Can low-income households afford a healthy diet? Insufficient income as a driver of food insecurity in Europe.

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Abstract

In Europe, food insecurity is still a serious concern for individual and public health. Although progress has been made in reducing undernourishment, other types of malnutrition such as obesity and overweight are on the rise. Policies that aim at improving healthy eating and addressing food insecurity tend to focus on food aid, nutritional education and financial incentives. These policies are generally not targeted at the problem of insufficient income as a key barrier to access a healthy diet. In this paper, we present new evidence which shows that insufficient household income and inadequate minimum income policies constitute a remaining concern for accessing a healthy diet. We make use of estimates of the minimum cost of a healthy diet in 24 European countries, in accordance with national food-based dietary guidelines. We use these unique data to (1) estimate the proportion of people living in (sub)urban areas with insufficient income to access a healthy diet, before and after housing costs, based on representative income survey data (EU-SILC), and, (2) compare the cost of a healthy diet with the level of minimum income schemes for specific household types using microsimulation techniques. We find that in 16 out of 24 countries at least 10% of the population in (sub)urban areas risks to be confronted with income-related food insecurity. Our findings show that policies directed at tackling food insecurity should be embedded in broader economic and social policies that promote an adequate income for all, and limit the cost of other essential goods and services.

Keywords

Food insecurity, healthy diet, reference budgets, food cost, adequate income, accessibility

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1. Introduction

Food insecurity remains a global and urgent problem also in European welfare states (FAO 2018b; Davis and Geiger 2017). One of the main causes of being food insecure is *the lack of access to a nutritious diet due to insufficient purchasing power* (Riches and Silvasti 2014; Pollard and Booth 2019; FAO 2018b). In this paper, we address the economic access to a healthy diet and its relation to income adequacy in Europe. Although all EU Member States provide minimum income support for people at active age, poverty remains high and minimum income schemes are proven to be largely, and in some countries increasingly, inadequate to reach a decent living standard (Cantillon et al. 2019).

In rich welfare states the problem of food insecurity is not so much an issue of undernourishment, but rather of lacking access to a healthy diet (WHO 2014; Perez-Escamilla et al. 2018; FAO 2018a, 2018b). Energy-dense but nutrient-poor diets cause a rising trend of obesity and related non-communicable diseases, while coexisting with forms of undernutrition, the so-called double burden of malnutrition (Gakidou et al. 2017; Roberto et al. 2015; Lock et al. 2005; WHO 2014; FAO 2018a). The reasons for malnutrition are diverse, and do not all refer to economic accessibility, including factors such as marketing, attitudes and socio-cultural pressures (Bublitz et al. 2019; Leng et al. 2017). However, studies have shown that unhealthy eating patterns and diet-related health problems have a clear socio-economic gradient (Robertson et al. 2007; Forster et al. 2018; Perez-Escamilla et al. 2018; Vereecken et al. 2005; Nikolić et al. 2014).

Policies aimed at improving the adequacy of dietary patterns in Europe increasingly focus on health-related taxes such as the so-called 'sugar tax' (Teng et al. 2019; Backholer et al. 2017). Depending on their design, they do not necessarily adversely affect low-income households (Nordström and Thunström 2011). However, it can be expected that their health impact on low-income households will be limited if the overall cost of a healthy diet remains too high in comparison with their income. At the same time, another increasingly

popular policy response to food insecurity in the European Union (EU) is food assistance, generally through supporting food banks organised by the voluntary sector (Caraher and Cavicchi 2014; Greiss et al. 2019; Lambie-Mumford and Silvasti 2020; Galli et al. 2018).

Several scholars have criticized this individualized and charity-based approach, arguing in favour of a rights-based framework which recognises the need for adequate economic resources to ensure access to a healthy diet (Dowler and O'Connor 2012; Riches and Silvasti 2014; Pollard and Booth 2019). Such an approach requires empirical underpinning which takes the needs of households into account, as well as the prices they face, the economic resources they have and the societal and personal conditions they are confronted with (Burchi and De Muro 2016). However, there is a lack of comparable data and empirical evidence revealing the size and structural determinants of access to a healthy diet to guide policy makers in Europe (Pollard and Booth 2019; Davis and Geiger 2017). Current studies on food insecurity in affluent countries (e.g. Davis and Geiger 2017; Loopstra et al. 2015; Depa et al. 2018; Galli et al. 2018) have two main limitations: (1) they generally lack a conceptualisation of what is minimally needed to obtain a healthy and acceptable diet, and, (2) they fail to reveal the role of adequate incomes and social policies in having access to a healthy diet.

With this paper, we provide new evidence on the role of adequate income in the ability to access a healthy diet across Europe. Although scholars have inquired the effect of diet costs on dietary habits (e.g. Pechey and Monsivais 2016; Aggarwal et al. 2011), only a few national studies (e.g. in Australia (Ward et al. 2013) and in the UK (O'Connell et al. 2019)), studied the relation between the cost of healthy food and household income. An exception is the recent study by Hirvonen et al (2020), who study the affordability of a healthy and sustainable diet, developed by the EAT–Lancet Commission, in 159 countries. They find that about 99% of the population in high-income countries have a household income that is higher than the healthy and sustainable diet. However, they largely neglect the socio-cultural acceptability of this diet and the cost of other essential goods and services, which also affect the affordability of an adequate diet.

To the best of our knowledge, we are the first to study the affordability of a healthy diet that complies with national food-based dietary guidelines, in a cross-nationally comparable way in Europe. This study makes use of a data set of comparable food baskets representing a healthy diet for urban areas in many European countries (Carrillo-Álvarez et al. 2019b). By comparing the cost of a healthy diet with total disposable household incomes, we first provide a conservative estimate of the number of people experiencing affordability problems across Europe. However, unlike Hirvonen et al (2020), we also apply a more comprehensive approach to affordability by taking the cost of housing and other non-food necessities into account. Finally, by comparing the cost of a healthy food basket with the level of minimum income protection across Europe, we show how many welfare states fail to protect the right to an adequate diet for the most vulnerable.

The paper is structured as follows. First, we briefly discuss some of the main insights from the literature on measuring access to a healthy diet in Europe. Secondly, we elaborate on the methodology we employ in this paper to assess the economic accessibility to a healthy diet across Europe. In the results section, we estimate the number and profile of people in (semi-)urban areas in Europe with an income that does not allow them to access a healthy diet in accordance with the national food-based dietary guidelines. Subsequently, we compare the cost of a healthy diet with minimum income protection levels in Europe. In the penultimate section we discuss the limitations and policy implications of our study, after which we conclude.

2. Economic access to a healthy diet in Europe

Access to an adequate diet is an essential part of the right to an adequate living standard and a life in human dignity (Article 11 in the International Covenant on Economic, Social and Cultural Rights). General Comment 12 of the UN Committee on Economic, Social and Cultural Rights (CESCR 1999) emphasizes that, in order to maintain and enhance good health, not only sufficient, but also *adequate*, socially and culturally acceptable, nutritious and quality food must be *available* and *sustainable* for everyone in the long term. Importantly, the right includes the importance of economic and physical *accessibility* to a

healthy diet, particularly for vulnerable groups (CESCR 1999). Scholars and advocacy organisations generally recognise four main dimensions of food insecurity (FAO 2018b; Barrett 2010; Bublitz et al. 2019): *availability* (i.e. adequate food supply of good quality), *accessibility* (i.e. the nutritious food choices open to person(s), given their income, prevailing prices, and formal or informal safety net arrangements), *utilization* (i.e. whether persons are able to prepare and consume a healthy diet, given the societal and individual context) and *stability* (securing the other three dimensions in the long term). Riches and Silvasti (2014) also stress the importance of food *sovereignty* as an essential part of food security, i.e. the ability to acquire food in socially acceptable ways.

In this paper, we limit ourselves to studying the accessibility dimension of food insecurity as an insufficient, but essential condition for achieving food security. We would like to emphasise that the ability to be food secure not only depends on income and prices, but also on the full set of assets available to a person, on the societal, cultural and individual level, as well as on the nutritional knowledge and dietary practices (see Burchi and De Muro 2016; and Section 6 for a further discussion on the utilization dimension). Furthermore, in line with existing literature on the *affordability* of essential goods and services (cf. Vanhille et al. 2018; Heylen and Haffner 2013), we recognise that economic accessibility does not only depend on household income and the cost of food itself, but also on the cost of other essential goods and services. In what follows, we use the terms economic access and affordability interchangeably.

In Europe, at least four types of indicators are used by policy makers and researchers to gain more insight into access to a healthy diet: outcome indicators, the EU-SILC food deprivation indicator, the Food Insecurity Experience Scale' (FIES) and figures on food bank usage. We briefly elaborate on each of these indicators and what they teach us about access to a healthy diet in Europe.

Outcome measures show that undernourishment rarely occurs in European welfare states, while overweight, obesity and micronutrient deficiency are widespread across the continent (WHO 2020; FAO 2018a; European Commission 2019b; WHO 2014). In 2017, more than

half of the adult population was confronted with overweight or obesity, with generally a higher prevalence among the lowest income quintiles (European Commission 2019b). Research in various developed countries also reveals that healthy, well-varied and quality food products have a relatively higher cost compared to energy-dense and nutrient-poor food products (e.g. Darmon and Drewnowski 2015; Schröder et al. 2006; Barosh et al. 2014). This has an important impact on food choices, especially for people with a limited income (Steenhuis et al. 2011; Pechey and Monsivais 2016; Aggarwal et al. 2011). This suggests that the observed income gradient in overweight and obesity in Europe is at least partially due to inadequate access. Yet, it provides only a very indirect measure of it, as it does not tell us directly whether households on low incomes have higher obesity rates because of inadequate access to food.

In contrast, the EU-SILC food deprivation measure is based on a single survey question asking directly about "the inability to afford a meal with meat, chicken, fish (or vegetarian equivalent) every second day". According to this measure, about 8% of EU (EU-28) citizens is defined as 'food deprived' (Eurostat, 2019 based on EU-SILC data for 2018). Another group of comparative studies (e.g. Jones 2017; Depa et al. 2018) makes use of the subjective 'Food Insecurity Experience Scale' (FIES) developed by the FAO (Ballard et al. 2014; FAO 2018a). The scale includes eight questions that focus on experiences of financial access to sufficient and adequate food. According to this measure, in Europe 16% of the population experiences mild food insecurity, while 6.3% and 3.5% is identified as moderate, respectively severe, food insecure (Jones 2017).

Although these indicators provide useful information on how many people experience financial hardship to access food (e.g. Davis and Geiger 2017; Loopstra et al. 2015), they face several limitations. Firstly, they lack a clear conceptualisation of what constitutes a healthy and acceptable diet across European welfare states. "[A] meal with meat, chicken, fish (or vegetarian equivalent) every second day" is a poor proxy of a healthy diet as defined in dietary recommendations across EU member states (Carrillo-Álvarez et al. 2019a), given that access to fruit, vegetables and whole grains are a more prominent

problem (WHO 2014; Nikolić et al. 2014). Moreover, both the food deprivation measure and the FIES face problems of comparability since concepts such as 'affordability' and 'nutritious', 'enough' or 'healthy' food do not have a uniform interpretation among the public, differing across economic and socio-cultural contexts (Davis and Geiger 2017). Last but not least, given that these indicators do not measure directly the actual resources people have and the out-of-pocket costs they need to pay to access a healthy diet, they are less useful to guide policies targeted at increasing the economic accessibility of a healthy diet.

Finally, researchers often refer to data on food assistance to highlight problems of inadequate access to food. Data on food assistance reveal that a significant – and increasing – number of European citizens is receiving food aid (Galli et al. 2018; Lambie-Mumford and Silvasti 2020). The 2018 annual report of the Federation of European Food Banks (FEBA) indicates that 9.3 Million people are supported through 421 Food Banks across 24 EU countries (FEBA 2018). Importantly, this is a rather conservative estimate since there is a large variation of local initiatives operating without the support of the European Commission (Galli et al. 2018). Due to this wide variety of actors and reporting systems, there are no comparable data available on the actual amount of people receiving food assistance in Europe (Gentilini 2013). The changing profile of food bank beneficiaries could indicate that the affordability of a healthy diet is becoming more widespread across the population, especially among single parent households, the working poor and young people (European Commission 2019a; Gentilini 2013; Depa et al. 2018). However, apart from being incomplete and lacking comparability, data on food bank usage may provide misleading information to assess trends in economic access to an adequate diet. The rising trend of, and cross-national variations in food assistance across Europe can be driven by many factors, including supply-side changes (increase in policy support, food donations, number and access of food banks), and demand-side changes (e.g. increased public acceptability of food aid). Also at a single point in time, not all households that make use of food banks necessarily face problems of not being able to afford a healthy diet and vice versa, not all those with affordability problems will turn to food banks, due to stigma or

other coping strategies such as adhering to inadequate and unhealthy diets (Davis and Geiger 2017; Riches and Silvasti 2014; Lambie-Mumford 2019).

Given the limitations of existing indicators, we propose to make use of the reference budget method to assess the cost and accessibility of food needed to maintain good health. Compared to the previously mentioned indicators, reference food baskets have the advantage of providing a context-specific benchmark of what people minimally need to eat a healthy diet. By comparing the cost of an adequate diet directly with disposable household income, it is possible to directly measure affordability problems for accessing a healthy diet. Several national or local studies developed food baskets to measure the cost of a healthy diet e.g. in Scotland (Dawson et al. 2008), Australia (Ward et al. 2013) and the UK (Ginn et al. 2016; O'Connell et al. 2019). We are the first to make use of food baskets that were developed in a comparable matter to reflect the cost of a healthy diet in accordance with national food-based dietary guidelines across European welfare states (Carrillo-Álvarez et al. 2019b).

3. Data and method

In this section we consecutively (1) explain how we estimated the minimum cost of a healthy diet making use of available food budgets; (2) discuss the three indicators that we use to measure the economic accessibility of a healthy diet; (3) elaborate on how we implemented these indicators in representative samples of the population; (4) and explain how we estimated the level of minimum income protection in each country.

3.1. Estimating the cost of a healthy diet

In this paper, we make use of 24 food baskets[2] developed in the 'pilot project for the development of a common methodology on reference budgets in Europe' (Goedemé et al. 2015a; Carrillo-Álvarez et al. 2019b). In this project, country teams developed food baskets that should allow people to eat a healthy diet, in accordance with the national

[2] In the project, food baskets have been developed for 26 EU Member States. However, in this paper, we exclude Denmark and the Netherlands since they used a somewhat different method and, hence, are not fully comparable.

food-based dietary guidelines. These dietary guidelines are evidence-based recommendations to promote healthy eating while considering the member states' cultural and health context (EFSA 2010). Each country team collaborated with a nutritionist to translate the guidelines into a concrete list of food items. The following main food groups are included in all national food baskets: Liquids (mainly water), vegetables and fruits, dairy products (including milk), meat, fish and eggs, grains, fat and a small group of residuals. To account for edible portions and unavoidable wastes, recommended net amounts of fresh food products were increased with a waste percentage[3] that was kept constant across countries. The type of foods and the recommended amounts within the main food groups differ across countries, in line with the national food-based dietary guidelines (see Table 1 in the Annex).

In each country, the completeness and acceptability of the food baskets was evaluated in two to three focus groups composed by a mix of 5 to 11 adults with different family situations and socio-economic backgrounds. The baskets for a healthy diet were generally accepted, but the focus group participants often made minor suggestions to replace or add products to enhance the taste, variation and socio-cultural acceptability. These suggestions were resubmitted to the nutritionists and were considered insofar they did not impede a healthy diet. The food budgets can be expected to reflect the dominant cultural patterns, and in this study, we assume that accommodating other cultural preferences (e.g. of ethnic minorities), can be done without increasing the overall cost of the food budget.

All items were priced at market prices in March/April 2015 in a well-spread, accessible shop in the capital city following a standardized pricing procedure. Due to the large variation across time, shops, regions and households' abilities, the pricing procedure ignored discounts or sales (For more information on the method, see Goedemé et al. 2015a; Carrillo-Álvarez et al. 2019b). For the purpose of measuring economic accessibility, we want to make sure that the level of the food baskets represents a reference bottom line

[3] Net amounts of fresh fruits, vegetables, potatoes, fish, fatter meat and eggs were increased with a waste percentage of respectively 22%, 28%, 10%, 30%, 20% and 12% (cf. Hoge Gezondheidsraad 2005).

under which it is very difficult to access a healthy diet in accordance with the national food-based dietary guidelines. Hence, the version of the food baskets that we use in this study is restricted to the cheapest food prices collected in the price survey carried out by the country teams.

Reference food budgets were developed for the following set of hypothetical household types: a single-person household (male / female), a single parent household with two children and a couple with two children. The adults are assumed to be at working age (about 40 years old) and the children are a boy in primary education (about 10 years old) and a girl in secondary education (about 14 years old). To estimate a lower bound on the cost of a healthy diet, it is assumed that all household members are in good health, well-informed about prices and have the necessary competences to purchase economically and prepare their meals at home. Furthermore, we only include food products and no other essentials, such as the kitchen equipment for storing, preparing, serving, consuming and conserving food. Similarly, food items and related products that are needed to fulfil other functions besides a healthy diet (e.g. social, or psychological functions of food), are not explicitly included in the level of the food baskets.

The level of the food baskets varies from about 72 EUR per month for a single woman living in Warsaw to about 750 EUR per month for a couple with two children living in Stockholm.

3.2. Three measures of economic accessibility

We estimate three indicators that assess the economic access to (or affordability of) a healthy diet, which vary by the extent to which they take other human needs into account.

The first indicator is the most restrictive one. It simply compares people's disposable household income to the cost of a healthy diet for that household. Persons living in a household with an income below the cost of a healthy diet are identified as having affordability problems (a broadly similar approach was taken in Hirvonen et al. 2020). Obviously, this is a very conservative estimate, as households have also other essential

expenses. At the same time there might be some measurement error, given our focus on the bottom of the distribution (cf. Van Kerm 2007). From a substantive point of view, it is important to keep in mind that we measure income, while some people might be low on income, but have considerable savings or other assets. Yet, there can be little doubt that for the largest share of those with an income below the cost of a healthy diet, achieving a healthy diet is very hard.

Focusing just on the cost of a healthy diet risks substantial underestimation of the number of people confronted with affordability problems. The biggest household expenditure category in many countries is housing. Housing is a relatively fixed cost, while food expenses are more flexible (Riches and Silvasti 2014). Further, at least for Canada, Kirkpatrick and Tarasuk (2007) found that high housing costs are negatively correlated with the adequacy of food spending of low-income households. Therefore, the second indicator we use, assesses whether disposable income after deducting housing costs (including rent, mortgage repayments, maintenance costs and utilities) exceeds the cost of a healthy diet.

Quite obviously, persons also have other needs to fulfil, including clothing, health care, mobility, social relations, education, etc. (cf. Doyal and Gough 1991). For a given disposable income, the higher the cost of these additional expenses, the higher the risk of food affordability problems. To allow for these additional essential expenses, the third indicator of economic accessibility assesses whether disposable income after housing costs exceeds twice the cost of a healthy diet. This is a rather rough approximation based on Goedemé et al. (2015b) who estimated the minimum cost of participating adequately in society, including the cost of housing, food, clothing, health care, personal care, rest and leisure, education, maintaining social relations and mobility in six large European cities (Antwerp, Athens, Barcelona, Budapest, Helsinki and Milan). For these cities, the minimum cost of accessing these goods and services, excluding housing, amounted to between 2.1 and 3.5 times the minimum cost of a healthy diet, with somewhat higher rates for single-person households as compared to multi-person households.

3.3. Implementation in the sample

We estimate the incidence and distribution of financial constraints to access a healthy diet based on EU-SILC 2016 data. The EU Statistics on Income and Living Conditions (EU-SILC) is a yearly household survey, which contains detailed and harmonised information on disposable household incomes for representative samples of the population living in private households in each country (See Atkinson et al. (2017) for an introduction to the survey data). We compute 95% confidence intervals that take account of the complex sample design that is used in most EU-SILC countries (cf. Goedemé 2013). For the purposes of this paper, we make use of EU-SILC 2016, which contains information on disposable income in 2015, the year for which we have data on the cost of a healthy diet.

To estimate the cost of a healthy diet for each household in the data, we start from the minimum cost of food for a single adult (average man-woman), and the average cost for a child between the age of 7 and 17 (as available from the food budgets). Given that young children need less food in order to be healthy, we assume that the cost of a healthy diet for children below the age of 7 is half of that for children above that age. This corresponds to the results of more detailed food budget calculations for Belgium (Storms et al. 2015), Finland (Lehtinen and Aalto 2014) and Spain (Carrillo-Alvaréz et al. 2019). Disposable household income includes all potential sources of income (from wages, self-employment income, capital income, alimony, regular gifts from family or friends, social benefits, tax refunds), after deducting taxes and social security contributions, for all household members.

When estimating the number and profile of people confronted with problems of economic access to a healthy diet, we restrict ourselves to densely and intermediately populated areas, and exclude rural areas (i.e. areas classified as *thinly* populated areas, defined as "grid cells outside urban clusters")[4]. This limitation is necessary because the original price survey for the cost of a healthy diet was carried out in the capital city, while prices can

[4] Unfortunately, for Germany and Slovenia the variable on degree of urbanisation is not available, so we include the total population.

vary considerably between regions (See Janský and Kolcunová 2017). Also, there may be more widespread practices of producing food for own consumption as well as informal exchanges of food products in rural than in urban areas. Densely and intermediately populated areas account for between 45 (Lithuania) and 100 per cent (Malta) of the population in the countries under study. In other words, the results presented below cannot be generalised to the entire population of each country, and the representativeness differs across countries.

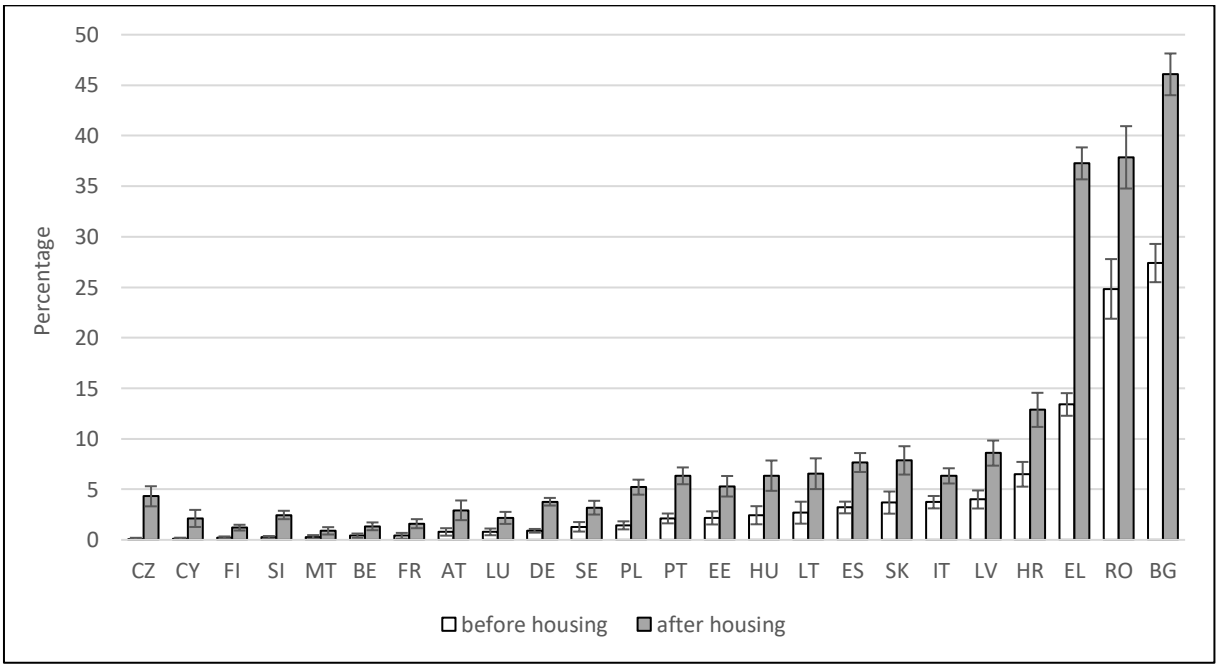
3.4. Simulating minimum income benefits

In addition, we compare the cost of a healthy diet with the disposable income that welfare states provide as a last safety net. Minimum income support is simulated for the same household types that were used to estimate the minimum cost of a healthy diet relying on the HHoT-MIPI database (cf. Marchal et al. 2018). HHoT is a flexible tool that is part of the European tax-benefit microsimulation model EUROMOD (see Hufkens et al, 2019; Sutherland and Figari 2013). It allows the user to specify a large variation of hypothetical households for which the net income, given a pre-specified gross income, can be simulated. We make use of the simulated net incomes for social assistance recipients and single earners working full-time on a minimum wage for the year 2015, taking into account social assistance benefits, and additional relevant housing benefits and child benefits (For an overview, see Marchal et al. 2018). In the case of couples, we assume that the second partner is inactive.

4. Prevalence of households with insufficient income to access a healthy diet

In the figure below we assess how many people live in a household with an income (before and after deducting housing costs) below the cost of a healthy diet. This results in a lower bound on the number of people confronted with food affordability problems. We take this approach to underscore the fact that even with such a restrictive approach, in quite a few countries insufficient economic resources are an important barrier to access a healthy diet. Especially in Greece, Romania and Bulgaria, the level of economic accessibility problems is

high, reaching respectively 13%, 25% and 27% of the population in densely and intermediately populated areas, without taking housing costs into account. In contrast, in the richest member states, as well as some Mediterranean countries (Malta and Cyprus) and the Czech Republic very few households would have to spend their entire income on food to have access to a healthy diet. However, when looking at net income after paying for housing costs, which is often a fixed and large cost for households, the picture deteriorates significantly in all countries. This shows how the affordability of a healthy diet is affected in important respects by the cost of other essential goods and services, of which housing is in many countries (among) the most important.

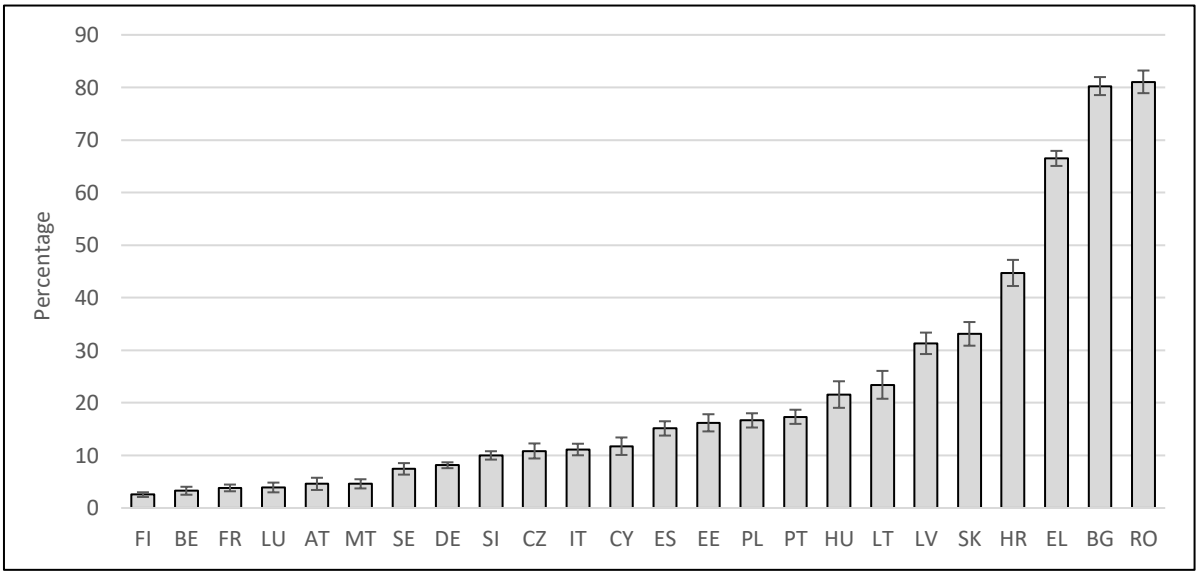


Source: EU-SILC 2016, ver1, own calculations.
Note: Country abbreviations: AT, Austria; BE, Belgium; BG, Bulgaria; CY, Cyprus; CZ, Czech Republic; DE, Germany; EE, Estonia; EL, Greece; ES, Spain; FI, Finland; FR, France; HR, Croatia; HU, Hungary; IT, Italy; LT, Lithuania; LU, Luxembourg, LV, Latvia; MT, Malta; PL, Poland; PT, Portugal; RO, Romania; SE, Sweden; SK, Slovakia; SI, Slovenia.

Figure 1 Percentage of people living in a household with a net disposable income (before and after housing costs) below the cost of a healthy diet for their household, densely and intermediately populated areas, 2015/2016.

However, in order to get a more comprehensive understanding of the extent of affordability problems to access a healthy diet in Europe, we should take into account that households are also confronted with many other essential expenses such as costs for clothing, health care and social relations. In Figure 2, we show the percentage of people for whom disposable household income after deducting housing costs amounts to less than twice the

cost of a healthy diet (cf. indicator 3). Measured in this way, affordability of a healthy diet in accordance with national guidelines appears to be potentially problematic for a higher share of the population, ranging from 2.5% in Finland to over 40% in Croatia, Greece, Bulgaria and Romania. In 16 out of 24 countries at least 10 per cent of the population in (sub)urban areas risks having no access to a healthy diet due to insufficient income. While this indicator leads to very high estimates in Eastern and Southern Europe, especially in Greece, Bulgaria and Romania, these numbers are more in line with what we would expect based on estimates of food deprivation in Western Europe and Scandinavia.

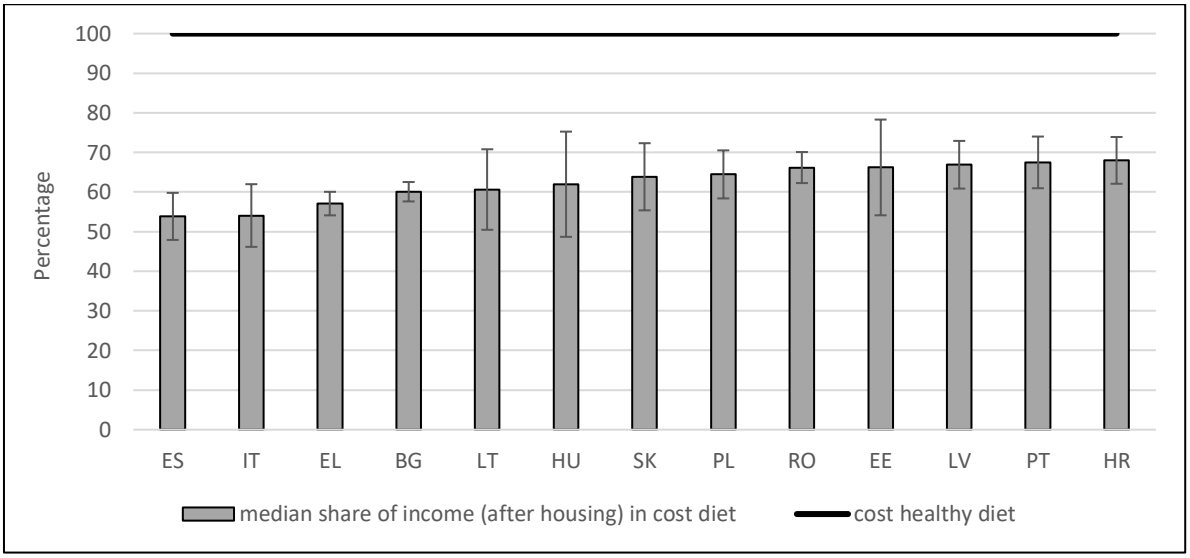


Source: EU-SILC 2016, ver1, own calculations.

Figure 2 Percentage of people living in a household with disposable income (after housing costs) below twice the cost of a healthy diet for their household, densely and intermediately populated areas, 2015/2016.

In what follows, we zoom in more closely on the people living in a household with a net income after housing costs below the minimum cost of a healthy diet (cf. Indicator 2, the grey bars in Figure 1). Given data problems at the bottom of the income distribution (See Van Kerm 2007) and in order to have a sufficiently large sample, we include only the countries where the population with an income (after housing costs) below the cost of a healthy diet is higher than 5%. Figure 3 shows the median gap between the net disposable income (after housing costs) and the cost of a healthy diet for persons we have identified as not having economic access to a healthy diet. In the Figure, we see that the median income (after housing costs) reaches about 50 to 70% of the cost of a healthy diet. In

other words, the median gap to access a healthy diet is quite large (30 to 50%) for those confronted with this severe form of food affordability problems. It is remarkable that the gap is the largest in Spain and Italy, countries with a relatively low share of the population with an after-housing-cost income below the cost of a healthy diet.



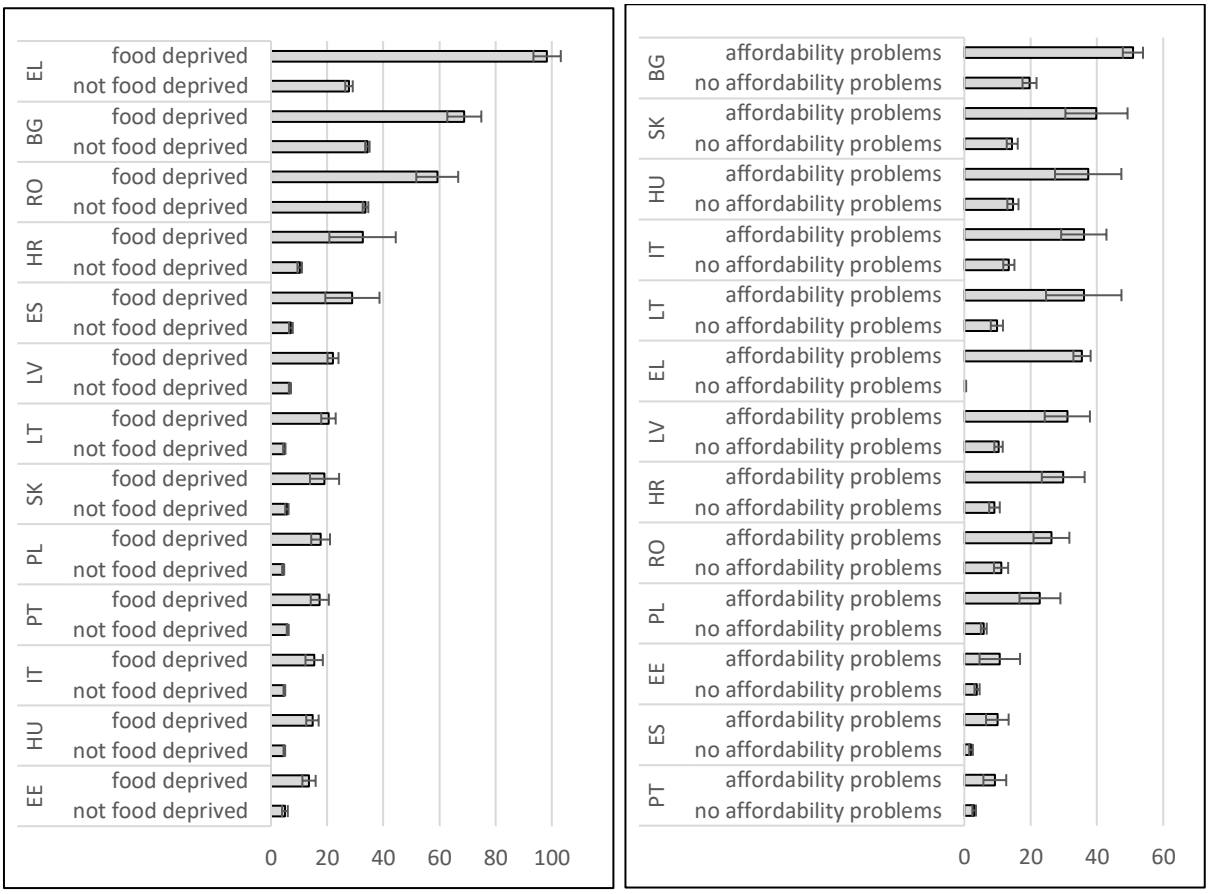
Source: EU-SILC 2016, ver1, own calculations.
Note: Only including countries with at least 5% of the population in urban areas living in a HH with a net income (after housing) below the cost of a healthy diet.

Figure 3 Median share of the total net disposable income (after housing costs) and the cost of a healthy diet for people with an income (after housing costs) below the cost of a healthy diet, densely and intermediately populated areas, expressed as a percentage, 2015/2016.

Finally, problems of economic accessibility are not fully captured by the commonly used EU-SILC indicator of food deprivation. Figure 4 shows, at the left hand side, the percentage of persons unable to afford a healthy diet, measured as having an after-housing-cost income below the cost of a healthy diet, in the group of people identified as food deprived compared with the group who is not. Clearly, food deprivation (as stating that you cannot afford meat, fish or vegetarian alternative every second day) is correlated with our measure of food affordability. However, in several countries the deprivation indicator fails to capture a significant share of the population with an income (after housing costs) below the level of a healthy diet. This is especially the case of Romania, Bulgaria and Greece. This underlines the added value of our approach.

In the right-hand side of the figure, we depict the level of food deprivation among those that we identify as having problems to access a healthy diet or not. It shows that, having

an income below the cost of a healthy diet is associated with a high incidence of food deprivation as commonly measured, relative to having an income above that threshold. Second, clearly, the indicator of food affordability also misses part of the population who feel unable to afford certain food items, showing the complementary of both approaches.



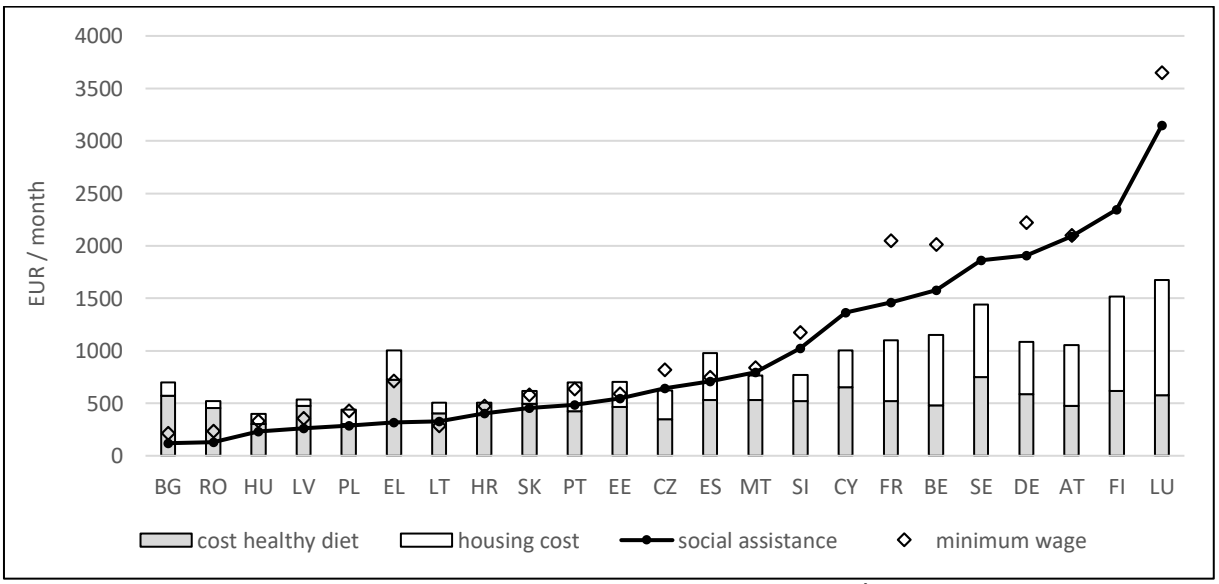
Source: EU-SILC 2016, ver1, own calculations.
Note: 'food deprived' = persons who cannot afford a meal with meat, chicken, fish (or vegetarian equivalent) every second day, 'affordability problems'= persons living in HH with a net disposable income (after housing costs) below the cost of a healthy diet in urban areas. Only including countries with at least 5% of the population in urban areas living in a HH with a net income (after housing) below the cost of a healthy diet.

Figure 4: Percentage affordability problems for a healthy diet by food deprivation vs. percentage food deprivation by affordability problems for a healthy diet, densely and intermediately populated areas.

5. The lack of adequate minimum income protection

Do welfare states guarantee adequate income protection for accessing a healthy diet? To answer this question, we compare the minimum cost of a healthy diet to the level of minimum income protection. Figure 5 shows the monthly net income from social assistance or one full-time minimum wage of a couple with two children (the partner is assumed to be inactive). The net incomes are simulated taking account off all relevant benefits and

taxes (see Marchal et al., 2018). The lower part of the bars represents the cost of a healthy diet, while the upper part of the bars illustrates the median housing cost for private tenants (HHoT-MIPI database, based on actual rent in EU-SILC). Obviously, the latter does not represent the same quality of housing across countries and the representativeness varies largely depending on the number of private tenants in each country. Nevertheless, the figure clearly demonstrates the inadequacy of minimum income protection schemes in quite a few European countries. In most Eastern and Southern member states (except for Czech Republic, Slovenia, Malta & Cyprus), social assistance recipients have insufficient resources to access a healthy diet and rent a dwelling. Moreover, although the situation looks better in some wealthier member states such as France, Belgium and Sweden, even their social assistance income after housing costs, is lower than twice the cost of a healthy diet (cf. indicator 3). Hence, minimum incomes will in many cases not allow to access both healthy diet and other essential goods and services that are needed for adequate social participation, such as health care, clothing, education, social activities and transportation. Also for couples with two children with one partner working on a minimum wage, we see that there are many Eastern European countries, as well as Greece and Spain, where the net income is not (or barely) sufficient to pay for housing and food. In sum, families on minimum income protection, including those with one partner at work, bear a high risk of having no access to a healthy diet.



Source: Food baskets from EU pilot project on Reference budgets (Goedemé et al., 2015a); Simulated net minimum incomes and median housing costs for private tenants from the MIPI-HHoT database (Euromod). The

median housing costs for private tenants are based on actual rent in EU-SILC. For Bulgaria, Lithuania and Romania median housing costs for the whole population were used due to few observations (Marchal et al. 2018).
Note: Prices and incomes year 2015. Results refer to the capital city of each country. No minimum income data available for IT, no statutory minimum wage in CY, FI, SE.

Figure 5 The net income for a couple with two children (10,14y) with social assistance benefits or a full-time minimum wage, compared to their minimum cost of a healthy diet and the cost of rented housing, EUR/month

6. Discussion

There are several limitations to this study. First, the estimations of the cost of food are done for a limited number of household types, living in urban areas. Hence, the results cannot easily be generalised to the population. To allocate a more precise food budget to all households in the survey, the cost of a healthy diet should ideally be calculated for households with small children, students and people in old age as well. Similarly, we did not calculate the cost of a healthy diet for other cultural patterns (e.g. of ethnic minorities), dietary preferences (e.g. vegetarians), or in case of other health needs (e.g. in case of diabetes). Since the food baskets are priced in the capital cities, we neglect the large variation in food prices, purchasing patterns and (home) food production within countries. Because of potentially large differences between urban and rural areas in some countries, thinly populated areas are excluded from the analysis. It would be beneficial if future studies could take these variations in needs, cultural expectations and food prices better into account, preferably based on a more extensive price survey, to develop a more fine-grained measure of access to a healthy diet. Secondly, the study measures the risk of not being able to afford a healthy diet at one point in time, while food prices and incomes might fluctuate frequently. For future research, a longitudinal study would be beneficial to understand changes in the economic accessibility of a healthy diet over time.

Thirdly, the quality of the dietary guidelines differs across countries (Carrillo-Álvarez et al. 2019a; EFSA 2010) and they generally do not include concerns of environmental sustainability (see Lassen et al. 2020). Nevertheless, they are an important policy tool for influencing providers and consumers and could be used as a starting point to ensure access to culturally acceptable and healthy diets. Given the variation in quality of the guidelines, the reliance on the food-based dietary guidelines implies a specific notion of comparability,

which would benefit from higher quality guidelines in each country. Comparability could also be improved by adapting assumptions regarding edible portions and unavoidable food waste to each national context when more refined data become available (cf. De Laurentiis et al. 2018). Fourthly, we take other essential needs into account in a rather crude way. With more data on the cost of essential goods and services across Europe it would be possible to considerably fine-tune this indicator to the situation in each country. Fifthly, the measure of disposable income that we used as a proxy of available resources ignores both savings and debts, which also determine the amount people can spend on a healthy diet.

Finally, although economic access to a healthy diet is crucial, it is not sufficient to avoid food insecurity (Barrett 2010; Burchi and De Muro 2016). We focus exclusively on the cost of a healthy diet and assume that food-based dietary guidelines take account of how food is consumed in practice. We did not directly account for the cost of kitchen equipment to conserve, prepare and consume the food, although this is implicitly covered in the third version of the indicator. Furthermore, food is not only about being in a good health, but it is also an important part of social and cultural life (e.g. Ginn et al. 2016; O'Connell et al. 2019). As part of the project in which we estimated the minimum cost of a healthy diet (Goedemé et al., 2015a), we co-organised two to three focus group discussions (FGs) in each Member State. In these focus groups, citizens with varying socio-economic status reflected critically on the acceptability of the food baskets and the underlying assumptions. In order to construct a minimal budget that should enable people to eat healthily, we made the assumption that (1) people have the capacity to cook daily healthy meals, and, (2) people are able to shop economically, meaning that they are well-informed about prices and that the cheapest retailers are accessible to them. Although the content of the food basket was generally accepted, focus groups argued that preparing and shopping healthy food with a limited budget is not always feasible due to constraints such as a lack of time and energy. This is especially so for full-time working parents and single parent families. In line with these discussions in focus groups, and to ensure acceptability and feasibility, we allowed for some freedom of choice (by disregarding discounts) and did not assume

specific survival strategies that people in poverty may apply, such as extensive 'shopping around' to find the cheapest bargains (e.g. Attree, 2005). Furthermore, several other studies have concluded that, in particular for vulnerable groups, dietary guidelines are not always easy to interpret, there is a lack of comprehensive information and not everyone has sufficient skills, time and energy to prepare healthy meals (Roberto et al. 2015; Tiwari et al. 2017). The focus group participants argued that good kitchen equipment (e.g. freezer, microwave) to work with left-overs, healthy lunches at school or work and supportive family members can increase the feasibility to cook on a regular basis. Similarly, several studies have argued that the social environment, including parents, schools, the work environment and the media, can have a mediating effect on creating a context where healthy eating is stimulated and supported (Vereecken et al. 2005; Brambila-Macias et al. 2011). It would be useful if future comparative studies would further consider the utilization dimension of food insecurity and their impacts on the accessibility of a healthy diet.

6.1. Policy implications

A potential danger of studying the affordability of a healthy diet is that it is perceived as being isolated from the problem of poverty and inequality, and their structural determinants. With this paper, we hope to have shown that a healthy diet for all can only be realised if food policies are embedded in economic and social policies that address the structural inadequacy of income and the cost of other essential goods and services (such as housing) that many households face. Therefore, securing adequate incomes should be an essential component of any comprehensive strategy to improve access to a healthy diet for all, alongside other policies that potentially can have sizeable effects, such as regulations regarding trans-fats or salt in food products and financial incentives to make healthier choices (e.g. Mhurchu et al. 2013; Teng et al. 2019).

Also, the trend towards providing more food assistance through food banks (Lambie-Mumford and Silvasti 2020) is unlikely to address the scale of the problem that we identified in this paper. Not surprisingly, Eastern European countries, where we estimate high proportions of people unable to afford a healthy diet, register the largest share of food

bank beneficiaries relative to their population size (see Gentilini, 2013). In the countries with the highest levels of food affordability problems such as Bulgaria, Romania and Latvia, the share of food support from the Fund for European Aid to the Most Deprived (FEAD) is found to be relatively high compared to national social benefit spending (Greiss et al. 2019). While food banks may help to increase access to food for some households, it does not solve one of the underlying causes of the accessibility of a healthy diet which, for many households, is likely to be a lack of adequate income. In these countries, a much more ambitious programme of employment policies and income redistribution is needed to tackle income-related food insecurity.

In this paper we worked with a yearly measure of household income. To the extent that people have to cope with volatile income flows, the total number of people confronted with food affordability problems at any point in time during the year is likely to be higher than what we found in this paper. Income stability for those living on a low income is therefore another issue that policies should address.

Besides adequate income protection, policies can also reduce the cost of a healthy diet, for instance by providing accessible, high-quality and affordable school lunches. Free or subsidised school meals are not included in the food budgets that we have used for the purpose of this study. However, for three countries (Estonia, Finland and Sweden) the data also contain food budgets that take account of subsidised school meals, by replacing the cost of a packed lunch brought from home with the out-of-pocket cost of subsidised school meals. We recomputed the three indicators of economic access starting from these alternative budgets (see Table 2 in Annex). This shows that publicly subsidised school lunches have a rather small impact on the total share of the population facing affordability problems, although it can be expected that for low-income families that benefit from the school lunches the impact will be non-negligible.

In short, ensuring access to a healthy diet for low-income groups requires a broad set of policy responses, including regulations, nutritional education and information, and

incentives to encourage healthier diets as well as public provisions and subsidies that improve access to other essential goods and services, and adequate employment policies and social protection.

7. Conclusion

In this paper we make use of cross-nationally comparable estimations of the cost of a healthy diet in 24 European cities and compare these with net disposable household incomes before and after housing costs. We show that especially in Eastern and Southern European countries, particularly in Bulgaria, Romania and Greece, a large share of the (sub)urban population lacks sufficient income to access a healthy diet in accordance with national dietary guidelines. Clearly, financial constraints for accessing a healthy diet are not distributed equally across Europe. However, when including the affordability of other essential goods and services, in particular housing costs, the economic accessibility of a healthy diet seems to be a considerable problem in a broader range of EU countries. In many richer EU member states, people receiving minimum income protection have insufficient means to access a healthy diet and fulfil other essential needs.

Acknowledgements

We are grateful to two anonymous reviewers and the editors for comments and suggestions on a previous draft of the manuscript. The data used in this paper have been produced by a broad network of experts, listed on the referencebudgets.eu website. We are grateful to all of them for their input and collaboration, and in particular to Bérénice Storms, Karel Van den Bosch and Elena Carrillo-Álvarez. The results presented in this paper are based on EUROMOD version H1.0+. EUROMOD is maintained, developed, and managed by the Institute for Social and Economic Research (ISER) at the University of Essex, in collaboration with national teams from the EU member states. We are indebted to the many people who have contributed to the development of EUROMOD. The EU-SILC microdata were made available by Eurostat under contract RPP 77/2017-EU-SILC-HBS. The members of the reference budgets country teams, nor the European Commission, Eurostat or the EUROMOD network can be held responsible for the content of this article and any remaining shortcomings or errors, which is the sole responsibility of the authors.

Funding

The data collection has been financially supported by the European Commission (DG EMPL) (contract no. VC/2013/0554). The process of extending and updating EUROMOD is supported by the European Union Programme for Employment and Social Innovation Easi (2014-2020). Tess Penne acknowledges financial support from the Research Foundation – Flanders. Tim Goedemé acknowledges financial support from Citi through the Oxford Martin Programme on Inequality and Prosperity.

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Annex

Table 1. Food basket for a single woman, living in the capital city (amount per day in g/ml), 2015

	Liquid (ml)	Grain	Vegetables	Fruit	Dairy	Meat, fish & eggs	Fat	Residual	Total (excl. liquid)
AT	952	449	358	361	435	122	50	68	1843
BE	1497	423	354	303	471	120	50	93	1814
BG	1255	271	272	309	618	245	68	155	1939
CY	1759	273	317	361	419	127	38	79	1614
CZ	1415	401	288	265	299	77	45	146	1521
DE	1537	284	532	298	380	91	40	117	1742
DK	1113	445	563	197	249	309	20	112	1894
EE	1007	388	378	256	495	178	45	52	1792
EL	2188	332	362	633	568	196	73	103	2267
ES	1675	285	366	460	667	202	60	117	2157
FI	1522	427	591	534	710	222	70	30	2585
FR	1654	341	281	403	242	137	40	92	1536
HR	1290	402	399	385	342	234	58	26	1846
HU	1513	414	470	334	253	136	50	80	1737
IT	1770	316	472	626	256	103	40	34	1848
LT	1512	482	626	384	216	193	29	80	2010
LU	1631	259	478	345	379	326	40	67	1895
LV	1327	382	358	257	610	177	35	25	1844
MT	2040	512	409	465	394	167	38	66	2051
PL	1995	628	714	384	573	127	45	50	2522
PT	1558	428	977	638	427	170	19	31	2690
RO	1893	546	348	407	342	185	58	56	1942
SE	1647	447	297	290	445	204	39	119	1842
SI	1588	302	597	512	350	187	49	71	2068
SK	1535	477	405	447	226	79	57	157	1848

Source: Goedemé et al. (2015a); Carrillo-Álvarez et al. (2019b).
Note: Country abbreviations: AT, Austria; BE, Belgium; BG, Bulgaria; CY, Cyprus; CZ, Czech Republic; DE, Germany; EE, Estonia; EL, Greece; ES, Spain; FI, Finland; FR, France; HR, Croatia; HU, Hungary; IT, Italy; LT, Lithuania; LU, Luxembourg, LV, Latvia; MT, Malta; PL, Poland; PT, Portugal; RO, Romania; SE, Sweden; SK, Slovakia; SI, Slovenia.

Table 2. Percentage of people experiencing problems to afford a healthy diet according to three indicators (I1, I2, I3), densely and intermediately populated areas, without and with taking subsidised school lunches into account for Finland, Sweden and Estonia, 2015/2016

	Without school lunches			**With subsidised school lunches**		
	I1	**I2**	**I3**	**I1**	**I2**	**I3**
Finland	0.23 *(0.06)*	1.21 *(0.14)*	2.54 *(0.23)*	0.23 *(0.06)*	1.21 *(0.15)*	2.49 *(0.22)*
Sweden	1.29 *(0.24)*	3.19 *(0.35)*	7.44 *(0.56)*	1.22 *(0.23)*	3.05 *(0.34)*	6.84 *(0.52)*
Estonia	2.18 *(0.33)*	5.31 *(0.52)*	16.20 *(0.83)*	2.04 *(0.32)*	5.16 *(0.51)*	15.18 *(0.80)*

Source: EU-SILC 2016, ver1, calculations by the authors.

Note: I1= Percentage with a disposable household income below the cost of a healthy diet; I2: Percentage with a disposable household income after housing costs below the cost of a healthy diet; I3: Percentage with a disposable household income after housing costs below twice the cost of a healthy diet. Robust standard errors are in parentheses.