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Food insecurity, dietary quality and health in the Netherlands

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Citation

Velde, L. A. van der. (2022, March 1). *Food insecurity, dietary quality and health in the Netherlands*. Retrieved from <https://hdl.handle.net/1887/3277065>

Version: Publisher's Version

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Note: To cite this publication please use the final published version (if applicable).

CHAPTER 1

General introduction

Worldwide, major inequalities in health exist between the most and least advantaged groups, which are often expressed in terms of income, education, and employment status. These inequalities are seen between countries, but also within countries and between subgroups (1). Social inequalities are also observed in dietary quality, with less advantaged groups generally consuming less healthy diets (2). To identify cues that will help reduce inequalities in health and diet, it is of the utmost importance to address social determinants of health (1). These are non-medical factors determined by socioeconomic systems that have important health consequences, and are estimated to account for up to 55 percent of health outcomes (3). The WHO describes social determinants of health as “the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life” (3). An important social determinant of health is inadequate access to and availability of food to meet basic food needs: food insecurity. Because of the crucial role of adequate foods for health and survival, food security is recognized as a human right (4), and is included as one of the seventeen Social Development Goals which, amongst others, aim to end hunger and achieve food security and improved nutrition (5). This highlights the importance of identifying food insecurity for health, which nevertheless currently remains a relatively neglected issue in European countries such as the Netherlands.

In this introduction, a summary of current literature describes how food insecurity can be defined, the prevalence of food insecurity in affluent countries, and the groups at risk of food insecurity. Furthermore, associations are outlined between food insecurity, dietary intake and the food environment, and with population health. Finally, the objective and outline of this thesis are presented in this introduction, describing how our studies aim to contribute to developing a better understanding of the prevalence of food insecurity and its consequences for dietary intake and health in the Netherlands.

Defining food insecurity

Food insecurity is an elusive and multidimensional concept and this is reflected in the various definitions currently in use. Food insecurity occurs when people lack consistent physical, social, or economic access to adequate food because of limited resources, and is the opposite of food security. The widely accepted FAO definition states that “food security exists when all people, at all times, have physical and

economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” (4). Hence, food insecurity is the opposite of this definition: insufficient physical and economic access to adequate foods.

Food insecurity and hunger are closely related but distinct concepts: hunger is a physiological phenomenon caused by a lack of food, while food insecurity describes a broader and more complex condition defined by unreliable (physical or economic) access to sufficient food. This also includes, for example, anxiety and worries about not having enough (healthy) food. Hunger is a potential, but not a necessary, consequence of food insecurity (6).

Food insecurity can be conceptualized to encompass the hierarchical dimensions availability, accessibility, and utilization (7). Food availability refers to the supply of adequate food and whether this is physically available. Food accessibility refers to the ability of the individual or household to obtain the available food. Major drivers herein are economic access (for example, income and purchasing power) and social access (for example, food distribution within the household and (religious) dietary rules). Lastly, food utilization refers to the use of available food. For example, whether affordable but also nutritionally adequate foods are consumed, whether healthy and safe methods are used to prepare the food, and whether individual health status is sufficient for adequate metabolism of the consumed foods (7). Ultimately, for food security to exist, the availability, accessibility, and utilization of food need to be stable over time (8).

The following quote from one of the participants of our study illustrates the priority of firstly having an adequate amount of food (accessibility of food), and secondly having adequate dietary quality (utilization of food):

“Healthy eating for me and my family means ensuring that there is always some food. That is first of all healthy: you have to eat. And secondly, yes, that you pay attention to your diet.”

Father from a dual-parent household, living in a disadvantaged neighborhood in The Hague, the Netherlands

Besides availability and access to adequate food, feelings of worry and anxiety over food supply and the inability to acquire food in socially acceptable ways are also

important components of food insecurity. These components are incorporated into the definition used by the United States Department of Agriculture (USDA), stating that food insecurity is “the limited or uncertain availability of nutritionally adequate, safe foods or the inability to acquire foods in socially acceptable ways” (**Figure 1**) (9).

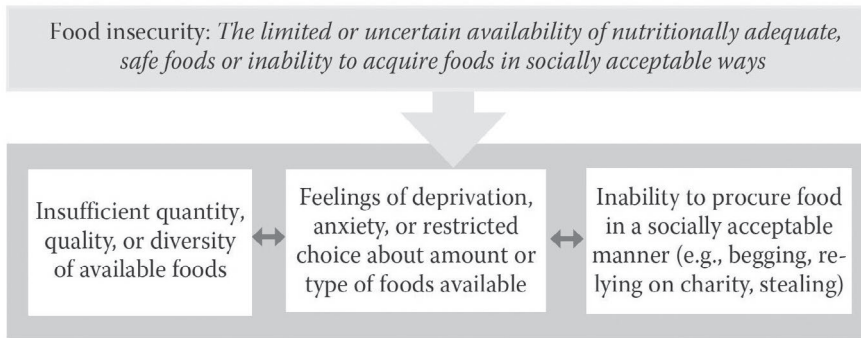


Figure 1. Definition of food insecurity (9)

These definitions attempt to grasp the multidimensionality of the concept of food insecurity, while also addressing psychological and social needs and consequences regarding food access. For example, social exclusion due to an inability to participate in social and cultural norms (i.e., not being able to afford appropriate foods to celebrate religious, social or cultural events) is an important aspect of the experience of food insecurity (10).

Food insecurity prevalence in affluent countries

Food insecurity is increasingly being recognized as a major public health concern facing not only low income countries, but also wealthier countries (11). In high-income countries, food insecurity is often unrelated to lack of access to a sufficient quantity of food (i.e., access to an adequate amount of calories), but rather is an issue of lack of access to a sufficient quality of food (i.e., access to nutrient-dense foods). In the United States, the prevalence of household food insecurity is assessed annually among a representative sample of households, and the most recent report in 2019 found a prevalence of 10.5 percent (12). In contrast, in European countries the prevalence of food insecurity is not routinely monitored. A review outlining the academic discourse on food insecurity in Europe, as expressed in articles published in scientific journals between 1975 to 2013, indicated that scientific knowledge

concerning food insecurity in Europe is limited and highly diverse in terms of reported prevalence, as well as in terms of assessment methods and definitions used (13). This makes it difficult to provide a clear overview of the prevalence of food insecurity in European countries, and as a result, food insecurity remains a relatively little-known issue in these countries (14).

The literature that is available, however, indicates that people living in European countries indeed face issues regarding food security. According to a comprehensive study by Jones et al. (2017), approximately one quarter of people across 39 countries in Europe reported experiencing food insecurity (15). The prevalence of food insecurity varies across populations, regions, and countries. Among European children living in the United Kingdom, France, Germany, Greece, Spain and Greenland, food insecurity ranged from nine percent in the general United Kingdom population, to 100 percent among deprived families receiving charity in the same country (16). Among older European adults (50 years of age and over), over ten percent experienced food insecurity (based on the unaffordability of meat/fish/poultry and fruit/vegetables) (17).

Despite studies suggesting that food insecurity is prevalent in European countries, research focusing on food insecurity in the Netherlands is still scarce, with the exception of some research conducted in the past decade (e.g., (18)).

Food insecurity research is ever more relevant, as prevalence rises due to the global COVID-19 pandemic and public health responses to control viral transmission that impact economies and food systems both locally and worldwide (19, 20). Some studies have already begun to report on these developments, such as a study by Fitzpatrick et al. (2021) that included over ten thousand adults living in the United States, and a study by Niles et al. (2020) which included over 3000 US participants. Both of these studies found increased prevalence of food insecurity since the onset of the pandemic (21, 22).

Those at risk of experiencing food insecurity

As discussed above, the prevalence of food insecurity varies between countries, regions, and populations. Moreover, within countries, regions, and populations, some people are more at risk of experiencing food insecurity than others. Specifically, factors such as belonging to a racial or ethnic minority group, a lower income, a lower

educational level, unemployment, being single, living in an urban area, and lacking a social support network are all associated with an increased risk of food insecurity (16, 23, 24). Independent of these factors, women are generally more at risk than men (24). Gender differences in food insecurity may be explained by economic factors (e.g., women generally have fewer employment opportunities and lower paid jobs) and cultural factors (e.g., women may perceive and react to situations differently given their roles in society, and may feel more responsible for feeding the family which may result in mothers shielding their children from hunger at the expense of their own food security) (25, 26).

Although food insecurity and poverty are closely related, it is important to note that this is not a one-to-one relation: food insecurity and poverty reflect distinct constructs (27). By way of illustration, on the one hand, people living on low incomes may nevertheless be food secure if they possess greater financial and food-management skills that enable them to prepare cheap and nutritious meals (27). Furthermore, good social networks and strong social support - included in social capital - may have a protective effect against food insecurity: a study by Martin et al. (2004) showed that for households with similarly limited financial/food resources, the risk of experiencing hunger was lower for those with higher levels of social capital (28). Social capital reflects the resources that are available due to social behaviors and being part of community networks (28). This may increase access to food, for example by enabling the borrowing of food or the means of transportation from neighbors, or through membership of a religious community which grants access to specific food aid within such communities (e.g. a food pantry run by a church or mosque) (28). Furthermore, previous literature showed that social capital is not only important for adequate food quantity, but also for adequate food quality, as it also influences dietary quality (29, 30).

On the other hand, higher-income groups may experience food insecurity if they have high fixed expenses (limiting the budget available for food), have to prioritize other expenses (such as medical bills), or have poor financial and food-management skills. Furthermore, food insecurity also reflects psychological and social consequences specific to limited access to foods. Taken together, these factors emphasize that indirect indicators such as income are poorly suited as proxies for the experience of food insecurity.

Food insecurity, dietary quality, and the food environment

Earlier literature consistently shows that food insecurity is associated with poor dietary quality among adults: those experiencing food insecurity generally have, amongst others, lower intakes of fruits, vegetables and micronutrients, and higher intakes of calorie-dense foods (31-33). Among children, less evidence exists for the association between food insecurity and poor dietary quality, with the most consistent evidence pointing to an adverse association between food insecurity and fruit intake (31). This may suggest that children are shielded from food shortages by their parents (31), as also suggested by one of the participants in our study:

"I don't care because I prefer [caring for] them [children] rather than myself. I can manage with a few slices of bread and peanut butter and then I go to bed. But they can't."

Father from a dual-parent household, living in a disadvantaged neighborhood in The Hague, the Netherlands

A recent study by Landry et al. (2019), which used the child's own reporting of experienced food insecurity, found evidence for significantly lower dietary quality among food insecure children (34).

Various factors may contribute to suboptimal diets among people experiencing food insecurity. Firstly, limited food availability (i.e., supply of adequate food and whether this is physically available) may pose a barrier for healthy eating among people experiencing food insecurity. Evidence suggests that food deserts - areas with poor access to healthy and affordable food - can be found in disadvantaged areas in the United States, and may contribute to diet-related health disparities (35). In other countries, including the Netherlands, limited evidence for this phenomenon has been found however (36). Nevertheless, an unfavorable food environment with low availability of healthy, nutrient-dense foods and high availability of low-cost, easily accessible fast foods may impede healthy food choices, although evidence for an association is inconsistent (37-39). Similarly, no clear evidence has been found for a differential impact of food environments on diet across socioeconomic position (SEP) groups (40). Research on the food environment and its impact on health is currently emerging, but results have mostly been inconsistent. This may be due to the large variety of methodological choices in these studies, which makes them hard to compare (41, 42). More research in the field of food environments is therefore

warranted, as this may be a promising target for interventions aiming to improve dietary quality.

Secondly, food accessibility, including economic access to foods, is an essential component of food security (7), and the generally higher costs of healthier foods may therefore hamper healthy eating among people experiencing food insecurity (43). One of our participants also indicated financial constraints as a barrier to healthy eating:

“I didn’t really buy healthy food back then, I just bought what was cheap. I only want to live because you are in a cramp, it’s not possible, it’s difficult.”

Single mother living in a disadvantaged neighborhood in The Hague, the Netherlands

A comprehensive cross-national study, which estimated the cost of a healthy diet according to national food-based dietary guidelines in 24 European countries, showed that economic access to a healthy diet is an important problem in a range of European countries. In 16 of the 24 countries, at least 10% of (sub)urban residents were at risk of food insecurity due to inadequate economic access to healthy foods (44). Previous literature, including qualitative studies, also suggests that food prices are an important barrier for healthy eating among lower-SEP groups (30, 45-48). Following the conceptual framework proposed by Laraia et al. (2017)(49) (**Figure 2**), poverty indeed influences healthy food purchasing power, but also influences (food) insecurity and biobehavioral mechanisms (including stress, sleep, and cognitive burden). These insecurities in particular trigger hormonal responses (i.e., stress-, appetite-, and hunger-regulating hormones) that shape eating behavior. These factors then create a scarcity mentality, which (together with a poverty-induced reduced purchasing power) adversely influences the ability to focus on longer-term health goals such as healthy eating, thereby adversely influencing eating behavior (49, 50).

Thirdly, food utilization (i.e., the use of the available food: whether nutritionally adequate foods are consumed, whether healthy and safe methods are used to prepare the food, and whether individual health status is sufficient for adequate metabolism) is an essential component of food security influencing dietary quality (7). Episodic and chronic psychological and emotional stresses associated with food insecurity may adversely impact dietary quality through hormone-induced excessive

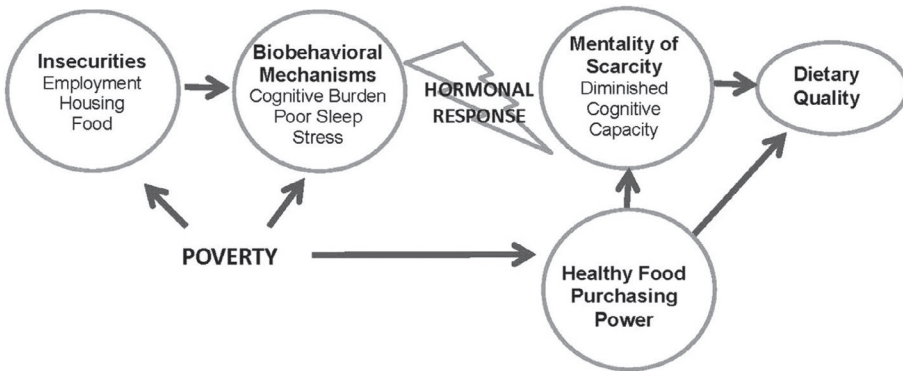


Figure 2. Conceptual framework proposed by Laraia et al. (2017): how poverty creates an environment of scarcity that leads to poor dietary quality (49)

intakes of foods (particularly foods high in fat and sugar), or simply through overeating/binge eating due to hunger when food again becomes available or as a coping mechanism (51, 52).

As described above, various factors may contribute to suboptimal diets among people experiencing food insecurity. It should be noted, however, that although the link between food insecurity and dietary quality is well described in literature, the relationship between food insecurity and dietary behavior is complex. Important research gaps remain in our understanding of underlying mechanisms, the impact on specific subgroups and the cumulative impact over a life course (53).

Food insecurity and population health

As also illustrated in **Figure 2**, food insecurity is an important issue due to its negative consequences for health, and numerous adverse health effects of food insecurity have been reported over the past decades. Experiencing food insecurity is associated with various chronic conditions, including Type 2 diabetes (54, 55), cardiovascular disease (56, 57), chronic kidney disease (58), and asthma (59). Food insecure households in high-income countries are also at increased risk of obesity, and within food insecure households, women are at higher risk of obesity compared to men (60), although the mechanisms and pathways underlying the association between food insecurity and obesity are not yet fully understood (53). Furthermore, adults experiencing food insecurity are more likely to have multiple chronic conditions (61). Moreover, food insecurity increases the risk of anemia, especially among women and children (62).

Besides the impact on physical health, food insecurity also has an adverse effect on mental health, including depression, stress, and anxiety (63, 64). This may be explained by feelings of deprivation and alienation because of inadequate access to food or the inability to acquire food in socially and culturally-accepted ways (64). A review by Bruening et al. (2017) shows that the associations between poor mental health and food insecurity are bidirectional (i.e., experiencing food insecurity increases the risk of poor mental health, but poor mental health also increases the risk of experiencing food insecurity) (65). Women, who are already disproportionately affected by food insecurity, are also at increased risk of poor mental health induced by food insecurity (66). The effect of poor mental health on unfavorable eating behavior is clearly illustrated by the following quote from a single mother, who explained that she lacked energy to prioritize healthy eating or cooking because of poor mental health:

“Everyone is in a difficult situation and you are not in the mood; so yes, then it’s easy to get a bag of fries and throw them in [the frying pan] and everyone has fries. It requires less effort and if you don’t feel well mentally, then washing the dishes is really too much. Going to a supermarket, uh, getting out of bed even, is just too much.”

Single mother living in a disadvantaged neighborhood in The Hague, the Netherlands

People have different social and biological needs throughout their life course, and may therefore be more vulnerable to the consequences of food insecurity at particular stages of life (67). Besides the negative impact of food insecurity on health among adults, experiencing food insecurity in childhood negatively impacts short-term and long-term health, with consequences that include asthma and depressive symptoms, and is associated with increased emergency department visits (68). Living in food insecure households is associated with behavioral, academic, social, and emotional problems among children from infancy to adolescence (69, 70).

As outlined above, food insecurity is associated with disadvantage, interacts with adverse health outcomes, and has different effects during the life course. Therefore, one can argue that in light of socio-ecological inequality and inequity that enhances this adverse interaction, food insecurity reflects a syndemic (i.e., two or more mutually enhancing health conditions that cluster within a specific population) (67).

Himmelgreen et al. (2020) clearly describe this in their proposed dynamic model of the food insecurity and diet-related chronic diseases syndemic (67). In short, this model shows how socio-ecological inequality and inequity induce food insecurity and associated stress, which has an amplifying adverse effect on nutrition and health status (also depending on the life course stage). This can ultimately result in diet-related chronic disease(s), particularly in adulthood. These diseases create a feedback loop that can result in a vicious cycle, thereby amplifying adverse health outcomes (67) (**Figure 3**). The use of a syndemic and life course approach can help provide a more accurate and nuanced understanding of food insecurity and its causes and consequences.

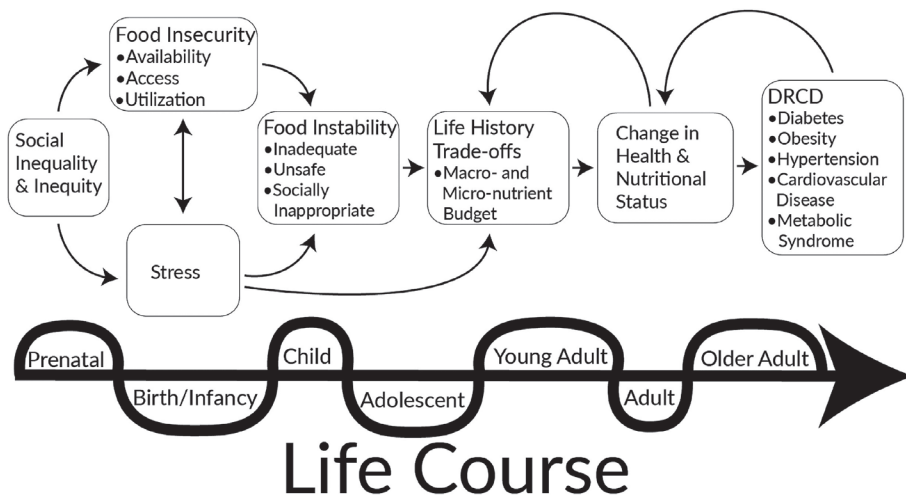


Figure 3. Conceptual model proposed by Himmelgreen et al. (2020) of the food insecurity and diet-related chronic diseases (DRCD) syndemic throughout the life course (67)

All things considered, food insecurity is a multidimensional concept that is interlinked with health through various pathways (9). As described by Weister et al. (2015), determinants within the community, household, and individual level influence health. At the community level, socioeconomic factors and structural factors such as the local availability of food influence food insecurity. At the household level, food insecurity impacts physical health at the individual level, through nutritional, mental health, and behavioral pathways. The influence of nutritional and mental health pathways may be driven by immunologic responses induced by stress or obesity, such as chronic inflammation and negative impacts on the composition of gut microbiota. Importantly, the association between food insecurity and health can be

bidirectional: food insecurity is not only associated with poor health, but poor health is also associated with food insecurity, thereby creating a vicious cycle (9).

The aforementioned literature clearly indicates a link between experienced food insecurity, dietary intake, and health, thereby underlining the importance of achieving food security for population health. Despite the evident importance for health, food insecurity is still a relatively neglected issue in Europe, illustrated by the limited scientific knowledge and important research gaps concerning food insecurity in European countries (13, 14, 71). Specifically in the Netherlands, research into food insecurity is still rare, but as the prevalence of food insecurity and its consequences are known to differ between and within countries, regions and populations, expanding knowledge of food insecurity in the Netherlands is important.

Objective and outline of this thesis

The overall aim of this thesis was to develop a better understanding of the prevalence of food insecurity in the Netherlands, together with its consequences for dietary quality and health. These studies may identify potential targets for interventions aimed at reducing food insecurity among affected people and families in the Netherlands.

The studies presented in this thesis specifically aimed to:

- Assess the association between food insecurity and obesity among disadvantaged Dutch families, and to explore potential mediation by other risk factors for obesity, such as lifestyle factors and social situations (**Chapter 2**).
- Explore the value of assessing food insecurity and adding this to traditional social determinants of health for explaining poor physical and mental health (**Chapter 3**).
- Gain a better understanding of needs and perceptions regarding healthy eating behavior of people at risk of experiencing food insecurity living in disadvantaged neighborhoods in the Netherlands (**Chapter 4**).
- Explore the interplay between food insecurity, fast-food outlet exposure and dietary quality in disadvantaged neighborhoods in the Netherlands (**Chapter 5**).
- Assess whether extending the Theory of Planned Behavior, with barriers related to financial scarcity and food insecurity, better explains dietary quality (**Chapter 6**).

List of abbreviations

SEP	Socioeconomic position
DRCD	Diet-related chronic diseases

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