፈረትና ቅጥነት መጠንን ገምግምዎል።።
ምዕራፍ አምስት በኢንፎርማስ የምግብ ከባቢ ፖሊሲ ኢንዴክስ መሰረት የአትዮጵያን የምግብ ነክ ፖሊሲዎች ትንተና ዉጤትን ያቀርባል።።ጥናቱ የሃገሪቱን ፖሊሲ አላማ፤ግብና ትግበራቸዉን ከምግብ ከባቢና አመጋገብና ስነምግብ እይታ ገምግሟል።።

የጥናቱ ዉጤቶች

ምዕራፍ ሁለት ለይ የቀረበዉ አይነታዊ ትንተና በግለሰብ፤ማህበረሰብ፤ እንዲሁም በማክሮ ደረጃ የወጣት ልጃገረዶችና ሴቶች አመጋገብና አካላዊ እንቅስቃሴ ላይ ተጽዕኖ ያላቸዉን ጉዳዮች ለይትዎል።። የጥናቱ ተሳታፊዎች የምግብን ጤናማነት በዎነኝነት ከምግብ ደህንነት አንጻር የሚያዩ ሲሆን የህም እንደ ኢትዮጵያ ላሉ ታዳጊ ሃገራት በፋብሪካ የተመረቱ የታሸጉ ምግቦችን እነደ ፍራፍሬና አታክልት ካሉ ምገግቦች በተሻለ እንዲመረጡ ሊያደርግ ይችላል።። ይህም የታሸጉ ምግቦች ድህንነት የተሻለ ነዉ ብሎ ከማመን ይመነጫል።። የሁን እንጂ የወጣቶቹ የምግብ ደህንተት ስጋት በመንገድ ዳር የሚሸጡ ምግቦችን ከመመገብ አላገዳቸዉም።። የምግቦቹ ጣዕምና ለአመጋገብ ምቹ መሆን እነኚህን ምግቦች ለመመገብ ዎነኞቹ መነስኤዎች እንደሆኑ ተገልጽዋል።። በሌላ በኩል የመክሰስ (የታሸጉ) ምግቦችን መመገብ እንዲሁም በቂ የአካል እንቅስቃሴ አለማድረግን ከተሻለ የኑሮ ደረጃ ጋር በመያያዙ ምክኒያት በቤት የተሰሩ ባህላዊ ምግቦችን ምንም እንክዎን ጤናማ ቢሆኑም እንኚህን ምግቦች መመገብ እንደ ኋላ ቀርነት የመታየት ዕድል ከፍቷል።። እናቶች በበኩላቸዉ የግል አመጋገባቸዉን የሚወስነዉ የባለቸዉና ልጆቻቸዉ የምግብ ምርጫ እንደሆነና የህም ጣፋጭና በቀላሉ የሚበሉ ምግቦችን እንዲያዘወትሩ ምክኒያት እንደሆነ ይገልጻሉ።። ይሁን እንጂ በቤት ምግብ የሚያዘጋጁ እናቶች በወጣት ልጆቻቸዉ አመጋገብ ላይ በጎ ተጽዕኖ አላቸዉ።። በጥቅሉ ጤናማ የሆኑ ምግቦች ወድና ተደራሽ ያልሆኑ እንደሆኑ ተገልጽዎል።። በሌላ በኩል በትምህርት ቤት ካፌቴሪያ የሚገኙት ምግቦች ምንም እንኳን ጤናማ ናቸዉ ተብሎ ቢታሰቡም ተማሪዎቹ የምግብ ደህንነት ችግርና ጥፍጥና እንደሚነላቸዉ ገልጸዎል።።ይህም በትምህርት ቤት ዙሪያ የሚሸጡ ጣፋጭና የታሸጉ ምግቦችን መመገብን እንደአማረጭ እንዲታይ አድርግዎል።።የምግብና መጠጥ ማስታወቂያዎች በአብዛኛዉ ጤናማ ያልሆን ምግቦችን ነዉ የሚያስተዎዉቁት።።

በምዕራፍ ሶስት ፎቶቮይስ በተባለዉን አሳታፊ ጥናት አማካኝነት በአዲስ አባባ የሚገኙ ወጣት ተማሪዎች አመጋገብ ላይ ተጽዕኖ ያላቸዉን ጉዳዮች በመለየት ቀርቧል፡፡ የተናጥል ቃለመጠይቆቹ፡ የቡድን ዉይይቶቹ፤ እንዲሁም የፎቶ ቮይስ ዉጤቶቹ በጥቅሉ ወጣት ተማሪዎቹ ጥሩ የሚባል የስነ ምግብ እዉቀት እንዳላቸዉ አሳይትዎል፡፡ ከተለያዩ የምግብ አይነቶች አስበጣጥሮ የመመገብን ጥቅም፤ እንዲሁም ስጋና ጣፋጭ ምግቦችን መገደብ ወይንም በመጠኑ የመመገብን አስፈላጊነት ለይተዎል፡፡ የምግብ ደህንነት ጉዳይ ዎነኛዉ የወጣቶቹ ስጋት ሲሆን ይህም ምንም እንኳን የፍራፍሬና አታክልት ጥቅምን ቢያውቁም ከመመገብ ግን ገድቧቸዎል፡፡ ይልቁንም በፋብሪካ ተመርተዉ የታሸጉና የአገልግሎት ጊዜአቸዉ በግልጽ የተለጠፈባቸዉን ምግቦች እንዲመርጡ አስገድዷቸዎል፡፡ በቤት የተዘጋጁ ምግቦች ጤናማ ንጹህና ደህንነታቸዉ የተጠበቁ እንደሆኑ አብዛኞቹ ወጣቶች የስማማሉ፡፡ የምግብ ዎጋና የመግዛት አቅም በምግብ ምርጫና አመጋገብ ላይ ተጽዕኖ ያደርጋሉ፡፡ እንደ አሳና ስጋ ያሉ ምግቦች ዉድ ሲሆኑ በምትኩ የተጠበሱና ጣፋጭ ምግቦች ርካሽና ተደራሽ እንደሆኑ ወጣቶቹ ይግልጻሉ፡፡

ምዕራፍ ዐራት የትምህርት ቤት ዉጭና ዉስጣዊ የምግብ ከባቢ እንዴት የወጣት ተማሪዎችን የተሰበጣጠረና ጥራት ያልዉ አመጋገብን እንደሚወስን ያሳያል፡፡ በአማካይ ወጣት ተማሪዎች ከአጠቃላይ 10 ይምግብ አይነቶች 3.6 ብቻ ያህሉን ነዉ የተመገቡት፡፡ ይህም ከጥራጥሬ፤ ከአገዳ እህልና አታክልት የምግብ አይነቶች የተዉጣጡ ሲሆን እንቁላል፤ የወተጥ ተዎጽዎና አረንጎዴ ቅጠላማ አታክልት የበሉ በቁጠጥር በጣም ዉስን ነበሩ፡፡ ይሁን እንጂ 23 በመቶ በከፍተኛ ደረጃ በፋብሪካ የተበላላ (አልትራ ፕሮሰስድ) ምግብ ተመግበዎል፡፡ በግል ትምህርት ቤት የሚማሩ ወጣቶች የተሻለ የኪስ ገንዘብ ሲኖራቸዉ ይህንንም የተጠበሱ ምግቦች፤ ለስላሳ መጠጦች እና ጣፋጭ ምግቦች ላይ ገንዘባቸዉን ያዉላሉ፡፡
ወጣት ተማሪዎች በትምህርት ቤት ዉሰጥና ዉጫዊ ከባቢ ጤናማ የሆኑም ያልሆኑም መግቦች እንዳሉ ይገነዘባሉ፡፡ ባብዛኛዉ በማስታወቂያ ሲተዎወቁ የሚመለከቷቸዉም ምግቦችም ለጤና ጎጂ እንደሆኑ ይገልጻሉ፡፡ሆኖም የማስታወቂያወቹን ብዛት እምብዛም እንዳልተገነዘቡ መረዳት ተችሏል፡፡በጥናቱ በተካተቱት 12 ትምህርት ቤቶች ለስላሳ መጠጦች በሁሉም የሚገኙ ሲሆን በሶስቱ ድግሞ የለስላሳ መጠጥ ማስታወቂያ ሊታይ ችሏል፡፡ ከትመህርት ቤቶቹ በ0.5 ኪ ሜ ዙሪያ ዘ13-924 የምግብ መሸጫወች ያሉ ሲሆን ከ44-720 የሚሆኑት የምግብና መጠጥ ማስታወቂያ (89.9 የለስለሳ መጠጦች ማስታወቂያ) የለጠፉ ናቸዉ፡፡ ጥናታችን በማስታወቂያ ብዛት ወይንም የምግብ መደብር መሸጫ ብዛት ከወጣቶቹ አመጋገብና የሰዉነት ዉፍረት/ቅጥነት ጋር ግንኙነት አላገኘንም፡፡ ይሁን እንጂ ጥናታችን የተሸለ የኢኮኖሚ ሁኔታ ከተሻለ የምግብ ስብጥርና ጤናማ አመጋገብ ጋር ግንኙነት እንዳለዉ ማሳየት ችሏል፡፡

በ**ዕራፍ አምስት** የኢትዮጵያ ፖሊሲዎች ሂደትና በግቦቻቸዉ የምግብ ከባቢ የተመለከቱ የተካተቱ/ያልተካተቱ ጉዳዮችን መርምሯል፡፡ ትንተናዉ ከዘጠኝ የመንግስት ሴክተር መስሪያ ቤቶች 38 የፖሊሲ ሰነዶችን ገምግሟል፡፡ አብዛኛዉ የምግብ ከባቢ መደቦች በፖሊሲዎቹ የተካተቱ ሲሆን ጉድለት ያለባቸዉ መደቦችም ተለይተዎል፡፡ ለምሳሌ ማናቸዉም የፖሊሲ ሰነዶች ስለ ጤናማ ያለሆኑ ስቦች (ትራንስ ፋት)፤ ስኳር፤ ጨዉና ስብ ምንም አይገልጹም፡፡ ይሁን እንጂ የፎሙላ ወተትና በስኳርና ጨዉ የዳበሩ ምግብና መጠጦች በልጆች የቴሌቪዥን ፕሮግራም እንዳይተዎወቁ ቢደነግግም በስነ መህዳር (ኢንተርኔት) ወይም በትምህርት ቤቶች ስለሚደረጉ ማስታወቂያወች ምንም አይደነግግም፡፡ እንዲሁም ጤናማ ምግቦች ላይ ድጎማ ወይንም የግብር ቅነሳ በምትኩ ለጤና ጎጂ የሆኑ ምግቦች ላይ ደግሞ ተጨማሪ ግብር ስለመጣል የፖሊሲ ሰነዶቹ ምንም አይሉም፡፡ ይሁን እንጂ በ2020 ተጨማሪ እሴት ታክስ በከፍተኛ ስኳር፤ ጨዉና ስብ ባላቸዉ ምግብ ላይ ተጥሏል፡፡ ምግብ ደህንነትን በተመለከተ በእጅጉ የተሻለ ትኩረት በፖሊሲዎቹ እንደተሰጠ መገንዘብ ተችሏል፡፡ ይሁን እንጂ የፖሊሲዎቹ አተገባበር ላይ ጉድለቶች እንዳሉ ማየት ተችሏል፡፡
በጊዜ ጎደት (2008-2020) ፖሊሲዎቹ እየዳበሩ ተጨማሪ የምግብ ከባቢ መደቦችን ማካተት ችለዋል፡፡ በተጨማሪም ፖሊሲዎቹ ከህጻናት የምግብ እጥረት በተጨማሪ ያለቅጥ ዉፍረትና ተያያዥ

ችግሮችነ ወደ ማካተት አድጓል፡፡እንዲሁም ከልጆችና እናቶች ወደ ሁሉም የእድሜ ክልል የትኩረተ አድማሱን አስፍትዎል፡፡

ማጠቃለያና የጥናቱ አንድምታወች

ይህ ጥናታዊ ጽሁፍ በአመጋገብ ባህሪያ ላይ ተጽዕኖ የሚያስከትሉ ግለሰባዊ፤ ማህበራዊ፤ አካላዊና በማክሮ ደረጃ ያሉ ምክኒያቶችን መለየት ችሏል፡፡የምግብ ደህንነት ስጋቶች ከሆኑት ምክኒያቶች፤ አመለካከቶች፤ ማህበራዊና ባህላዊ ደንቦች፤ የመገናኛ ብዙሃን እና ጤናማ ምግብ ለማዘጋጀት በቂ ጊዜ አለመስጠት በአመጋገብ ስርዓታችንና ለተለያዩ የምግብ እጥረት ጫናዎች አሉታዊ ተጽእኖ አላቸዉ፡፡ ጤናማ ያልሆኑ ምግቦች ጋር ተጓዳኝነት ያላቸዉ አመለካከቶች ልመሳሌ ዉፈረት የሃብት መገለጫ መሆኑና በዝቅተኛ ኑሮ ለሚገኙ ሰዎች ጤናማ ምግብን ለማግኘት ከባድ መሆኑ ዎና ዎና ችግሮች ናቸዉ፡
ጥናታችን የወጣት ተማሪዎችን የአመጋገብና የምግብ ምርጫ እዉቀት ብቻ ሳይሀኖነ ዉስብስብ የሆኑ መዎቅራዊና ማህበራዊ ጉዳዮች እንዲሁም በራስ የመተማመን ክህሎት እንደሆነ ይጠቁማል፡፡በኢትዮጵያ የታሸጉ ምግቦችና መጠጦች ማስታወቂያ በስፋት የሚታዩ ሲሆን ለሚታየዉ የአመጋገብ ሽግግር (ኒዉትሪሽን ትራንዚሽን) የራሱን አስዋጽዎ እያበረከተ ይገኛል፡፡
ይህ የመመረቂያ ጽሁፍ በወጣቶች የአመጋገብ ባህሪያቶች ለይ ሊሰሩ ስለሚገባቸዉ ጉዳዮች ለቀጣይ ጥናቶችና ፖሊሲ አዉጪዎች ብዙ የመነሻ ሃሳቦች ለይቶ አስቀምጧል፡፡ወጣቶችን በፖሊሲ ማዉጣት ሂደት ላይ እንዲሳተፉና የራሳቸዉን ግብዓት እንዲያበረክቱ ማመቻቸት ያስፈልጋል፡፡ ጤናማ አመጋገብን የሚያበረታቱ ሁሉን አቀፍ የትምህርት ስነ ምግብ ፕሮግራሞች ያስፈልጋሉ፡፡ እነኚህ ፕሮግራሞች ጤናማና ዘላቂ አመጋገብን ለማምጣት ከምግብ ግዢ እስከ ስነ ምግብ ትምህርት ሊይዙ እንደሚገባ ይሁም በመመሪያና ህጎች መደገፍ የገባዎል፡፡
ሁለንተናዊ የምግብ ስረዓትን ያገናዘበ እንዲሁም የፖሊሲ መናብብን የሚያመጣ አካሄድ መተግበር የተሻለ ዉጤት ሊያሰገኝ ይችላል፡፡

ACKNOWLEDGEMENTS

I feel very privileged to have been able to do a PhD. While a lot of privilege has to do with the luck of where you are born in the world, I was also lucky to be surrounded by people who believed in me and lifted me up.

Both my parents, Helga and Gerhard Trübswasser would have been smart enough to go to university, but they could not afford to stay in school beyond 9th grade and had to start working when they were 15 years old. I am forever grateful that my parents gave me the chance to study and trusted me one hundred percent in whatever choice I made (when I myself was doubting many of them).
Danke Mama, Danke Papa, dass ihr immer an mich geglaubt hab, auch wenn ich manchmal den Glauben an mich verloren hab. Ihr habt all meine Ideen unterstützt, auch wenn ihr es selbst ganz anders gemacht hättet!

Besides privilege and education, you also need a lot of time and patience to do a PhD. Both of which and so much more I was lucky to get from Tilly, Felix and Josh. I want to thank Josh for, well, everything. You've been my constant companion, on the good PhD days and the bad ones. You have been everything from the editor of my grammar mistakes, my therapist for any misery I went through, to my advisor thinking through conceptual issues. Your patience, listening to every boring detail, that you heard over and over again, meant the world to me. Tilly and Felix, you have sacrificed a lot in the past years with a mom who was often absent, stressed or just too tired to play. Your patience with me, your interest in my research, how you wanted to understand every single step and your anger at reviewers who rejected my manuscript, kept me going every single day.

Another crucial ingredient you need for a PhD is, obviously, knowledge and I would not be where I am now without the support, conceptual discussions, technical guidance but also caring thoughts I got from my supervisors:
Elise Talsma, you have paved the way for me from the beginning, from pushing the right papers with the right people, helping me get financial support, lifting me up in tricky times, being available to listening to my frustrations from the data collection to rejected papers. You helped me improve my work, asking the critical questions that helped me focus and think scientifically while also empowering, praising, and motivating me! I also really appreciated spending time in Addis and Wageningen with you beyond the PhD.
Edith Feskens, you were always there at the right moment to answer the tricky questions and take the time to help me, from basic library access questions to complicated statistical queries. I would have not been able to do my PhD studies without the financial support you helped me with. I liked when you challenged my views, making me go back to the literature and get my arguments lined up. You are an incredibly positive person, and you encouraged and motivated me whenever I had doubts.

Michelle Holdsworth, once I knew I was working on food environments in Africa and searched for information, your name popped up all over the internet. How lucky was I that you not only responded to my out-of-the-blue email but also agreed to supervise me?! You opened a lot of doors for me, connecting me with other researchers, including me in another review team and spending so much time with me in Sheffield, deconstructing frameworks and helping me think through my research design.
Kaleab Baye, five minutes with you usually answered all my questions and solved all my problems (at least the PhD related ones!). You were also the one giving me the last push to decide for the PhD when I told you sometime in 2017, that I want to do "some research" and you said "Why don't you do a PhD then?" You were so convincing that when walking out of that meeting, I called Josh and said "I'm doing a PhD!". So, I owe you this first push and constant encouragement during my time in Addis and also for the super speedy last minute translation of the summary!
Inge Brouwer, you were the first person I met from the Wageningen team and when I told you I wanted to do "something on food systems", you didn't laugh in my face, but politely suggested to focus on something more specific, maybe on food environments and adolescents. And this is what I did! Thank you for your spot-on inputs from the beginning, helping me keep a sharp focus and also helping me get funding for my work.

I was also very lucky to have amazing co-authors from whom I learnt so much. Roos Verstraeten, I am so grateful that I could do the evidence review with you, that you guided me step-by-step through every turn that a review can take. And whenever we got stuck, there was Andrew Booth, who is my hero of systematic reviews. His incredible knowledge and interesting courses were always good excuses to go to lovely Sheffield. Receiving comments on your writing is usually hard, but getting comments from Andrew was a pure delight! With your kind and witty attitude, you taught me a lot. Jeroen Candel you are a great teacher and helped me wrap my head around policy science, challenging my thinking, and motivating me to do better. Leah Salm, Maartje Poelman and Stuart Gillespie thank you for bringing your expertise to my papers!

I want to thank my opponents: Yemane Berhane, Christopher Béné, Lenneke Vaandrager and Sigrid Wertheim-Heck for reviewing my thesis and providing constructive comments and questions as part of the process. I appreciate the time you have spent.

I started this PhD late in my career, which made me feel that I might not quite fit in with all the other PhDs. But over the seven visits to Wageningen, starting with 2, 3 people I had lunch with on the first trip, I ended up with quite a busy social life and a lovely group of friends. While there are many PhD colleagues I met over the years, I especially want to mention Giulia, Tesfaye, Mahsina, Tsitsi, Donya, Son, Arli,

Taonga, Hongyi, Inga, Koen, Claudia, Marion, Ilse, Umi, Duong, Asrul and Fusta. A special thanks to my two paranymphs, Giulia and Tesfaye, who have been so generous with their time, helping with all the little and big and mostly boring admin stuff in the end, but more importantly, being so encouraging and supportive, reading my discussion section, and thinking through the propositions. I also wanted to thank my Ethiopian PhD friends, Tesfaye, Aregash, Tibebu, Kifle, and Masresha, who have made me feel part of their group, which helped me whenever I missed Ethiopia. Donya, I so enjoyed our scientific discussions from the first moment we met. You motivated me to get into qualitative research and I cannot thank you enough for opening my eyes to this amazing new world! I also want to thank Megan who did her Master study research as part of my project. We met during the most challenging phase of the data collection, when we were trying to figure it all out. Thanks for helping in these crazy, but also most exciting, times of my PhD. Julia, it was so nice meeting you in Addis and Wageningen, chatting and laughing about our research and all the problems we faced. Also, thanks to the Newtrition editorial board, Matjaz, Eva and Mamadou, with whom I enjoyed working for a year.

Gea, Jasmijn and Jeannine helped me from the first minute that I arrived, looking for a desk, getting settled, finding my way around, booking meetings, getting the right project number and chasing people down for signatures. A huge thank you to Jasmijn, you were the superstar at the right minute to book my defense date in the middle of your holidays!

Vesna, you have been very helpful along the whole way of my PhD and thought of me when funding opportunities crossed your desk and always had an open ear for all my random questions. Jacco, thank you for your creative guidance to develop my story for the defense. Jeanne, Alida and Karin, it was always nice to chat with you in between and even though you were not involved in my project, you always showed interest, which was very motivating.

A sincere thank you to all the students who participated in the data collection, which was the absolute highlight of my whole PhD. Hearing your thoughts and ideas brought the theoretical research questions to life. I also want to thank the people who helped get the students to talk, especially Esete, Dawit, Fikre, Ferehiwot and Selamawit. Selamawit you have also been my admin assistant, translator and coordinator during the data collection. Also, I am grateful to the school headmasters and teachers who facilitated access to the students and provided their premises.

Abebe, you have been more than a driver, you have been basically the logistics manager during the data collection. You cared so much about my research that you got almost angrier than I did when cameras were stolen from the study.

Thanks to my Addis PhD partners-in-crime Daisy and Justin, I will never forget our morning coffee at the French bakery, when Daisy and I convinced ourselves to also do a PhD and every time I entered my log in password “I’m in it to win it”, I thought of you Daisy!

Besides doing my PhD, I had the opportunity and honour to work with Corinna Hawkes. I have learned so much during my time with Corinna, learning to think outside the box, to look at the bigger picture and to consider different angels. And besides thinking about food systems transformations, I have learned so much about inclusive, uplifting leadership from her. Talking of amazing leaders, Francesco Branca, Trudy Wijnhoven, Karin Schindler and Oladapo Walker, you have been my early teachers, supporters and inspirations for nutrition.

There were so many other people along the way, who helped at different stages, but I want to mention the most important by name: Roseline Remans, this PhD would have never happened without you pushing to book my very first meeting with Inge, when I passed through Wageningen the first time. Anne Bossuyt, you were always there for a chat, keeping me grounded with nutrition in the real world beyond all the papers I was often drowning in. Kalle Hirvonen, you have been the saviour at the last minute providing the all-time best instructions to complicated statistics questions as well as at the stage of my first thoughts on the proposal. Barbara Stadlmayr, my Viennese nutrition buddy, thanks for all the moral support, inspiring discussions about doing nutrition differently, as well as your open ear for my ranting fits! Kirsten Wandschneider, thanks for helping with the propositions and general research survival advice.

I also want to thank my sisters Barbara, Annemarie and Veronika and my niece Julia for her interest in my research and my friends in Vienna, Addis and wherever they are in the world. I am also grateful to my parents-in-law Carol and Dennis for their constant encouragement.

I am thankful for the funding I received from A4NH, IFPRI, AON and the Chairgroup which allowed me to collect the data and focus better on my studies.

Lastly, a big thank you to anybody who asked, “how is it going with the PhD?” or “what is your PhD actually about?” or even “Are you done yet?” you might not have been interested, but it meant a lot that you asked.

ABOUT THE AUTHOR

Ursula Trübswasser is a public health nutritionist who specializes in food and nutrition policies and programs, infant and young child feeding, adolescent nutrition and food systems. She has more than 15 years of experience in management, implementation and research in Europe, Asia and Africa.

Ursula was born in Vienna, Austria. She studied nutritional sciences at the University of Vienna. After her studies, she worked on clinical nutrition in a hospital in Bucharest, Romania and the General Hospital in Vienna. She then worked for six years at the World Health Organization (WHO), first in the Regional Office to the European Region on nutrition policies; then in Tajikistan and Uzbekistan, focusing on infant and young child nutrition; and finally in the Eastern and Southern African Region supporting 19 countries on a variety of nutrition programmes and strategies. Over the following years, Ursula worked as a consultant for NGOs (Mercy Corps, Concern Worldwide, FHI 360) and the UN (FAO, WHO) in Tajikistan and Ethiopia on nutrition guidelines and training materials and testing of the dietary diversity score for women.

From 2015-19, Ursula supported the EU Delegation and its Member States designing, implementing and evaluating nutrition-sensitive programmes and policies in Ethiopia. She also contributed to the EU Strategy on nutrition and to the Ethiopian Agricultural Growth Program and the Productive Safety Net Program, as well as helping to set up information platforms on nutrition-sensitive agriculture and nutrition in pastoralist communities.

As part of her PhD research, Ursula had the opportunity to work with International Food Policy Research Institute (IFPRI) on a nutrition policy review in Ethiopia as part of the National Information Platform on Nutrition and a qualitative evidence synthesis for Transform Nutrition West Africa.

In 2020 and 2021, Ursula worked as a researcher at the National Research Institute for Agriculture, Food and Environment (INRAE) in France and at the Centre for Food Policy at City, University of London, preparing literature reviews on food safety and dietary behaviours and on benefits and risks of food system policies for diets, environmental sustainability, livelihoods and gender in different contexts.

List of publications

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Overview of completed training activities

Name of the course/meeting	Organizing institute(s)	Year
A. Discipline specific activities		
Workshop March 2018, Presentation on adolescent nutrition lit review	Alive and Thrive	2018
Conference on 'Critical Public Health Consequences of the Double Burden of Malnutrition and the Changing Food Environment in South and South East Asia'	Public Health Resource Network, the Peoples' Health Movement, Jan Swasthya, Abhiyan, WPHNA, Narotam Sekhsaria Foundation and IFPRI	2018
8th African Nutritional Epidemiology Conference 2018	African Nutrition Society and Food and Nutrition Society of Ethiopia	2018
International Symposium on Understanding the Double Burden of Malnutrition for Effective Interventions,	IAEA	2018
Exposure assessment in nutrition research	VLAG	2018
Agriculture, Nutrition, and Health (ANH) Academy's fourth annual	ANH	2019
Study visit to Sheffield to work on QES protocol	Sheffield University	2019
Ethiopia National Nutrition Conference "Diets, Affordability and Policy in Ethiopia: From Evidence to Action"	IFPRI, Compact2025, CGIAR, Ethiopian Public Health Institute	2019
WPHNA Congress	WPHNA	2020
Agriculture, Nutrition, and Health (ANH) Academy's fifth annual	ANH	2020
A4NH Food systems for healthier diets	WUR	2020
African Food environment conference	Ghana university	2020
2nd Africa Food Environment Research Network (FERN2021) eSymposium	INFORMAS/FERN	2021
B. General courses		
VLAG PhD week	VLAG	2018
Library course	WGS	2019
Presentation training	IFPRI	2019
Data vizualization 1	Coursera	2020
Data vizualization 2	Coursera	2020
Research Data Management	WUR library	2020
Scientific writing	WUR VLAG	2020

Name of the course/meeting	Organizing institute(s)	Year
Statistical analysis with SPSS	BOKU, University of Natural resources and life sciences	2020
C. Other activities		
Preparation of PhD proposal	Research group	2017
ESQUIRE course	Sheffield university	2018
The Science of Weight Loss: Dispelling Diet Myths	edx	2018
Global adolescent health	Coursera	2018
CGIAR food environment meeting	A4NH	2019

Colophon

The advisory committee for this research included:

Prof. Dr Michelle Holdsworth, IRD: French National Research Institute for Sustainable Development, Montpellier, France
Prof. Dr Kaleab Baye, Addis Ababa University, Ethiopia

Financial disclosure
The research described in this thesis was financially supported by
by the CGIAR Research Program on Agriculture for Nutrition and Health (A4NH), Research Flagship on Food Systems for Healthier Diets (FSHD). I also received funding from Ethiopia NIPN Technical Assistance Project (ENTAP), International Food Policy Research Institute and the Agriculture for Nutrition and Health (A4NH) Supporting Policies, Programs, and Enabling Action through Research (SPEAR) Flagship and a scholarship from AON

Financial support from Wageningen University for printing this thesis is gratefully acknowledged.

Cover design	Ursula Trübswasser, Brook Getachew, www.brookand.co and Proefschriftmaken.nl
Printed by	Proefschriftmaken.nl