

TOWARDS CROSS-COUNTRY COMPARABLE REFERENCE BUDGETS IN EUROPE: A METHODOLOGICAL NOTE ON THE DEVELOPMENT OF FOOD BASKETS

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Executive Summary

An adequate minimum income is imperative for the fight against poverty and for the realization of human rights (Cantillon et al., 2019; Van Lancker et al., 2020). A safety net that secures a decent level of minimum income is not only imperative for the fulfilment of other rights but is also a right in itself. The right to an adequate minimum income has been a long-standing commitment of the EU and its Member States and is one of the key principles in the European Pillar of Social Rights (EPSR) endorsed by all EU institutions and the Member States (European Commission, 2017). Principle 14 specifically addresses the right to an adequate minimum income that ensures a life in dignity, emphasizing the importance of labor market participation and access to enabling goods and services. Recently, this has been further elaborated and supported by the European Commission and Council by means of a Recommendation on adequate minimum income (Council of the European Union, 2022). While these EU initiatives are important steps forward towards adequate minimum incomes in Europe, we have argued (Storms et al. 2023) that besides the income-based AROP-indicator, there is a need for a benchmark that represents the costs that households face to access necessary goods and services. More specifically, we advocate the development and use of high-quality reference budgets (RBs) as a benchmark providing a sound multi-dimensional understanding of what social safety nets should entail in order to guarantee a life in dignity at all stages of life. RBs are priced baskets of goods and services that illustrate what households need in order to be able to live a dignified life. If the adequacy of minimum incomes is to be monitored at the European level, there is a need for RBs that are comparable across the member states.

In previous EU projects {Goedemé, Storms, Penne & Van den Bosh, 2015a; Goedemé, Storms, Stockman, Penne, Van den Bosch, 2015b; Menyhért et al., 2021) first attempts have been made towards the development of cross-nationally comparable RBs (RB) in Europe. In the context of the current EuSocialCit project, additional steps have been taken towards more comparability. More specifically, the methodology to develop and price cross-nationally comparable food baskets representing a healthy and sustainable diet has been further elaborated and implemented in four European countries (Belgium, Finland, Hungary and Spain). In the current methodological note, we outline the methodological choices and considerations and the necessary steps for the future development of RBs across Europe. More specifically, we investigated how the methodology of developing comparable food baskets can be enhanced. Besides adding a layer of common guidelines and improving the pricing strategy, we have also investigated the feasibility of including sustainability criteria at different levels to construct the food budgets. Although food budgets alone are insufficient to fully assess the adequacy of minimum incomes, the note aims to illustrate how these comparable food baskets are a first step for measuring both affordability of necessary goods and services and income adequacy in a comprehensive way across Europe.

Methodology

For developing the food baskets in the EuSocialCit project, all four countries used the same theoretical framework (Doyal & Gough, 1991.; Storms, 2012) and a common concept of the standard of living.

The developed food budgets represent in a normative manner what a family needs to consume for a healthy diet. Since the developed food baskets represent a lower bound, the assumption is made that meals are home-cooked and food items are purchased, prepared, stored and consumed in an economical way. Therefore, the food budgets developed here also include a minimum cost for kitchen equipment (e.g., refrigerator, cutlery, pots and pans). In order to move forward in the development of cross-nationally comparable RBs, the baskets were extended and refined by taking sustainability criteria into account (in order to ensure that the standard of living is not only guaranteed for the present citizens but also safeguarded for the next generations) and by improving the robustness of the methodology.

Improving the cross-comparability of the content of the food baskets

For the food baskets developed in previous EU projects (Carrillo-Álvarez et al., 2019a; Goedemé et al., 2015a), national dietitians compiled a healthy diet for various family types based on the national Food Based Dietary Guidelines (FBDGs). FBDGs are science-based national recommendations for healthy eating addressed to the general public. They take into account not only the biological needs of people but also relevant cultural and social habits as well as food availability, and reflect recommended patterns of consumption of broad food categories (Carrillo-Álvarez et al., 2019a). Consequently, a diversity of dietary patterns can be consistent with the FBDGs and there is a lot of room for personal interpretations by the nutritionists which is disadvantageous for the cross-national compatibility of the resulting food baskets. Moreover, the European Food Safety Authority (EFSA) identified large differences between countries in terms of timeliness, quality and level of detail of the FBDGs (EFSA, 2010). At the European level, there are no dietary guidelines expressed in nutritional categories and taking into account national dietary habits. As no harmonization of national FBDGs can be expected in the near future, the approach followed here aims to improve the methodology by using two common healthy food standards, namely the Dietary Reference Values of nutrients (DRVs) (EFSA, 2017) and the EAT-Lancet thresholds for a sustainable diet (Willett et al., 2019) in the pursuit of constructing more cross-national comparable food baskets in Europe. DRVs are a set of reference intake values that determine the amount of energy and nutrients required to meet the physiological requirements of different population groups (i.e. children, adults, elderly, pregnant women...). EFSA has compiled DRVs for a wide range of nutrients, for healthy European citizens from birth to old age. The EFSA DRVs provide reference values to ensure the nutrient adequacy of the food baskets. In the current project, nutritionists started from the existing national FBDG-based food baskets, updated them to the most recent FBDG in each of the four countries and aligned them with the EFSA DRVs. The resulting food baskets do not only meet dietary requirements that are culturally acceptable and in line with each country's public health targets, but they are also cross-nationally comparable in terms of nutritional values (energy content, macronutrients and micronutrients), thus avoiding disproportionate discrepancies between countries.

Additionally, as the majority of the FBDGs do not take into account criteria for a sustainable diet (Springmann et al., 2020), the EAT-Lancet guidelines were applied to the resulting food budgets to develop sustainable healthy food baskets for adult men and women in the four countries. The EAT-Lancet framework (Willett et al., 2019) is universal for all food cultures and production systems with the potential for local adaptation, which makes the guidelines suitable for RBs as they can be adapted

to different contexts. Finally, to achieve maximum cross-nationally comparable contents of the food baskets, various product groups of the sustainable food baskets were harmonized across the four countries in order to minimize remaining arbitrary differences. The resulting diets still comply with the FBDGs, the EFSA DRVs and the EAT-Lancet guidelines, with the remaining differences only explained by institutional variations, climate or geographical variations, cultural differences, or differences in availability, quality and prices of food items.

Applying the aforementioned steps resulted in three baskets: 1) the FBDG/DRV baskets in which most recent FBDG-based food baskets were made consistent with the European DRVs, 2) the sustainable food baskets in which the FBDG/DRV baskets were made sustainable according to the EAT-Lancet guidelines and 3) the harmonized sustainable food baskets in which the last arbitrary differences in the content of the sustainable food baskets were eliminated using the criteria mentioned above.

Improving cross-comparability of the pricing strategy of the food baskets

A second major challenge for cross-nationally comparative food baskets is concerned with the pricing strategy, or the type of data that are taken into consideration to calculate a minimal cost of healthy food. In the current project, the pricing procedure from earlier EU projects (Goedemé, 2015a, 2015b) that approached the issue of cross-nationally comparable RBs was further refined to increase cross-country comparability and extended to include a first investigation of the usability of additional sustainability criteria at the level of pricing.

There are different pricing methods or data sources that can be used to develop RBs, each with its own advantages and drawbacks. An optimal cross-country comparable pricing strategy should allow calculating a minimal budget of financial resources necessary to acquire a basket of food items that are both fully compliant with the characteristics outlined in the dietary guidelines (content) and that are acceptable to low-income citizens in terms of allowing enough variation in product-choices and shop selection, at a minimal price level. The calculation of such a budget should also be practically feasible in an accessible and a cross-country comparable manner.

The different food items in the RBs can be described in terms of food product categories based on the European version of COICOP (Classification of Individual Consumption According to Purpose) and can be priced using consumer price statistics. Whereas this has important advantages in terms of efficiency, ease of frequent updating and representativeness of the items and prices included (Menyhért, et al., 2021), there are also important limitations of this method. For instance, the arbitrary choice of price level is an important driver for the level of the food budget (e.g. 25th percentile price or other price cut-off point). Furthermore, it is often not possible to guarantee that quality characteristics of products in the food basket are included (e.g. the 25th percentile price level of sandwich meat does not necessarily represent the price of a high quality, unprocessed, low fat option), the face validity is quite low which will not help for its acceptability, access to price data is often restricted or very expensive and there is limited cross-national comparability in the manner of collecting the source data for the consumer price statistics (e.g. data may come from traditional consumer price surveys, household or store scanner data, ...). Alternative and related methods such as using crowd-sourced data (e.g. Numbeo) offer prices based on a relatively large sample of prices.

However, since these are not based on random selections from a population frame, reliability may pose significant challenges and the number of food items included is generally very low.

A more common procedure to establish the cost of reference baskets in a cross-country comparable manner, which was extensively used in previous projects, is through small scale hand-collected pricing. This implies noting prices for particular food items with predefined characteristics in low-price store locations or online shops. This pricing method aims to reflect the minimal budget to meet food-related needs in a manner that both complies to dietary guidelines and that is accessible to low-income consumers (Carrillo-Álvarez et al., 2019b). This results in minimal food budgets with high levels of face validity corresponding to what low income people would spend when buying healthy food. In order for RBs to be acceptable by both low income citizens who might have to be consigned to live by them as well as by policy makers, both the content as well as how this has been priced needs to be acceptable and transparent (Citro & Michael, 1995). As hand-collected pricing is very time-consuming, it limits the frequency of price updating. Additionally, hand-collected price data are sensitive to both choices of stores and specific sampling of items as well as human errors. The replicability of the hand-collected pricing procedures can be increased by standardization and transparency of methodological choices. This can be done by providing highly detailed lists of goods and services with corresponding characteristics, price levels and assumed lifespans, together with a list of selection criteria for retailers. In the current project, we proposed this hand-collected pricing procedure to price the food baskets (both food items and kitchen equipment), and we tried to improve the previous studies by further standardizing the procedure, as well as by extending the hand-collected pricing in order to be able to investigate the cross-national feasibility of different sustainability criteria (Carrillo-Álvarez et al., 2021).

Main results

Feasibility of sustainability criteria for food in Europe

We analyzed the impact of different sustainability criteria on the minimum necessary budget for healthy food. The analysis indicates that the minimum budget for a healthy sustainable diet (i.e., content in line with the EAT-Lancet guidelines but not applying additional sustainability criteria at the pricing level) is cheaper in comparison with the non-sustainable food basket (the FBDG/DRV food basket) for three out of four countries, namely Finland, Spain and Hungary. In Belgium, the minimum monthly budget for food baskets with a sustainable diet is slightly higher than the FBDG/DRV food basket because the national FBDG of Belgium already considers guidelines for sustainable diets. Secondly, we wanted to investigate the applicability of additional sustainability criteria for buying local food items (or of a neighboring country), food items in bulk and in season. When these criteria were added, the minimum necessary cost increased in the four countries. This is consistent with previous research results of Carrillo-Alvarez et al (2021) who examined the impact of the same sustainability criteria on the minimum necessary budget for healthy and sustainable food in Spain. However, the number of food items meeting one or more of the price-level sustainability criteria within one food category (e.g., fresh fruit) decreases strongly in Belgium, Finland and Hungary. Consequently, consumers in these countries have limited freedom of choice if the sustainability criteria of country of origin, bulk and seasonality are taken into account. For instance, only four fruit varieties meet the criterion 'local' and only one fruit variety meets the three criteria 'local', 'bulk' and 'in season' for the

countries Belgium, Finland and Hungary. In Spain, this problem presents itself much less since about a dozen fruits are local while meeting the three price-level sustainability criteria. The strongly limited freedom of choice for consumers in Belgium, Finland and Hungary conflicts with one of the basic principles of the RBs, which is to ensure that the RB is feasible for households who have to live on such a budget. Hence, it is currently not advisable to include sustainability criteria other than those related to the food content when constructing cross-nationally comparable food baskets within Europe. In the results that follow we only include the sustainability criteria regarding the diet (i.e. the EAT-Lancet guidelines) and not the price-level sustainability criteria. Further research is needed to formulate additional sustainability criteria adapted to each country and evaluate their impact on the minimum cost of healthy food.

Evaluation of the cross-national comparability of the European food baskets

To evaluate the cross-national comparability of the resulting food baskets within the EuSocialCit project, we performed a shift share analysis capturing the variation of the healthy food budget due to differences in diets across the four countries (see Figure 1). This analysis compares the minimum cost of a healthy diet for an adult male as constructed in the Pilot project (based solely on national FBDGs available in 2014) (Goedemé et al., 2015a) and the three constructed baskets in the EuSocialCit project, namely the FBDG/DRV basket, the sustainable basket and the harmonized sustainable basket. The sum of the absolute amounts of variation of the four countries in the cost of healthy food attributable to differences in diets is higher in the Pilot project compared to the three food baskets in the EuSocialCit project. The total decrease of variation due to differences in diets for the four countries is the strongest between the Pilot food basket and the FBDG/DRV basket. But also adding the EAT-Lancet criteria to adjust the content of the food baskets still considerably reduces the variation between countries. The reduction is less pronounced between the sustainable and the harmonized sustainable food baskets. As the variation in food reference budgets (FRBs) attributable to differences in diets between countries is the lowest for harmonized sustainable food baskets, these baskets are the most preferable in pursuing the most cross-national comparability.

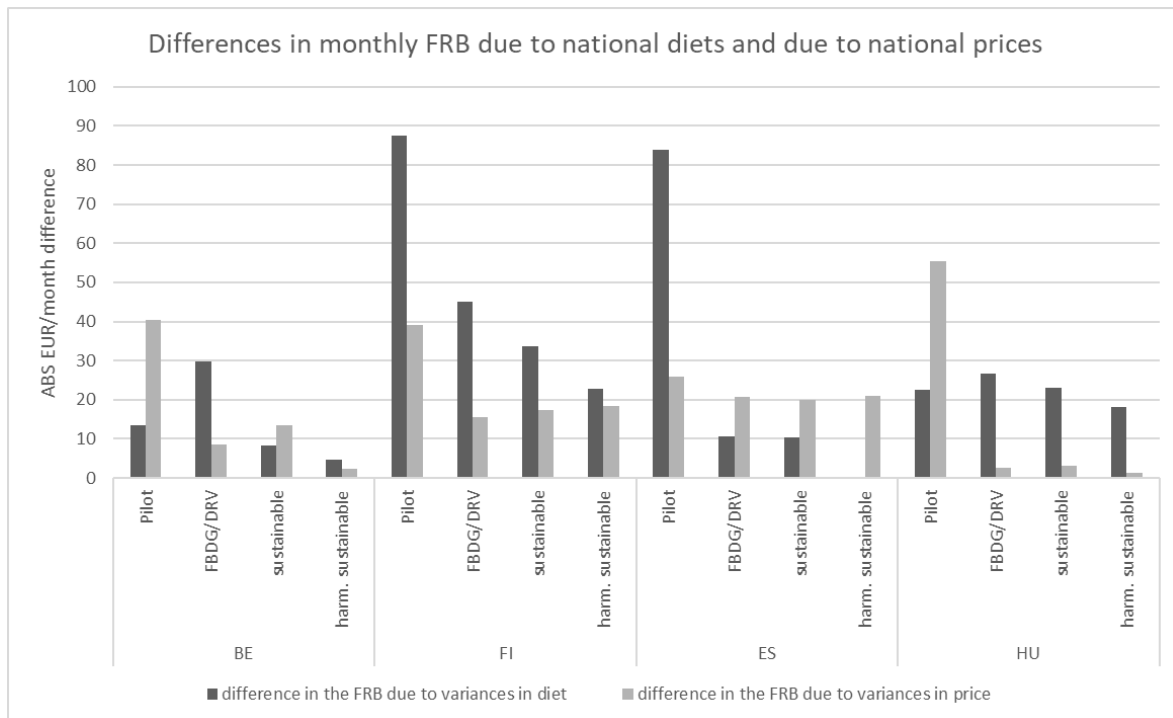


Figure 1. Absolute amount of variance in the FRBs (expressed in EUR/month) for a single male: adult due to differences in diets and prices in Belgium, Finland, Spain and Hungary for the food baskets without kitchen equipment developed in the Pilot project (these amounts are corrected for inflation) and the EuSocialCit project (June 2022)

The shift share analysis further demonstrated that the total variation in the cost of healthy food attributable to local differences in food prices was higher in the Pilot project compared to the three food baskets in the EuSocialCit project. This suggests that the refinement and standardization of the hand-collected pricing procedure has decreased the overall cross-country variability due to pricing differences between countries. However, the decreased price level variations may also be (partially) due to alignments in the market prices across the four countries between 2015 and 2022. Further validation using other data sources is needed to figure this out.

How to use European food budgets to measure adequacy of minimum income and affordability of food?

We demonstrate an illustrative exercise to give an idea of the potential of RBs as an indicator to assess the affordability of a healthy and sustainable diet in Belgium, Finland, Spain and Hungary. Measuring food affordability using an income-ratio approach compares the food costs faced by households with the (disposable) households' income. Ward et al (2013) constructed an income-ratio for measuring food affordability claiming that families who have to spend more than 30% of their household income on a healthy food basket; experience 'food stress' and are pushed to buy less or inferior quality food. Figure 2 indicates that single males receiving social assistance in Belgium and Finland do not experience 'food stress' as they spend 20% and 22% of their disposable income on healthy and sustainable food (calculated by the harmonized sustainable food basket, including kitchen equipment). Single males who receive social assistance in Spain need to spend 30% of their income on this healthy food basket. In Hungary, a single male receiving social assistance cannot afford healthy and sustainable food since the monthly budget necessary for this diet is 2,5 times the disposable

income. This indicator is entirely income-based, not taking into account the other minimum necessary expenses for, for example, housing, mobility, health care and leisure.

Hence, a more appropriate measure could be the residual income approach, comparing the household food cost with the residual income, i.e. the income that remains after all necessary goods and services, except those of food, have been paid for. RBs are well suited to measure food affordability using the residual income approach as they normatively reflect the minimum necessary expenditures of households. This however requires fully developed up-to-date RBs which are, for the moment, only available for Belgium (see Figure 2). On top of the minimum cost for healthy food, the Belgian RBs include the minimum cost for social housing (shaded bars), the additional cost to rent a private house (i.e. the difference in minimum cost between renting a private and social house, visualized in the pointed bars) and other minimum necessary costs (grey bars) such as clothing, maintaining social relations, mobility, personal care and health care. When we measure food affordability using the residual income approach and take the minimal costs of all needs into account, we can demonstrate that healthy and sustainable food is not affordable for Belgian single males receiving social assistance. The reverse is applicable when we apply the methodology of Ward et al (2013) to single males receiving social assistance in Belgium. This exercise illustrates that the construction of the indicator to measure affordability of food (or other necessary goods and services) has an impact on the size and composition of the group of people for whom food is considered (un)affordable.

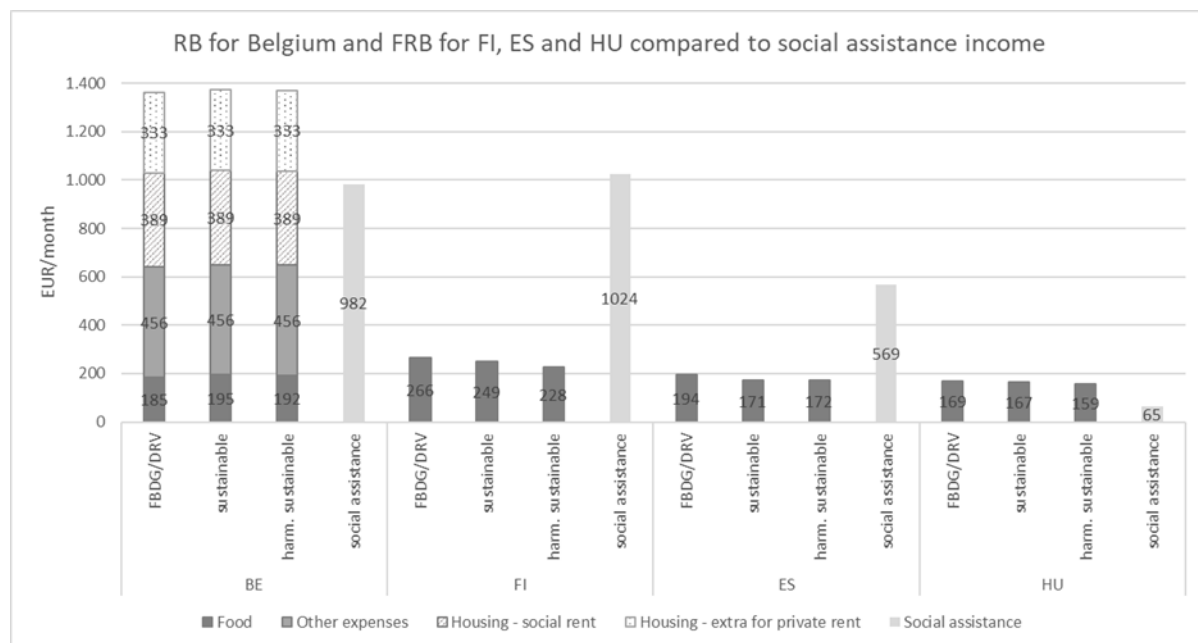


Figure 2. Comparison of the FRBs developed within the EuSocialCit project and the RB of Belgium with the disposable income of social assistance for a single person for Belgium, Finland, Spain and Hungary (2021).

Conclusions

The note presented here is a first step to improve the methodology to construct cross-country comparable RBs to monitor the adequacy of minimum income across the EU. With RBs we translate what is needed for adequate social participation into a concrete monetary benchmark that represents the minimum cost to access all necessary goods and services. In doing this, they reveal the mutual relationship between affordability and adequacy. An income is only adequate when it enables people to afford all essential goods and services, while goods and services can only be affordable if people have a sufficiently high income to be able to pay for it.

In this project we have only focused on the development of cross-nationally comparable food baskets that represent the need for a healthy diet in the different countries to give an idea of the potential of RBs as indicators to monitor minimum income adequacy in Europe. The results can be used as an inspiration and a first step towards fully developed RBs in Europe.

Towards cross-country comparable RBs in Europe. A methodological note on the development of food baskets

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Work package	<p>EuSocialCit is an interdisciplinary research project aiming to support the EU in strengthening social rights and European social citizenship. It evaluates the current state of social rights in Europe and their relationship to social inequalities, gender inequalities, poverty and precariousness, and diagnoses the shortcomings of current policies and institutions at the level of individual countries and the EU.</p> <p>The EuSocialCit project focuses on three domains in which social rights are important: the empowerment of citizens (e.g. education and activation), fair working conditions and social inclusion. Each of these domains are respectively studied as part of WP3, WP4 and WP5.</p> <p>This report is produced as part of WP5 which is entitled Inclusion through social policy. This WP focusses on minimum incomes sensu lato, social protection and housing. It identifies, among others, more effective policy packages for the future, based on an innovative set of policy indicators.</p>
Web address	For more information about the EuSocialCit project, please visit www.eusocialcit.eu . EuSocialCit's output can also be found in its community on Zenodo: https://zenodo.org/communities/eusocialcit

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1. Introduction

In the Horizon 2020 EuSocialCit project about 'The Future of European Social Citizenship', a multidisciplinary team of researchers investigates how to achieve a more social and fairer Europe. The project aims to *'provide scientific analysis and examine policy scenarios to strengthen European social citizenship. It focuses on three domains that mirror the building blocks of the European Pillar of Social Rights: the empowerment of citizens, fair working conditions and social inclusion.'*

The current methodological note fits within Work Package five (WP5) of the EuSocialCit project, which is concerned with the analysis of social rights, conceived in terms of normative, enforcement and instrumental resources, and related to the principles in the 'social protection and inclusion' cluster of the EPSR. The specific objectives of this WP are fourfold: (1) to map the existing social rights and social outcomes in the area of social protection and inclusion and the related national and EU policies; (2) to establish how EU policies in this field affect national policies across the member states; (3) to understand policy successes and failures in the past, and identify more effective policy packages and the respective policy gaps and (4) to identify policy options through which EU action in the field of social rights for social inclusion can complement national policies to improve outcomes.

Regarding the third objective, the current methodological note is the result of a search for innovative policy indicators that can adequately measure and monitor the right of European citizens to social safety nets that secure them a decent level of minimum income. The right to an adequate minimum income has been a long-standing commitment of the EU and its Member States and is one of the key principles in the European Pillar of Social Rights (EPSR) endorsed by all EU institutions and the Member States (European Commission, 2017). Principle 14 specifically addresses the right to an adequate minimum income that ensures a life in dignity, emphasizing the importance of labour market participation and access to enabling goods and services. The EPSR repeatedly refers to two important and interrelated concepts of social protection and social inclusion, namely: adequacy and affordability.

The findings in this note are the result of the actions taken in WP5 Task 5.2 which resulted in the elaboration of a more refined set of indicators to monitor policies aimed at improving the adequacy of minimum income and the affordability of essential goods and services.

Indeed, in current assessments of member states' efforts to reduce poverty in the EU, the central indicator used is the At-Risk-of-Poverty rate (AROP), defined as the proportion of individuals living on an income lower than 60% of the national median equivalized net household income. This threshold of 'adequacy' is defined rather arbitrarily, while the indicator builds on the assumption that economies of scale at the household level are proportional to the level of household income and constant across countries. We therefore advocate for the development and use of high-quality RBs as a benchmark providing a sound multi-dimensional understanding of what social safety nets should entail in order to guarantee a life in dignity at all stages of life (Storms et al., 2023). RBs refer to prized lists of goods and services that can be considered as minimum resources for adequate social participation. By

clarifying what income is necessary at the minimum to achieve a living standard that enables full social participation, and by taking account of the services and the cost compensations offsets present in a country or region, these indicators also allow better assessment of social protection and minimum income adequacy.

RBs can clarify the actual meaning of 'adequacy', 'affordability' and 'being at-risk-of poverty' in countries with large differences in standard of living. They provide combined guidance for three related core strands of any successful anti-poverty strategy, namely (1) policies that increase income protection directly through the tax- and benefit system and wage regulations; (2) policies that improve the accessibility of essential goods and services and (3) policies that strengthen individual competences and labour market participation.

In Task 5.2 we have built further on the work done in the EU-Pilot project for the development of a common methodology on RBs in Europe (Goedemé et al., 2015a). We refined this RB approach to better capture the notions of 'adequacy' and 'affordability' crucial to the social inclusion dimension of social rights. We extended and updated the healthy food budgets of four European metropolitan areas and explored the possibility of using them as quality indicators for monitoring the adequacy of minimum income protection and the affordability of healthy food for those living on minimum wage or minimum income.

In the following sections, we describe more in detail the methodology used for developing cross-national comparable food budgets. We first focus on the development of a common framework with food-based dietary guidelines for the EU, including the exploration of pricing methods, extending the range of model families and incorporating sustainability aspects in the RBs for food. This improved and refined methodology was then used to calculate comparable food baskets in four European countries: a southern European country (ES), a western European country (BE), a northern European country (FI) and an eastern European country (HU). The current document, in conjunction with harmonized data files for composing national lists of goods and services for a healthy diet and for collecting prices, can serve as a guide for other countries to developing high quality cross-nationally comparable food budgets. By providing the building blocks needed to develop high quality indicators to measure the adequacy of minimum incomes and the affordability of necessary goods and services, we think the work done within the current task 5.2 can further contribute to the implementation of European social rights.

2. Contents of the food basket

The following section describes the methodological background of the content of the food baskets developed within the current project. First, we explain the rationale for adapting a modified strategy in determining the content of the food baskets. We point out the limitations of the previous EU projects and indicate how we overcame them in the EuSocialCit project. Next, we describe in detail the procedure we followed in EuSocialCit to obtain improved food baskets for a range of extended model families.

2.1 Limitations of previous approaches and rationale for a modified strategy

RBs are illustrative priced baskets of goods and services that represent a given living standard. Often, they refer to the minimum required resources that people need in order to participate adequately in society. Applications of RBs include the development of policy indicators, the contextualisation of existing poverty indicators, and the assessment of the adequacy of social protection and minimum incomes, as well as other uses such as providing additional income support, debt rescheduling and financial education (EU Platform on Reference Budgets, 2019).

A major challenge in the development of RBs is how to conceal cross-national comparability with cultural representativeness and relevance. In the last years, several researches have been conducted with the aim to advance in this regard. Examples of such projects include the 7FP funded ImPRovE project (2012-16), the DG EMPL funded Pilot Project (EURB) (2014-15), or the DG EMPL initiated ASPBO project (2021). In all these projects, different approaches have been implemented which share several conceptual and procedural aspects, namely the concept of social participation and living standards, as well as a mixed-method approach combining expert knowledge, scientific research, survey data and results of focus groups. Now, in the context of the H2020 funded EuSocialCit project (2021-23), a further step is taken with regard to the food basket.

Food is an essential need to participate fully in society. Not only does it represent a vital need, but it also has the characteristic of incorporating culturally relevant aspects of the way of living of individuals and societies. Moreover, unlike some other baskets, the food basket offers the possibility to depart from a normative point of view: the recommendations on healthy eating. And while not all the eating exclusively serves the biological function to promote physical health (food also fulfils important psychological and social needs), considering the recommendations on healthy eating provides a unified starting point to develop the food basket by guiding the inclusion of foods and kitchen equipment that are required to prepare, consume, and serve a healthy diet.

In some of the previous projects, like ImPRovE, a distinction was made between two different parts: a budget that would enable people to consume a healthy diet, and secondly a budget that also takes

into account the other functions of food besides physical health, including activities such as eating out or inviting friends over. The core part of the food basket is the first one. It represents all products that people minimally need to prepare and consume healthy and tasty meals at home. With this aim, the mixed methods used to develop the healthy food basket are conceived to be sensitive to the psychosocial and cultural nature of eating, including the food-based dietary guidelines, food consumption survey data, and focus groups.

However, as developed in the paper by Storms et al. (2023), cross-national comparability remains a challenge in the development of the food basket, and the dietary standard chosen as the departing point for the construction of the FRB, constitutes a key aspect in this regard. In the previously mentioned projects, two types of dietary standards have been used in the development of the food basket: food-based dietary guidelines (FBDG) and dietary reference values (DRVs). FBDGs are actually the most used approach, and DRVs have been incorporated into the ASPBO project in the pursuit of building comparable food baskets across Europe.

In the next section, we describe both FBDGs and DRVs as dietary reference standards and discuss their applicability in the context of the development of RBs.

2.2 Introduction to dietary reference values and food based dietary guidelines

One of the core aims of the European Union is to strengthen its social dimension and to foster, in the face of global uncertainty, convergence towards better working and living conditions for its citizens (European Commission, 2018a). To achieve this aim, the EU seeks to strengthen social citizenship by advancing social rights, rendering the principles in the *European Pillar of Social Rights (EPSR)* into action at both the European and national levels (European Commission, 2017b). This drive corroborates, in the domain of social policy, the EU's commitment to the United Nations' *Sustainable Development Goals*.

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2.2.1 Dietary Reference Values (DRVs)

DRVs are a set of reference standards used to inform, assess, implement and monitor public health policies relevant to nutrition (Buttriss et al., 2018). They provide different thresholds of values for nutrient intakes against which population food supplies and intake may be gauged. However, they

should not be taken as recommendations nor diagnostic thresholds, but as risk markers: DRVs are precautionary and overestimate requirements.

Three concepts are fundamental to the development of DRVs: requirements, bioavailability and interindividual differences. The notion of requirement refers to the minimum amount of a nutrient which, when continuously supplied, allows the maintenance of organic functions as well as development and growth. Requirements are estimated through different scientific approaches, including metabolic studies, clinical trials, and population studies, and they vary across the population due to dietary aspects, individual physiological factors, physical activity, environmental elements, and others. The concept of nutrient bioavailability indicates the fraction of an ingested nutrient that is absorbed and utilized by the body and differs between food sources and depending on the overall diet. For instance, only 2-20% of non-heme iron (the type present in vegetable foods) is absorbed, in comparison with 30-60% of heme iron (present in animal foods) (González Urrutia, 2005). Likewise, the absorption of non-heme iron will be increased in the presence of vitamin C and other organic acids but diminished in diets with abundant calcium, phytates, oxalates, and phosphates, among others. The overall composition of a population's diet, as well as their main source(s) of iron, will modify the amount of iron that is described as a requirement.

The scientific evidence indicates that not all individuals within a population have the same requirements, even when considering bioavailability. Hence the concept of interindividual differences: we do not all need the same amount of nutrients to be healthy. If we depict the observed nutritional requirements of a population, we will obtain a curve with a normal distribution. From there, and with a precautionary approach, several targets are established for a given nutrient, which represent different levels of nutrient adequacy and can be used to prevent deficiencies and excesses and to promote health (see Figure 1).

First, the average requirement (AR) of a specific nutrient is determined. This parameter indicates the amount of a given nutrient that is enough for half of the individuals in a specific population. From here, lower and upper reference nutrient intake are set 2 standard deviations below and above the AR, which are referred to as lower threshold intake (LTI) and population reference intake (PRI), respectively. The former indicates the reference intake below which almost all individuals (97,5%) will be unlikely to fulfil their biological needs. Contrary to this, PRI refers to the level of nutrient that is enough for 97.5% or nearly all healthy people from a given group. In some cases, when data is not available to determine an AR for a specific nutrient, a value called adequate intake (AI) is estimated for which there is little risk of deficiency or toxicity. Additionally, with the purpose to avoid excessive consumption of specific nutrients, thus representing a risk to individuals' health, a tolerable upper limit intake (UL) is also established for nutrients whose data is available.

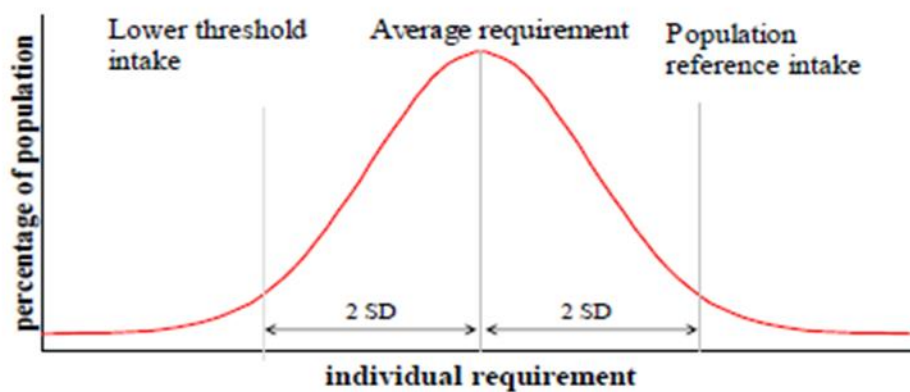


Figure 3. Distribution of requirements of a population group assuming that the requirement is normally distributed and the variation in requirements between individuals is known. Figure extracted from 2010 EFSA report “Scientific Opinion on principles for deriving and applying Dietary Reference Values”

Taking all the above into consideration, several sets of DRVs exist, capturing the needs of different populations. At the European level, most countries have established their own DRVs, but a unified set of standards exists at the European level, developed by the European Food Safety Authority (EFSA) at the request of the European Commission, and based on the assumption that physiological requirements do not significantly differ across European citizens. In this regard, EFSA’s DRVs have been established for a wide range of nutrients, for healthy males and females from birth to elderhood and also for physiological situations like pregnancy or breastfeeding (EFSA, 2022).

DRVs are not meant to be used by individuals, since they require a comprehensive interpretation from professionals in the field. DRVs can be applied in different contexts such as: 1) Public health, for planning and implementing food policies based on energy and nutrient requirements of the population; 2) Food industry, for the development and marketing of products, as well as to help the public interpret the nutritional information displayed on food; 3) Research and health professionals, to assess the nutritional adequacy of a diet from a given group, or institutions and caterers to develop nutritionally adequate menus (EFSA, 2016).

2.2.2 Food based dietary guidelines (FBDG)

FBDGs are a different type of dietetic reference standard. Contrary to the DRVs, they constitute the set of recommendations closest to the general population. Their purpose is not to be used in the planning of public health and community nutrition policies, but to bring nutritional recommendations closer to the general population in a way that is easily understood. In this regard, they reflect patterns of consumption more than numerical targets. They take into account elements of the environment such as the culinary culture, food availability and social habits, and are developed specifically for each territory and even for different groups within the same territory. Very importantly, a great diversity of dietary patterns can be consistent with the recommendations of a FBDG.

Guidelines are context-specific, thus adapting each FBDG to the public health needs of a particular population (normally country or region based, but sometimes also considering other factors such as life-course moment or socioeconomic circumstances). From a public health concern, FBDGs also include recommendations that go beyond reaching nutrient requirements, such as the need to overcome sedentary behaviour by increasing physical activity or to ensure food safety due to the risk of foodborne diseases. FBDGs are feasible and effective tools when developed taking account of the dietary patterns from each context and the prevalence of both deficiency disorders and non-communicable diseases. In addition to this, feasibility is also achieved by considering the cultural, social and economic context of each territory. The FBDGs of some countries already take into account sustainability principles to overcome the environmental consequences derived from food consumption. Contrary to the assumption made on DRVs referring to not vary across European citizens, this does not apply to FBDGs. Following EFSA consultation in 2010 to standardize FBDG across European member states, a conclusion was achieved: it is not feasible to do such exercise due to clear differences between countries on public health concerns, dietary habits, food availability, and harmonised consumption data (EFSA, 2010).

FBDGs are based on recognized public health issues rather than nutrient excesses/deficiencies. Once these have been identified, the development of FBDGs involves several steps, including the identification of diet-health relationships, country specific diet-related health problems, nutrients of public health importance, foods relevant for FBDG, and food consumption patterns, testing and optimizing procedures and graphical representations of the FBDG. When compared with DRVs, it can be asserted that FBDGs capture not only dietary recommendations but also aspects of food consumption, cultural and health-related aspects of eating. In this regard, their use as a starting point for RBs is very attractive, since they already reflect various important aspects of the context for which they are developed. However, they also present several challenges, which have been identified as hinderers to cross-national comparability. These challenges include substantial differences in the date of publication, the degree of detail and the sometimes-attributed arbitrary nature of the recommendations (Blake et al., 2018). Moreover, because FBDGs are designed to be compatible with a wide range of eating patterns, they are subject to interpretation, in such a manner that they can be adhered to by very different diets. What in the context of public health is a virtue, becomes a difficulty when trying to derive food baskets from FBDGs.

2.3 Compliance of the current healthy food reference budgets with the EFSA's DRVs

As a preliminary step for our proposal, we analysed to what extent the nutritional content of the existing food baskets in the four countries meets the EFSA DRVs. To do this prior exercise, we focused on the adult male profile from the food baskets developed within the ABSPO project for BE, FI and HU. In the case of ES, information is derived from the Spanish healthy food basket (Carrillo-Álvarez et al., 2016), developed during the ImPRovE European project, with its subsequent update in 2019, and also from the Spanish sustainable healthy food basket (Carrillo-Álvarez et al., 2021).

Food provision varies from country to country, either because fortification policies apply differently, the soil and feeding practices differ between countries, or some foods are available only in some regions (Merchant & Dehghan, 2006). Hence, we conduct the nutritional analysis using the most updated food composition database in each country. Table 1 shows the results of the nutritional analysis of the latest basket for the adult male in BE, ES, FI, and HU. As observed, all baskets are above the recommended energy content for a 30–60-year-old male, except in Belgium where the energy content is too low. In terms of macronutrients¹, the BE and HU food baskets were the most aligned with the EFSA recommendations, whereas the FI and ES ones were low in carbohydrates and high in fat, in the case of ES. Fibre requirements were met in all baskets. The micronutrient content of the baskets was adequate for all selected nutrients and baskets, except for B12 in the BE and HU baskets, whose values were 12.5-22% below the recommended amount (4mcg/day); vitamin D throughout all baskets; and zinc in the HU basket.

Table 2 provides details on how food baskets are composed in each country and therefore what food items have been included in each food category. This information will facilitate the recognition of how food baskets differ between each other from a qualitative perspective, rather than quantitative, and can be useful to contextualize the identified nutritional divergences.

Table 1. Nutritional assessment of the ASPBO/ImPRovE adult male baskets and its correspondence with the EFSA's DRV

	EFSA DRV PRI	FINLAND HFB	BELGIUM HFB	HUNGARY HFB	SPAIN HFB
Energy (kcal)	2549.40	2658.6	2333.3	2647.0	2874.6
Macronutrients					
Protein (%E)	0.83 g/kg/day	140.1 (21%)	93.6 (19%)	132.4 (20%)	129.4 (18%)
Carbohydrates (%E)	45-60%	43%	55%	51%	44%
Fat (%E)	20-35%	32%	26%	30%	37%
Fibre (g)	25	37.9	38.4	63	44.3
Micronutrients					
Calcium (mg)	1000	1763.6	1204.4	1209	1678.0
Iron (mg)	11	15.7	17.2	15.1	20.0
Magnesium (mg)	350 (AI)	596.6	573.6	588,0	717,7
Zinc (mg)	11.7	16.7	16.3	10,4	17,7
Vitamin B12 (mcg)	4 (AI)	7,3	3.5	3,1	7,2
Folate (DFE)	330	597.1	446.1	407.0	599.9
Vitamin C (mg)	110	386.4	194.0	204.0	262.3
Vitamin D (mg)	15 (AI)	14.7	8.5	5.0	4.4

AI: adequate intake; PRI: population reference intake; E: Energy; HFB: healthy food basket;

Note: although fibre is not strictly considered a macronutrient, it has been placed in this section to facilitate its interpretation

¹ Macronutrients provide energy and are broader nutritional categories, such as carbohydrates, proteins, and fat. Micronutrients are often referred to as vitamins and minerals and are required in far smaller amounts.

Table 2. Main differences found in the item composition of food baskets from each country

	FINLAND ASPBO	BELGIUM ASPBO	HUNGARY ASPBO	SPAIN ImPRovE 2019
Liquids	Referred as water, tea and coffee	In addition to water, tea and coffee, light soft drinks are also referred	Referred as water, tea and coffee	Only water is mentioned.
Vegetables	Fresh vegetables, frozen prepared vegetables, and prepared vegetables	Fresh vegetables, frozen prepared vegetables, frozen unprepared vegetables and canned vegetables	Fresh vegetables, frozen prepared vegetables, frozen unprepared vegetables and canned vegetables	Fresh and frozen vegetables.
Fruits	Fresh fruit and frozen berries	Fresh fruit, fruit puree, fruit juice and canned fruit.	Fresh fruit, fruit puree, fruit juice, canned fruit and dried fruits.	Only fresh fruit
Dairy	Semi & skimmed milk, mature cheese, curdled milk, sour cream and cooking cream.	Semi-skimmed milk and yogurt, mature and cottage cheese. Also drank yogurt, fruit yogurt and chocolate milk.	Semi-skimmed milk and yogurt, mature and cottage cheese. Also drank yogurt, fruit yogurt and chocolate milk.	Semi-skimmed milk, yogurt, and mature and cottage cheese
Legumes/pulses	Not included.	Not included.	Not included.	Canned legumes
Meat and coproducts	All baskets made specifications on lean charcuterie, lean meat and fatter meat.			
Fish	Only fresh fish.	Only frozen fish.	Only fresh fish. Very low recommendation on fish intake (total = 20g/d).	Fresh, frozen and canned fish
Fats	Spreadable fat, rapeseed oil and nuts.	Spreadable fat and cooking fat. Nuts are added in the fruits' group.	Olive oil, spreadable fat and cooking fat. No recommendation on nuts intake is given.	Olive and sunflower oil, and nuts.

2.4 Rationale for the current proposal

From a public health point of view, a healthy diet should be compatible with both the DRVs and FBDG for a given population. Therefore, we propose to *update* the BE, ES, FI, and HU healthy food baskets based on the DRVs. As we show in the previous section, the food baskets developed in the ImPRovE, EURB and ASPBO projects following the customary approach to RBs differ greatly in terms of nutritional contribution, even though they are aligned with the respective FBDG. These differences are explained by the factors related to the FBDGs enumerated before, including differences in the date of publication, the degree of detail and the nature of the recommendations. We are not, however, questioning the validity of FBDGs in representing and conveying to the citizens the recommendations for healthy eating, based on the epidemiological situation of each territory, as well as on its food-related, cultural and socioeconomic aspects. On the contrary, we defend the use of such a set of dietary reference standards as a starting point for the development of the healthy food basket, by complementing it with the nutritional recommendations established by the DRVs for the different individual profiles.

By introducing the DRVs we are achieving two key objectives. On the one hand, we ensure that the developed baskets are aligned with the nutritional requirements of the different individual profiles. On the other hand, we harmonize the variability between countries by introducing a common criterion that reduces the opportunities to make arbitrary decisions, while preserving the health-related and cultural representativeness provided by the FBDG.

Moreover, we implement two additional procedures to enhance the compatibility of the food baskets: the consideration of guidelines for sustainable eating, namely the EAT-Lancet guidelines (Willett et al., 2019) and the development of a harmonized version of the sustainable food basket, which reduces the arbitrary choices made by nutritionists and the diversity of food products among countries, while meeting the recommendations of the FBDG and the DRVs.

2.5 The general approach: the regular food basket

In this section we describe the procedure employed for the update of the food baskets by combining FBDGs and DRVs as a normative starting point. Specifically, we have followed a 5-step procedure:

1. *Decision of the individual profiles for which the food baskets will be developed.* Based on the data available from previous EU projects (Goedemé et al., 2015b; Menyhért et al., 2021) for the different countries and the structure of the FBDG and DRVs recommendations, 13 individual profiles are established: 2,5 child; 6y-old boy and girl; 10y-old boy and girl; 14y-old boy and girl; 18-29y adult man and woman; 30-60y adult man and woman; +60 man and woman.
2. *Identification of the most updated FBDG for each country* and revision of the documents to retrieve frequency and portion amount recommendations for the selected individual profiles. Frequency was prioritized over portion amount when modifications were necessary to adjust the basket to meet the DRVs. These were:
 - a. BE: Dietary guidelines for the Belgian adult population. 2019. https://www.health.belgium.be/sites/default/files/uploads/fields/fpshealth_theme_file/20190902_shc-9284_fbdg_vweb.pdf

- b. FI: Finnish nutrition recommendations. 2014.
<https://www.ruokavirasto.fi/en/themes/healthy-diet/nutrition-and-food-recommendations/>
 - c. HU: Hungarian Nutritional Recommendations OKOSTÁNYÉR®. 2016.
<https://www.okostanyer.hu/>
 - d. ES: SENC. Guías alimentarias para la población española, 2016.
<https://www.nutricioncomunitaria.org/es/noticia/guias-alimentarias-senc-2016>
3. *Identification of the most updated food composition database for each country.* This step is done in collaboration with the national team of each country. The selected food composition databases are:
- a. BE: Nubel Food Planner. <https://www.nubel.be/eng/>
 - b. FI: Finnish Institute for health and welfare. Fineli. Nutrition Unit of the National Institute for health and welfare, 2019. <https://fineli.fi/fineli/en/index>
 - c. HU: RODLER, I. (Ed): Új tápanyagtáblázat. (New food composition tables). Medicina. Budapest. 2005.
 - d. ES: Farrán, A., Zamora, R., & Cervera, P. Tablas de composición de alimentos del CESNID. Mc- Graw-Hill / Interamericana y Edicions Universitat de Barcelona, 2003.
 - e. Missing values in all countries have been completed with the UK food composition database McCance, R. A., and Elsie M. Widdowson. McCance and Widdowson's the Composition of Foods. 2015.
4. *Selection of targeted nutrients and determination of the EFSA DRVs for the comparison.* Based on the main nutritional risks for non-communicable diseases in Europe and the most commonly used parameters for assessing nutritional adequacy (Stanaway et al., 2018), we select a full range of macronutrients, which includes Energy (kcal/day), total carbohydrates (%Total Energetic Value, (TEV)), extrinsic sugar (%), total fat (%TEV), saturated fat (%TEV), polyunsaturated fat (%TEV), protein (%TEV), and fibre (g/day). Key nutrients such as trans fats and cholesterol were not analysed due to lack of data in the national food composition databases. In terms of micronutrients, we focused on those whose deficiency has been identified as highly prevalent: calcium (mg/day), iron (mg/day), magnesium (mg/day), zinc(mg/day), vitamin B12 (µg/day), folates (DFE/day), vitamin C (mg/day), vitamin D (Bailey et al., 2015; Beal & Ortenzi, 2022; Bruins et al., 2018; Roman Viñas et al., 2011). Following this rationale, vitamin A should have also been analysed, but we do not include it here for two reasons. First one is inconsistency between the parameters in the respective national food composition databases: while some provided a value for vitamin A, others separated carotenoids and retinol. Moreover, there were substantial missing values for vitamin A in the national databases. It is to note that the adequate intake for vitamin D is established based on data collected under conditions of assumed minimal cutaneous vitamin D synthesis. In the presence of cutaneous vitamin D synthesis, the requirement for dietary vitamin D is lower or may even be zero (Bresson et al., 2016). Therefore, we monitor but do not adjust the food baskets for vitamin D.
- EFSA DRVs were retrieved from the DRV Finder (EFSA, 2022), which provides energy and nutrient DRVs for all population profiles. Values for energy are established for each year of age in the case of children, and youth until 17 years old, and are available for different levels of physical activity. In the case of adults, energy recommendations are provided for seven

categories: 18-29, 30-39, 40-49, 50-59, 60-69, 70-79 and >80 years old. Macronutrient and micronutrient DRVs follow the same categories for adults and are also organized into different categories for children and adolescents. In our study, we take the exact DRVs for each age for almost all profiles. For the Child 2.5y-old, DRVs were obtained as the mean value of the 2- and 3-years old children, as in the case of 30-60 adults we assume the values for the 40-49 age range. Energy recommendations assumed a Physical Activity Level (PAL) of 1.6, except for children 2-3 y-old, where 1.4 is the only available in the EFSA DRV (EFSA, n.d.). We adopt the recently issued Upper Level (UL) for added and free sugars to be as low as possible (Turck et al., 2022), and observe the WHO strong recommendations that sugars provide below 10% of the total energy value (WHO, 2015). Because the EFSA provides DRVs for separate polyunsaturated fatty acids (PUFA), but not in an aggregated manner, we follow the FAO/WHO (Food and Agriculture Organization and World Health Organization of the United nations) report “Interim Summary of Conclusions and Dietary Recommendations on Total Fat & Fatty Acids” to benchmark, which indicates an Adequate Intake (AI) of 2,5-3,5% of the total energy value for adults and 11%VET for children 2-18 years old. In the case of calcium, we select the value indicated for 18-24 years old for our 18-29y-old profiles and the value >25 for the 30-60y-old profiles. Iron DRV for 30–60-year-old women consider pre-menopausal state. Zinc PRI are dependent on the level of phytate intake (EFSA, 2014). We consider a phytate intake of 600mg/day.

5. *Identification of targeted food items for the nutritional analysis.* Selection of representative items based on EAT-Lancet, FBDG and consumption habits. For this last criteria, national dietitians were consulted. In the selection of food items, a variety of food was pursued as much as possible in order to preserve food preferences from each country and also to account for nutrient differences found within foods from the same food group. This means that nutritional content from vegetables and fruits, for example, was derived from the selection of 6 to 7 foods typically consumed in these countries and that were sources of a wide variety of nutrients. More specifically, the foods that were split in order to account for different sources of micronutrients and cultural preferences were legumes, fresh fruit, fresh vegetables, frozen prepared vegetables, frozen unprepared vegetables, canned vegetables, fresh fish, frozen fish and fatter meat. With this, a first proposal of food items to be included in each country was drafted using as a reference the previous baskets. For fresh products, representative items for each country were chosen inspired by the foods included in the EAT-Lancet reference diet, which is indicative of certain nutrients. For example, in the selection of vegetables, it was ensured that all countries had “orange” colour vegetables (rich in B-carotenes) and “leaf/green” colour vegetables (rich in folates) among the selected foods for the nutritional analysis. A first list was sent to a national dietitian in order to validate the proposal with the consumption habits from each country. Last, the nutritional information for each food and selected nutrients (step 4) was copied into the template.
6. *Development of the updated food baskets, regular versions.* The adjustment of the regular food baskets departs from the ASPBO/ImPRovE reference baskets and the starting point was to check the amounts against the FBDG frequency and food amount recommendations for each country and age profile. With those targets in mind, adjustments to the food amounts were made to meet the DRVs requirements. A variation of +-5% was admitted, as the typically accepted range of deviation when deriving dietary plans.

The amounts of water, tea, coffee and salt were harmonized across countries. Water content was determined following the WHO recommendation of 1ml per kcal (Howard & Bartram, 2003). Coffee (8g/day) and tea(1.5g/day) were included only in the adult and adolescent baskets. Salt amount was adjusted based on age (3g for elderly and adults; 2g for adolescents and 10y children; 1g for 6y children; 0.5g for 2.5y child).

This exercise was done by two researchers/nutritionists working at the Human Nutrition and Dietetics Department of the Ramon Llull University. As for the implementation of FBDG a sound knowledge of the culinary culture and food habits of the population is necessary, it would be preferable to coordinate this exercise by a team of nutritionists of the participating countries. To compensate for this fact, there has been a very fluent communication with the national teams throughout all the process, who have helped to contextualize the recommendations. The specific procedure for the sustainable and harmonized sustainable versions is described in the next sections.

7. *Application of edible portions.* In this methodological note, we only show the results of net amounts - this is, the amounts that are theoretically eaten and therefore have an impact on the nutritional intake. However, some foods are bought in a form that cannot be completely eaten: shells, skin, peel, bones, etc., therefore it is necessary to apply a correction considering the edible portions of the different food products before the pricing. As in the previous projects, the determination of edible food portions will follow the standardised quantification of the Hoge Gezondheidsraad (Hoge Gezondheidsraad, 2005) and will be 0.9, 0.72, 0.78, 0.7, 0.8 and 0.88, for potatoes, fresh vegetables, fruits, fresh fish, meat and eggs, respectively. Therefore, the priced amounts of certain foods in the final food basket will be higher to compensate for necessary food losses before intake.

2.6 The sustainable food basket

2.6.1 Why sustainability is important to develop food reference budgets

The world is in a critical situation. The climate crisis threatens to transform the planet Earth into a less liveable place, with more frequent and intense weather events such as droughts, storms, heat waves, melting glaciers and warming oceans (WWF, 2022). In Europe, it is foreseen to have distinct effects in the different areas. In Southern and Central Europe, it may imply experiencing repeated heat waves, forest fires and droughts; just like the Mediterranean area, which can also lose land due to the rise of the sea level. In Northern Europe, by contrast, rain might be more recurrent, with flooding occurring more often (EU, 2022). This situation entails enormous risks for human health, for society and economy, and the effect on developing countries can be even worse due to their dependency on the natural environment.

Although socially contested, there is scientific agreement that climate change is a consequence of our way of living, which is carbon dependent, makes an excessive use of water, erodes the soil and threatens biodiversity. Reversing the situation requires, according to the United Nations (UN), “*a profound transformation of how we grow food, use land, transport foods and power our economies*” (UN, 2022a). Sustainability is the term that guides this new way of living and was coined by the UN World Commission on Environment and Development as “*the development that meets the needs of*

the present without compromising the ability of future generations to meet their own needs” (UN, 2022b).

In December 2019 the European Commission approved the European Green Deal, which gathers pollution control measures, social policies and actions against climate change, sustainability laws, reduction of gas emissions, energy efficiency, circular economy and green economy (EU, 2021). Through the Climate Pact, it also aims to provide an arena for all Europeans to participate in developing and implementing climate solutions.

Food systems are at the core of the climate crisis, as they are a key causal element in environmental transformations, at the same time that are greatly affected by them, threatening everyone’s food and water security. Food systems are estimated to be responsible for 25-42% of all global greenhouse gas (GHG) emissions (Crippa et al., 2021; WEF, 2021), 70-80% of freshwater consumption, the excessive use of land and the loss of biodiversity (FAO, 2008; Herrero et al., 2021; Moñino et al., 2021; Poore & Nemecek, 2018).

As part of the EU Green Deal, the Farm to Fork strategy aims to address the sustainability of food systems, while also working to make them healthier and more equitable. It sets the basis to transition towards food systems that have a neutral or positive environmental impact, helps to mitigate climate change and adapt to its impacts, reverses the loss of biodiversity, ensures food security, nutrition and public health, making sure that everyone has access to sufficient, safe, nutritious, sustainable food, and preserve the affordability of food while generating fairer economic returns, fostering competitiveness of the EU supply sector and promoting fair trade (European Commission, 2020). Such strategies prove how the transformation of food systems has become a priority in governmental agendas, which struggle to achieve the right balance to satisfy health, environment, economy, equity and culture.

Indeed, the FAO and WHO's definition of sustainable healthy as “dietary patterns that promote all dimensions of individuals’ health and wellbeing; have low environmental pressure and impact; are accessible, affordable, safe and equitable; and are culturally acceptable” (FAO & WHO, 2019) also points to the different criteria that these diets must meet.

Several aspects of what we eat have an influence on sustainability. That includes elements such as food transportation, food conservation, food waste or food packaging, but diet composition (that is, the type of food that is consumed - and *therefore* produced) is the main one (Barilla Foundation, 2018; Poore & Nemecek, 2018). In general, there is consensus that a healthy and sustainable diet comprises a variety of primarily fresh and minimally processed plant-based foods, sustainably produced vegetable fats, small amounts of minimally processed animal foods, tap water as a primary beverage choice, and very little wasted food (Moñino et al., 2021; Willett et al., 2019).

It is clear that sustainability cannot be omitted any longer when developing food reference budgets (FRBs). FRBs are priced baskets of goods and services to fulfil a healthy diet that allows an adequate social participation at the minimum cost. Whatever the use of FRBs (calculate poverty figures, financial advice, provision of social support, etc.), they must account for the cost of adopting sustainable choices, unless we want to create additional and wider disparities across groups. In this way, they must

not only aim to describe the goods (food, kitchen equipment) necessary for well-described types of families to preserve and promote their health in an affordable, safe and socio-culturally acceptable way, but also to promote dietary patterns and food systems that are protective of our environment and respectful with local economies.

As described before, the process of development of FRBs typically involves a 4-step procedure: (1) translation of national FBDG into monthly food baskets, (2) selection of items; (3) validation of the acceptability of such baskets, (4) pricing. Considering sustainability as part of the food basket requires an especial reconsideration of steps 1, 2 and 4.

2.6.2 FBDG and the inclusion of sustainability aspects as a departing point for Food reference budgets.

As mentioned above, FBDGs are science-based recommendations for healthy eating which translate numerical nutritional targets (in Europe, EFSA DRVs) into guidelines for the general population, taking into account the food culture, food availability and diet-disease relationships relevant for specific populations. For FRBs they are an excellent departure point in that these normative recommendations are already expressed in terms of foods instead of nutrients. However, until recently (ASPCAT, 2019; Christensen et al., 2022), sustainability was not taken into account when developing FBDG (Bechthold et al., 2018; FAO, 2016).

Springmann et al. (2020) recently developed a modelling study to assess the healthiness and sustainability of 97 national and global FBDG. The health and environmental impacts of these FBDGs were assessed by using a comparative risk assessment of deaths from chronic diseases and a set of country specific environmental footprints for greenhouse gas emissions, freshwater use, cropland use, and fertiliser application. They concluded that the actual adoption of such FBDGs by the population would reduce global mortality from non-communicable diseases (NCDs) by about 20% in the European region, but they would not address the environmental targets set by the Paris Climate Agreement (2015). In other words: most current FBDGs are not supporting sustainable dietary patterns and food systems. An added value of Springmann's paper is that they also modelled the impact on NCDs and the environment of the global adoption of the EAT-Lancet recommendations (Willett et al., 2019). That scenario was associated with 34% greater reduction of premature mortality due to NCDs and a general attainment of the environmental targets.

2.6.3 Why EAT-Lancet

The EAT–Lancet Commission report on healthy diets from sustainable food systems (Willett et al., 2019) has become a landmark publication on the relation between food, environment, and health. Developed by a group of almost 40 experts from 16 countries in various fields of human health, agriculture, political sciences, and environmental sustainability, the Commission has developed global scientific targets based on the best evidence available for healthy diets and sustainable food production.

Their report provides reference daily intakes for different food groups, which are expressed as both grams/day and kilocalories/day considering a diet of 2500 kcal/day – the reference diet for an adult

man and woman. Their framework is universal for all food cultures and production systems in the world, with a high potential of local adaptation and scalability. In practical terms this means that information regarding the frequencies of consumption or other indications related to the meal preparation are not provided, leaving room to adapt the proposed food amounts to different needs and eating cultures. The structure of the report is particularly suitable for FRB purposes, as it offers a framework in terms of food amounts per food group (like FBDG and as opposed to EFSA's DRVs for nutrients) which can be adapted to different contexts. Figure 2 shows the EAT-Lancet Healthy reference diet, with possible ranges, for an intake of 2500 kcal/day.

The authors emphasize that energy intake adequacy is an important element for both healthy and sustainable diets. Consuming 2500 kcal per day corresponds to the average energy needs of a 70-kg man aged 30 years and a 60-kg woman aged 30 years whose level of physical activity is moderate to high. In this way, although the global average per capita energy intake has been estimated as 2370 kcal per day and some analysis place the recommended mean intake in 2100kcal/day for the adult population, the EAT-Lancet report presents a 2500kcal diet (

Table 3) in the understanding that the recommended intake of 2100 kcal assumes a BMI of 22 kg/m² which is lower than the current population average and that place the recommendation in that threshold would leave little room to promote other Public Health measures such as encouraging physical activity. Although the use of different values for energy intake would affect absolute required food production, it would minimally affect conclusions regarding relative effects of different dietary scenarios on environmental or health outcomes.

Beyond the intake ranges for the different food groups, the report provides the general advice of adhering to energy adequate diets and minimizing food waste, as well as opting for the minimum degree of processing, which includes choosing foods without added sugars. The first two recommendations will be easily considered in the development of the sustainable food basket, as food amounts are stipulated theoretically. As for the degree of processing, it will be taken into account in the selection of the food items within the basket.

Table 3. The EAT-Lancet Healthy Reference Diet for an intake of 2500kcal/day, taken from the EAT-Lancet Commission

	Macronutrient intake (possible range), g/day	Caloric intake, kcal/day
Whole grains*		
Rice, wheat, corn, and other †	232 (total gains 0-60% of energy)	811
Tubers or starchy vegetables		
Potatoes and cassava	50 (0-100)	39
Vegetables		
All vegetables	300 (200-600)	
Dark green vegetables	100	23
Red and orange vegetables	100	30
Other vegetables	100	25
Fruits		
All fruit	200 (100-300)	126
Dairy foods		
Whole milk or derivative equivalents (eg. Cheese)	250 (0-500)	153
Protein sources ‡		
Beef and lamb	7 (0-14)	15
Pork	7 (0-14)	15
Chicken and other poultry	29 (0-58)	62
Eggs	13 (0-25)	19
Fish §	28 (0-100)	40
Legumes		
Dry beans, lentils and peas *	50 (0-100)	172
Soy foods	25 (0-50)	112
Peanuts	25 (0-75)	142
Tree nuts	25	149
Added fats		
Palm oil	6-8 (0-6-8)	60
Unsaturated oils ¶	40 (20-80)	354
Dairy fats (included in milk)	0	0
Lard or tallow	5 (0-5)	36
Added sugars		
All sweeteners	31 (0-31)	120

Note: For an individual, an optimal energy intake to maintain a healthy weight will depend on body size and level of physical activity. Processing of foods such as partial hydrogenation of oils, refining of grains, and addition of salt and preservatives can substantially affect health but is not addressed in this table

*Wheat, rice, dry beans, and lentils are dry, raw

†Mix and amount of grains can vary to maintain isocaloric intake.

‡Beef and lamb are exchangeable with pork and vice versa. Chicken and other poultry is exchangeable with eggs, fish, or plant protein sources. Legumes, peanuts, tree nuts, seeds, and soy are interchangeable

§ Seafood consist of fish and shellfish (eg, mussels and shrimps) and originate from both capture and from farming. Although seafood is a highly diverse group that contains both animals and plants, the focus of this report is solely on animals.

¶Unsaturated oils are 20% each of olive, soybean, rapeseed, sunflower, and peanut oil.

||Some lard or tallow are optional in instances when pigs or cattle are consumed.

2.6.4 Procedure of adaptation of the EAT-Lancet recommendations for Reference Budgets purposes

The characteristics of the EAT-Lancet Commission recommendations (Willett et al., 2019) require some adaptation to be used in the context of the methodology for developing FRBs, in order to consider the food and cultural context of each country and the different individual profiles for which FRBs are developed. Like in the previous EU RB projects {Goedemé, 2015a, Goedemé, 2015b), the following assumptions are made: (1) all family members are healthy and competent to make decisions about their diet, (2) within households, there are enough skills to buy, preserve, prepare and cook healthy food in an economic way, (3) family members are moderately active, (4) families live in the capital city with easy access to a variety of points of sale. In the context of the EuSocialCit project we develop sustainable RBs for two profiles: 30–60-year-old male and female. The EAT-Lancet recommendations are exemplified for a diet of 2500 kcal, which is closer to the male profile, and the ranges provided for the reference diet allow an easy adaptation to the nutritional targets of an adult woman. To apply these guidelines to the rest of profiles, new recommendations should be issued or a procedure to adapt the existing ones to other individual profiles, especially children and youth, would be needed. An option would be to modify the food amounts chosen for the adult male proportionally to the energetic content of diets as recommended by the EFSA DRVs (EFSA, 2017), in a similar manner to Back et al. (2021).

The work we describe here is based on a first exercise by Carrillo-Álvarez et al. (2021). In the Spanish Sustainable Food Reference Basket (SSFRB) different levels of sustainability based on different factors of food that influence sustainability were developed: diet composition (level 1), country of origin, packaging and seasonality (level 2), acquisition point (level 3). In the context of EuSocialCit project, only levels 1 and 2 are applied.

The first step in the development of FRBs is the adaptation of the food amount recommended in national FBDGs to the EAT-Lancet guidelines. Second, the list of foods in the food basket is priced selecting the items of the supermarket that meet certain criteria in terms of seasonality and origin.

a) Step 1. Combining EAT-Lancet and national FBDG

For both, the adult male and female, we select the value within the EAT-Lancet reference amounts that is closest to the amount chosen in the ImPROvE/EUPRB projects for that group – to increase comparability among them. In the event that FBDG had been updated since the development of the ImPROvE/EUPRB projects, then the value within the EAT-Lancet reference amounts that is closest to the amount of the new FBDG was chosen.

Table 4 provides a comparison of the EAT-Lancet report recommendations with the Spanish FBDG for an adult male. It is to note that the Spanish FBDG used for ImPROvE/EURPB were updated in 2016, hence the different columns.

Table 4. Comparison of the dietary recommendations by the EAT-Lancet report, the SENC 2004, the SENC 2016 for an adult man, and the chosen food amounts in the Spanish sustainable reference budgets. All values are net amounts

	EAT-Lancet	SENC 2004	SENC 2016	ImPRovE/ EURPB	SSFRB	SSFRB 2020 Weekly-daily distribution		
	g/day	g/day	g/day	g/day	g/day	PT size(g)	PT /week	PT /day
Whole grain ¹	232	333-680	250-566	276 ²	232	80	20	3
Potatoes	50 (0-100)			114	100	150	5	
Vegetables	300 (200-600)	300-400	300-400	400	400	200	14	2
Fruits	200 (100-300)	360-600	360-600	450	360	150	17	2
Dairy products	250 (0-500)	260-685 ³	260-685 ³	605	500	250	14	2
Red meat ⁴	14 (0-28)	Occ.	Occ.	50	30	150	1	
Poultry	29 (0-58)	43-71	43-71	54	29	100	2	
Eggs	13 (0-25)	27-36	27-45	60	27	63	3	
Fish	28 (0-100)	54-86	36-64	94	64	150	3	
Legumes/Pulses	75 (0-150)	17-46	17-34	17	46	80	4	
Nuts and seeds	50 (0-75)	9-30	25	20	25	30	7	
Added fat ⁵	40 (20-80)	30-60(ml)	-	40	40	10	42	
Added sugar	31 (0-31)	Occ.	0-50	50 ⁶	31 ⁶			

Note. 1 Includes rice, pasta, and breakfast cereals; 2 In ImPRovE/EURPB, grains are refined; 3 Both Spanish guidelines recommend low-fat dairy products, whereas the EAT-Lancet promotes whole milk by-products; 4 Includes ham; 5 Includes sources of unsaturated fat olive, rapeseed, sunflower and peanut oil; 6 In the form of table sugar, jam, and chocolate.

PT Portion, Occ. Occasional, SENC Sociedad Española de Nutrición Comunitaria, SHFRB Spanish Healthy Food Reference Budget, SSFRB Spanish Sustainable Food Reference Budget, FBDG Food Based Dietary Guideline.

b) Step 2: Determining specific food items

Once the amount per food group had been determined, the selection of specific food items within them was carried out according to the following principles.

- The baskets for the different individual types must contain the same food items - varying the amount of them - unless there is a good reason to change (i.e.: children or elderly may have different needs in terms of texture).
- Consistently with health evidence and recommendations (Pagliai et al., 2021), we select, for all groups, items with a low degree of processing (those in the 1-3 categories of the NOVA classification system) (Monteiro et al., 2019).
- If the amount of fruit and vegetables need to be reduced, two approaches can be applied: to diminish the amount of all products while maintaining the current diversity, or to cut down only the processed forms such as dried fruit.
- Dairy products were all full-cream, following the sustainability recommendation from EAT Lancet.
- Wholegrains can include wholegrain pasta and bread with the lowest degree of processing (i.e.: traditionally-baked bread is preferred over ultra-processed English bread). Rice will preferably be wholegrain too. Legumes represent the dried raw product and the specific amount of food items (lentils, beans, etc.) can vary to maintain isocaloric intake. These can

also be selected in its cooked form as long as they are only boiled – and in that case the buying weight will need to be modified according to the change of weight that comes with boiling (x3).

- The residual group includes culinary ingredients similar to ImPRovE/EUPRB, checking that added sugar is maximum 36g/day.
- No extra criteria were applied to meat, fish, eggs – beyond the amount set by the reference diet, the premise of choosing items with a low degree of processing and the specifications for fresh food.

2.7 The harmonized sustainable food basket

2.7.1 Why a harmonized sustainable version of the food basket?

After adjusting the different food baskets based on the EFSA DRVs, small differences that are difficult to justify from a cross nationally comparable perspective remained. These differences can be attributed to (a) difficult to explain differences in FBDGs, (b) difficult to explain cultural differences, (c) accessibility/availability of specific products, (d) choices made by the nutritionists. As mentioned in section 2.2, the application of FBDGs implies that, in each country, multiple dietary patterns are compatible with the recommendations. Therefore, arbitrary differences are inherent to the development of food baskets based on FBDGs. However, it is possible to agree on certain decisions in such a way that as long as the dietary recommendations and the cultural aspect of food are respected more comparability is achieved. For example, the Hungarian FBDG considers the intake of fruit in the form of fruit juices, while other countries discourage its intake in that particular form. Because consuming fruit juices is not compulsory and they are not strictly representative of the Hungarian food culture nor a staple in the current dietary habits of the population, a decision to consider fruit only in the form of fresh food is made. This situation is particularly present in the residual part of the food basket, which contains culinary ingredients and condiments, and it also appeared in regard to products such as soft drinks which were present in some baskets to allow freedom of choice.

To tackle this difficulty, a new procedure is tested, which intends to reduce the differences based on arbitrary choices and ensure that differences are only due to (a) institutional variations (differences in FBDG that can be explained, i.e. no better alternative thinkable), (b) clear cultural differences, and (c) empirical established variations in the availability, quality and prices of goods and services. To do so, certain decisions are made to harmonise the selection of food products among countries.

The departure point for the harmonized sustainable versions of the food basket is the sustainable food basket because it achieves a higher degree of comparability among countries (and also because sustainability can no longer be overlooked when developing RBs). Upon this basis, the changes made include: For (a) Difficult to explain differences in FBDGs, we eliminate canned and pureed fruit (BE, HU), fruit juice (HU, FI), dried fruit (HU) and include full cream milk for the 2,5 year old children (BE, FI, HU). For (b) Difficult to explain cultural differences, we eliminate curdled milk, sour cream and cooking cream (FI) and canned fish (ES). In terms of (c) Accessibility/availability of specific products, even though it is unrealistic to include the same variation of fresh fruits and vegetables, large discrepancies in the availability can be corrected during the pricing process. Additionally, we eliminate frozen fruit (BE, FI), and prepared frozen vegetables (BE, FI). On the contrary, frozen fish is included (FI). Last, to

harmonize the choices made by the nutritionists, we agree on no soft drinks (excl. in BE), and the liquids section remains as water, tea and coffee in all countries. Non-skimmed dairy is of preference in all countries and dairy products are limited to milk, yogurt (added in FI) and mature/cottage cheese. Therefore, curdled milk is erased (FI). Vegetable cubes are included in all countries, as well as cocoa powder. Condiments are restricted to vinegar, salt and pepper. Except in most of foods from the residual group, the elimination of items is compensated by an increased amount of the remaining in the food group (i.e.: the deleted amount of pureed fruit is increased to fresh fruit).

Table 5 presents the differences in the food items included in the different types of baskets: ASPBO/ImPRovE and the EuSocialCit regular, sustainable and harmonized sustainable versions. Among all types, there are amount variations between individual profiles to meet the EFSA DRVs.

Table 5. Food basket content variation between ABSPO/ImProVe, EuSocialCit regular, EuSocialCit sustainable and EuSocialCit harmonized sustainable

	ASPBO (BE/FI/HU) /ImProVe (ES)	EuSocialCit regular	EuSocialCit sustainable	EuSocialCit harmonized sustainable
GENERAL	FBDG as a bases	FBDG + DRVs as a bases NOTE: Amount variation across food groups to meet the EFSA DRV	Eat Lancet + FBDG + DRVs as a basis NOTE: Amount variation across food groups EAT Lancet recommendations	Sustainable food basket harmonizing some arbitrary decisions NOTE: Elimination of items is compensated by increased amount of the remaining in the food group
LIQUIDS	water, coffee, tea, soft drinks	water, coffee, tea, soft drinks	water, coffee, tea, soft drinks	water, coffee, tea
BREAD, GRAINS, LEGUMES AND POTATOES	white bread, wholegrain bread, potatoes, rice, pasta, legumes, breakfast cereals	wholegrain bread, potatoes, rice, pasta, legumes, oatmeal*	wholegrain bread, potatoes, rice, pasta, legumes, oatmeal	wholegrain bread, potatoes, rice, pasta, legumes, oatmeal
FRUIT	fresh fruit, canned fruit, juice fruit, Fruit puree, dried fruit, frozen fruit	fresh fruit, canned fruit, juice fruit, fruit puree, dried fruit, frozen fruit	fresh fruit, canned fruit, fruit puree, dried fruit, frozen fruit	fresh fruit
VEGETABLES	fresh vegetables, frozen unprepared vegetables, frozen prepared vegetables, canned vegetables, prepared vegetable product	Fresh vegetables, Frozen unprepared vegetables, Frozen prepared vegetables, Canned vegetables,	Fresh vegetables, Frozen unprepared vegetables, Frozen prepared vegetables, Canned vegetables,	fresh vegetables, frozen unprepared vegetables
DAIRY	milk, semi-skimmed; yogurt, skimmed; cheese, mature; cheese, cottage; yoghurt drank; fruit yoghurt; chocolate milk; full-cream milk; skimmed milk;	milk, semi-skimmed; vegetable drinks**, yogurt, skimmed; cheese, mature; cheese, cottage; full-cream milk; skimmed milk; curdled milk; sour cream; cooking cream	milk (whole), vegetable drinks**, yogurt, (whole); cheese, mature; cheese, cottage; curdled milk; sour cream; cooking cream	milk (whole), yogurt, (whole); cheese, mature; cheese, cottage

	curdled milk; sour cream; cooking cream			
MEAT, FISH, EGGS	charchuterie (lean); fish, fresh; fish, frozen; fish, canned; meat, lean; meat, fatter; eggs	charchuterie (lean); fish, fresh; fish, frozen; fish, canned; meat, lean; meat, fatter; eggs	charchuterie (lean); fish, fresh; fish, frozen; fish, canned; meat, lean; meat, fatter; eggs	charchuterie (lean); fish, fresh; fish, frozen; meat, lean; meat, fatter; eggs
FAT	olive oil; Sunflower oil; nuts, without husk; spreadable fat <= 1/3 saturated fatty acids; cooking fat <= 1/3 saturated fatty acids; rapeseed oil	olive oil; Sunflower oil; nuts, without husk; spreadable fat <= 1/3 saturated fatty acids; cooking fat <= 1/3 saturated fatty acids	olive oil; Sunflower oil; nuts, without husk; spreadable fat <= 1/3 saturated fatty acids; cooking fat <= 1/3 saturated fatty acids	olive oil; Sunflower oil; nuts, without husk; spreadable fat <= 1/3 saturated fatty acids; cooking fat <= 1/3 saturated fatty acids
RESIDUAL	honey; cocoa powder; choco; jam; sugar, crystal; spices; flour; mayonnaise, ketchup, vinegar; pudding powder; bread-crumbs; broth: vegetables; cake: 3 types; potato flour; mustard; lemon juice; vegetable cube	honey; cocoa Powder; choco; Jam; sugar, crystal; spices; flour; mayonnaise, ketchup, vinegar; pudding powder; bread-crumbs; broth: vegetables; mustard; lemon juice; vegetable cube	honey; cocoa Powder; choco; Jam; sugar, crystal; spices; flour; mayonnaise, ketchup, vinegar; pudding powder; bread-crumbs; broth: vegetables; mustard; lemon juice; vegetable cube	cocoa; sugar; salt, pepper; flour; vinegar

**Foods that replace a homologue one from the previous basket; **Foods newly added in respect to the previous basket*

2.8 Kitchen equipment

The food basket should also include the necessary kitchen equipment for storing, preparing, serving, consuming and preserving food. Therefore, the food reference basket also includes a budget for durable non-food items. In earlier RB research (Storms, 2012) in Belgium, a nutritionist prepared a list of minimally necessary items and advised on the type, quality and number of items necessary to achieve the following functions:

- storing and keeping food: this includes a shelving unit, a fridge, a freezer, jars and bags to store leftovers.
- preparing food and drinks: this requires for example a set of pots and pans, a cooking range, a microwave oven, knives to cut meat and vegetables, a water cooker to boil water, a coffee maker, ...
- serving meals: items needed to properly serve food and drinks such as a serving dish, oven mitts a pot stand and serving spoons.
- consuming food and drinks: this includes items such as cutlery, large and smaller plates, glasses, cups and saucers, a table, tablecloth and chairs.
- providing basic hygiene: kitchen equipment needs to be properly cleaned and households needs to be able to dispose of garbage, therefore also items such as dishcloths, sponges, detergent, a rubbish bin and bags and tea towels are included.

This list of kitchen supplies was evaluated during focus group (FG) discussions and some items were adapted. At the request of participants from the FGs with people over 65, we included a shopping bag on wheels for families in this age group.

In the EU pilot project (Goedemé et al. 2015a), the national partners started from this Belgian list of kitchen equipment as a common base and adjusted this to their socio-cultural context. In a next step, this list was discussed in different FGs to assess its completeness, feasibility and acceptability. Due to time limitations, the task of FGs was not to discuss every item on the list in detail, but rather to check whether the list was complete and acceptable. In general, the FG members across countries accepted the list of kitchen equipment but suggested including or excluding some items in order to make the list more adequate and suitable within their cultural context. The FGs generally had no remarks on the quantities and the lifespans of the items. Although a standardized procedure had been set up to decide whether or not to take account of FG-based adaptations, some cross-national differences in the decisions that were made seemed rather arbitrary. Most FG adaptations were made in relation to the practicality of electric devices such as a micro wave, a coffee machine, a toaster, a mixer or a dish washer. For example, in some FGs the participants argued that these are essential items that enable to manage the household taking into account time pressure, especially for working parents. In Finland, the country team therefore added a dishwasher for families with children based on FG arguments, while other country teams did not albeit there was also discussion on the need for a dishwasher or other electric devices for adequate social participation. Even though a procedure was set up to decide on how to adapt the list of kitchen equipment in response to the results of the FG discussions, it is clear that this remains a matter of judgement on the part of the country team. As a result, the comparability and robustness of the budget for kitchen equipment across EU member states was called into question (Goedemé et al, 2015a).

In the ABSPO project (Menyhért et al., 2021), the four country teams involved checked these lists and made some minor adaptations. In the current project, we started from the most recently available lists of kitchen equipment for each country (ABSPO for BE, FI and HU, Pilot for ES). These lists were compared on an item by item basis, not only in terms of the presence/absence of items for each function but also the quantities per household or person type, necessary attributes of the items and lifespans. From this comparison process, a common list was compiled with items that were either present in two or more country lists or were present in different forms in country lists (for instance an electrical coffee maker or a coffee maker/espresso maker to place directly onto the stove). For these items, the quantities and lifespans were standardized across countries and for each item, the necessary attributes were described in more detail. For instance, the lifespan of a package of freezer bags depends on the number and volume of the bags included, therefore this volume and content number was specified. The lifespan of a plastic storage jar might be longer than that of a glass storage jar, therefore the materials were specified more in detail. This resulted in a streamlined common list of kitchen equipment, which included sometimes different products, quantities or lifespans than the lists used in earlier. In a next step, very country-specific items were added to each list. This resulting list was proposed to each country team with the question to check the proposed quantities that were different from earlier projects, as well as the items that were previously not included in the country list and the country specific items. This resulted in a largely comparable list of kitchen equipment, with the two most considerable country-specific changes made for Finland with the addition of a number of baking utensils and a dishwasher for larger households; and for Spain where the use of a separate freezer and refrigerator unit is quite uncommon and which were replaced with a fridge-freezer combination for households of less than 5 persons.

3. Pricing the food baskets

The cost of the food basket does not only depend on its contents, but also on the method of collecting prices of the foods included in the basket. A second major challenge for fully comparative and robust food baskets is therefore concerned with the pricing strategy. The pricing strategy refers to a large extent to the type of data or the data source that is used to price the content of RB baskets but also to the manner in which price information is combined in order to yield a minimal cost. In the following sections we will briefly discuss earlier used pricing procedures and what can be learned from them. We will argue why we propose a hand-collected pricing strategy and how we think this pricing strategy can still be improved/extended compared to earlier efforts.

3.1 Potential pricing strategies

3.1.1 Previous cross-national reference budget projects

Lessons learned from pricing the Pilot and Improve food baskets

In all but three countries² participating in the Pilot project (Goedemé et al, 2015a), the RBs for food for a healthy diet and the RBs for kitchen equipment were based on prices that were hand collected in stores. The pricing procedure for food and kitchen equipment was guided by the two general criteria of **minimal resources** and **personal autonomy**.

- **Minimum resources:** The healthy food budget and the budget for kitchen equipment should represent the minimum resources that people need to get access to all essential items.
- **Personal autonomy:** The choice of shops and the selection of items in the shops should be done in such a way that it leads to a minimum budget that gives people an acceptable degree of freedom to choose both retailers as well as products within a store.

Prices for food items were collected in a single or only a few retailers, since it is impractical to visit different shops for regular purchases such as food. Retailers were suggested by the participants in FGs and met the following criteria: offering a wide variety of food/kitchen equipment of acceptable quality at low prices; being well-spread over the city; being well-accessible by public transport; being well-spread over the country can be another criterion that can be taken into account, as this could facilitate the future pricing of RBs developed for other regions. If possible, country teams were asked to rely on existing representative price comparisons between retailers to decide in which shop prices should be noted (that is, in accordance with the criteria defined above). After the calculation of the food basket, a top-up of X% (representing the price difference between the chosen store and other more accessible stores) was applied in some countries to account for the selection for the cheapest store which is not as well spread and accessible as other retailers.

Regarding the choice of shop for kitchen equipment, it is also deemed impractical to visit different shops so most prices were noted in one or, if not possible, in only a few retailers. In case more than

² Three countries used a divergent pricing method, using mainly products contained in the national consumer price index (CPI, LU), average prices in one store (DK) and using scanner data (NL). In the Improve project, similar pricing strategies were largely used and we will not discuss them separately.

one retailer was suggested by market surveys and FG discussions, retailer(s) were to be chosen that offer kitchen equipment of acceptable quality at the lowest price and which also were well accessible in the capital city and, if possible, are also widely spread across the country. Other criteria suggested were the presence of an after sales' service, an at-home-delivery service for larger items such as a fridge or freezer, the availability of energy labels for resource-intensive items and the availability of a linked online web shop. No sustainability concerns were taken into account.

Regarding the selection of which items to price, both food items and kitchen equipment items were to meet the quality criteria as described in the food basket (e.g. percentage of fat in dairy, energy label of a fridge). Generally, the price selected and included in the RB is the price for the cheapest item meeting the quality criteria for that item. However, for classes of food with many different variations, such as fruit, vegetables, meat, fish and cheese, the lowest price for all items meeting the criteria in a food group (for instance fresh fruit: per kilo price for cheapest apple, cheapest bananas, cheapest pears, ...) was noted. The final price included in the RB for healthy food was a weighted average of all types of products for each of these food categories available in the shop (excluding the most expensive items) so it allows sufficient variation. Since sales tend to be relatively volatile and may lead to a non-representative image of the price level of the food basket, they were not taken into account since it limits the possibilities for replication and appropriate updating of the food basket in the future, as well as its cross-country comparability and consumer choices and autonomy.

Conclusions

In the Pilot project, variations in prices explained twice as much of the cross-national variation in the food budgets as differences in quantities. While this might be (partly) due to real differences in actual price levels, the final report remarked on the cross-country differences in data availability and quality regarding prices and the structure of the food market. Some other issues related to pricing strategies can also be gathered from the experiences and results from this project.

Some national experts indicated that the hand-collected pricing procedure forced them to make decisions that were not always well-informed. Because the price data collected were not always collected through online stores, a replication /check by a secondary research team was also not always possible to reduce the variation in choices made between the researchers collecting the prices. Hence, for both food item prices and prices for kitchen equipment, online pricing is not only much more feasible than in-store pricing, it may also allow to improve comparability and reliability because different 'raters' can collect prices for the same items which should reduce interrater variability and those 'uninformed' choices that national experts were forced to make.

Prices should always be noted as price per unit (kg/L), even when online price information only reflects price per package/item. For prepackaged foods, this means a recalculation of the online price needs to be correctly done, for bulk raw items (i.e. a lettuce) a recalculation needs to be made based on standardized food tables reflecting the average weight per piece of a certain item. The input material for country teams needed to include possibilities to enter this information.

In line with the definition of adequate social participation and the importance of consumers' autonomy that follows from the theoretical framework, a choice was made to use a weighted procedure for a set of food groups such as fresh foods. However, the number of food items included in these weighting exercises differed strongly between countries. A simulation using a simple average of the lowest price products diminished the budget considerably. While it seems unlikely that households can stick to a healthy diet if the pricing of foods does not allow for sufficient variation, when a larger sample of products is priced, it may be advisable to limit the items included in such a weighted average procedure and make these as comparable as possible while taking into account cultural and seasonal variations across countries in order to increase cross-country comparability.

The timing of the pricing period had an impact on the price outcomes, particularly that of seasonal items, such as fresh fruits and fresh vegetables. This is a general pitfall of a one-off price survey, but since especially fresh food items may be subject to substantial seasonal variation, both in terms of availability and in terms of the price of foods, this is also counter set with the use of a weighted averaging procedure. However, using price data which also captures this seasonal volatility would improve robustness. In a later section, we return to this issue.

The criteria for the choice of shops were not ranked, so it is unclear which criterium country teams deemed most important. Some of the criteria for retailer choices refer to somewhat subjective criteria such as 'a wide variety', 'well spread' 'well accessible by public transport', which is again to a large extent at the discretion of the individual research team in each country. Regarding the quality criteria, improvements could be made on quality criteria for a number of kitchen equipment items, which strategy to follow when items are unavailable in the chosen store, whether to include delivery costs or not and for which items and which distance this should cover.

The differences in the budget for kitchen equipment are to an important extent due to price differences in the cost of kitchen equipment. Nonetheless, also the differences in the content of this basket will be a driver for budget differences. Especially the more expensive electric devices such as a dishwasher, a toaster or a blender might partly explain budget differences across countries. Reducing the variation in the content of this basket to a level that still represents national preferences and habits but is for the most part comparable across countries should also improve the cross-cultural variation in FRBs. In terms of cross-national comparability, it is also unclear to what extent the proposed lifespans of kitchen equipment durables may differ, since they also depend on the quality of the product chosen (for example, insurance companies make a distinction between the lifespan of a premium brand washing machine and a non-premium brand washing machine). It is unclear if the quality requirements specified for each of the items are sufficient to guarantee the same level of quality and thus the same life span across countries. Checking the budgetary impact of these lifespan assumptions on the food budget in each country might prove to be a first step to take into account these quality differences.

Lessons learned from pricing the food baskets in ABSPO project

In the ABSPO project³ (Menyhért et al., 2021), three different ‘measurement strategies’ for food budgets were compared, which all represent the same targeted standard of living, use the same notion and structure of minimum needs and feature broadly similar modelling tools.

1. RB approach: the RB approach used hand-collected pricing (similar to the Pilot project). The food baskets were adapted, updated and extended versions of the ImPRovE minimum food baskets (Goedemé et al, 2015b). Given the specificity of the products that compose the baskets, CPI data does not allow to identify the quality of the product. The criteria for the selection of retailers and selection of items within the stores were to a large extent similar to those outlined in the Pilot methodology: stores should offer a wide variety of items of acceptable quality at low prices, be well spread over the country (prices were collected at 4 different location types) and the shops should be well accessible by public transport. Since prices were collected during the Covid crisis, shops needed to allow online price collection. The selection of items within the shop followed the following algorithm: the choice of the available type of product(s) that matches the item in the basket, the choice of the most representative price(s) among the product types, processing of the prices to deliver the final price. For food items, the procedure differentiated between three types of food items: very elementary items (such as salt and spices) where the least expensive items were picked and price noted; fresh food items for everyday consumption (such as bread) where an average price was delivered on the basis of an enquiry of several local purchasing points; and food categories where variety and choice plays a major role (vegetables, fruit, meat, fish, ...) and where an identical weighted average procedure was applied. A final top-up of 10% was applied to all food budgets.

2. Survey-based approach: the contents of these food baskets were completely new sets of reference baskets calculated on nutritional grounds, consistent with common EU-wide dietary reference values (DRVs), and aligned with national food habits. The reference baskets are described in terms of generic food product categories based on the ECOICOP classification in a comprehensive manner, and the contents were priced using national consumer price statistics, collected through traditional consumer price surveys (where available, such as in Finland and Hungary) or based on household scanner data (for Belgium and Italy). In order to get a minimum expense at the level of the ECOICOP product category at the 5-digit level, the 25th percentile of the price distribution by NUTS1 region on the totality of price observations was taken as the reference price. This 25% was meant to represent a sufficiently low price point in the universe of all sampled items, retailers and price periods that still allows for a certain degree of consumer choice and autonomy. Economies of scale adjustments were made post hoc, by applying a scaling vector of 0.85 / 0.75 / 0.65 / 0.60 households with 2, 3, 4, and 5+ members, which is broadly comparable with the OECD modified equivalence scale used elsewhere in ABSPO modelling.

³ In this project, the main objective was to explore the technical, methodological, and data-related requirements of developing a new indicator for the EU-wide measurement of poverty, starting from a common European living standard, country-specific definition of minimum needs, and disaggregated measurement of living costs. Here we focus on the construction of the food baskets only.

3. Food-based statistical approach: here, the content of the food baskets was the same as in the survey-based approach. However, for pricing, we used Eurostat's harmonized national average price dataset. These data were available for all 27 EU Member States and differentiate along several product dimensions, including packaging size and brand type, among others. Eurostat detailed average prices comply with existing international standards, basing product descriptions on specifications used in Purchasing Power Parity (PPP) surveys, while the price collection was meant to utilize the timeliness and frequency of Harmonised Index of Consumer Prices (HICP) data collection. However, the last available set of data refers to 2018.

Conclusions

Because the content of the food based statistical approach basket was identical to the survey-based approach, the differences between these two resulting food budgets was in totality due to the pricing sources or the choice of a certain percentile (25th). The RB based approach uses a differently structured food basket as well as different pricing procedures. In order to compare them the relevant price of each item was mapped to the corresponding (or most appropriate) ECOICOP category.

When using price statistics data, the choice of percentile is very important. On average, the use of the 25th price percentile led to 30% higher budgets than the 10th percentile, and 26% lower budgets than the median (50th percentile) price based on the same pricing distribution. This means that the rather arbitrary choice of the price level is a very important driver of the resulting minimal food budget. The pricing source was also important. Using reference prices of the 25th percentile vary by 23, 36, 14 and 20 percentage points around the respective national means (BE, FI, HU, and IT) in relative terms. The limited evidence suggested that price information based on households' actual purchasing data (i.e., HBS-based and scanner prices) tend to yield lower budget estimates than representative prices from national price statistics (collected primarily for price index and inflation calculations). The most and least customized methods of price collection (small-scale RB pricing and national average price statistics from Eurostat, respectively) yield very similar estimates. This suggests that all of the presented sources may be equally suitable for poverty measurement and that the preference for one or the other should be based mostly on practical considerations (e.g. accessibility, data scope, conformity with other modelling tools). The price data at the national level (scanner data, price data, ...) which are used in the survey-based method food basket is often restricted in access and also has limited cross-national comparability. The use of harmonized national average price dataset compiled by Eurostat (as the HICP) might offer an alternative here and was also used to collect prices for the food basket in the food-based approach. However, it is not clear to what extent these data would be available to non-internal EU usage and how much of a delay there is between price collection and the availability of statistics to represent current prices.

Within the ABSPO project, it was also investigated to what extent the prices are adequate. Adequacy referred here to the reference prices matching poor households' effective costs of acquiring the reference baskets. In the Eurostat national average prices, the average price of cheaper variant brandless items (more often consumed by poorer households) was similar to the 25th percentile of full distribution. Moreover, the median food prices paid for items by low income households (the

lowest income quintile of the income distribution⁴) were comparable to the budget based on 25th price percentile from the Eurostat's national average price dataset.

3.1.2 Other potential pricing sources

Price survey data

In the Pilot project, Luxembourg used prices from the national price surveys (used for updating the consumer price index in Luxembourg) to calculate FRBs since the retail landscape is very different from that in neighboring countries (no single low-cost food retailer which is accessible and has common prices). A comparison between prices from national price surveys and retailers indicated however that a number of items included in the FRB baskets were missing from the official price survey and for some items, only one or a few, relatively expensive price observations were included. While the inclusion of these expensive items inflated the total price of the basket, most prices in the official price survey were not very different from the 'second cheapest product' in stores. At the same time, using official price survey data has the advantage of regular updating, is very time-efficient and is representative for the whole country (especially advantageous in cases where there is not one single store well-spread and accessible over the country). However, whereas the CPI indices tracking price evolutions are often available at a sufficiently low level, access to actual microlevel price survey data at country or regional levels is often restricted and cannot be accessed in most countries, limiting the applicability in the context of computing cross-country comparable food budgets.

Crowd-sourced data: Numbeo and Living Wage indicator project

Numbeo (<https://www.numbeo.com/cost-of-living/>) is an example of a free online tool that creates a database containing data on living conditions in cities and countries across the world, by means of collecting information on amongst others cost of living, health care, and quality of life. Starting in 2010, these data are gathered through the systematic input of visitors of the website, filling in the local cost of goods and services. Newly entered data is checked by an algorithm which compares the new contribution with existing data and the probability that the new contribution is admissible (e.g. falls approximately within a reasonable range of the already available price data). While this is an easily accessible and constantly updated source for pricing data, a major disadvantage of this type of online surveys is that in some countries the number of respondents is rather low, making it difficult to assess the veracity of the prices. The representativeness of the data collected and their reliability may also pose significant challenges, and the number of actual food items included is very low, in the case of Numbeo, limited to about 20 food items.

On the website www.wageindicator.org, various projects of all over the world with regard to assessing the living wage are brought together. In addition, in order to state something meaningful about the minimum level of a living wage, survey websites concerning the cost of living are summarized per country for about 85 countries. Similar to Numbeo, for each of these countries, visitors can enter the cost of a range of goods and services as they encounter them in the local market. The survey contains aspects of cost of living in the categories supermarket, transport, telecom, salary, and financing. As

⁴ Based on joint data on household income level and transaction level food purchases, available in HBS data from Belgium and scanner data from B and IT

this price survey methodology is broadly comparable to Numbeo, similar drawbacks to using these price data in the context of constructing FRBs apply.

Cash register data/retailer scanner data

In the Netherlands, The National Institute for Budgeting (Nibud) uses cash register data (retailer scanner data) to price the FRBs. Scanner data are collected at the level of the European Article Numbering (EAN) 13-code, allowing identification of type and packaging of products scanned. The use of scanner data is advantageous because it shows directly the actual price paid by customers, the quantities bought and the total turnover. Moreover, it is very time-efficient and allows to calculate yearly average prices instead of prices reflecting a single price. It can be representative for food prices across the whole country, is robust and excludes human errors in writing down prices which should increase reliability. However, when calculating a FRB, Nibud uses a weighted average price of the product, which is computed based on the turnover: articles that are more costly and/or are more frequently sold have a relatively larger impact on the average price. Average prices do therefore not necessarily reflect the minimally needed budget to acquire the necessary food items reflected in a minimal food basket. Secondly, the scanner data also include promotion and sales items, which diverges from the common hand-collected pricing method. The argument that the inclusion of sales items is not reflecting a stable price level is not necessarily valid here since prices are collected year-round. However, a final drawback at the practical level is that retailers have to allow access to their scanner data to the NIBUD in order for them to use these data. At the moment, only two retailers in the Netherlands have allowed this, and it is not clear to what extent these two large retailers' prices are representative for the lower price food market in the Netherlands. In terms of cross-country comparability, using retailer scanner data is also interesting but an avenue that requires to overcome several accessibility restrictions, as well as a comparison between the range of products scanned. Finally, not all countries at the EU level have introduced retail scanner data as a method to track CPI for food items.

Nutritional cost

In the US, so-called thrifty, low-cost, moderate cost and liberal food plans are developed by the U.S. Department of Agriculture (e.g. Carlson et al., 2007). Rather than 'manually' aligning dietary guidelines with prices selected in shops and with existing food consumption habits, a data-intensive approach is used in conjunction with a mathematical optimization model. More precisely, data from a food-consumption survey are converted into purchasable quantities and their nutritional value. In addition, cash register data are used to calculate the average price of foods, taking into account the volume of purchases of the particular items. Subsequently, nutritional and food-based guidelines are used as constraints in a model which optimizes the food basket for 15 age-gender groups such that a food basket is constructed which reflects the lowest cost (at average prices) of eating a healthy diet in accordance with food-based dietary guidelines, while taking into account the varying food consumption habits of the population. This approach has several advantages, but also requires that comparable food consumption surveys would be carried out across Europe and that there is a uniform 'table' to convert foods into nutrients across Europe. Currently, EU Member States have nation-specific tables.

3.2 Pricing strategy for cross-comparable food reference baskets: hand collected pricing

To summarize, earlier attempts to construct cross-nationally comparable food baskets have used either a hand-collected pricing strategy (PILOT, IMPROVE and ABSPO), using scanner data or national price statistics data (ABSPO and NL, LU in Pilot) or Eurostat's harmonized national average price datasets (ABSPO), each with different advantages and drawbacks. An important lesson from the ABSPO project was that the budgetary result from very different tested sources of pricing was relatively comparable and that the preference for one or the other method should be based mostly on the suitability of the method to achieve one's goals as well as practical considerations (e.g. accessibility, data scope). As outlined earlier, in the current project the goal is to calculate in a cross-country comparable manner a minimal budget of financial resources necessary to acquire a basket of food items that are both fully compliant with the characteristics outlined in the dietary guidelines (content) and that are acceptable and feasible to low-income citizens in terms of allowing enough variation in product-choices and shop selection, at a minimal price level.

When keeping this purpose in mind, it becomes clear that while using more statistical-based price resources such as consumer price statistics (scanner data, consumer price surveys, ..) has important advantages in terms of efficiency, ease of frequent updating, representativeness of the items and prices included (Menyhért, et al., 2021), there are also considerable drawbacks. The arbitrary choice of price level is an important driver for the resulting food budget, it is often not possible to guaranty that quality characteristics of products in the food basket are included, the face validity is quite low which will not help for the acceptability of the resulting food baskets, access to price data is often restricted or very expensive and there is limited cross-national comparability in the manner of collecting the source data for the consumer price statistics (e.g. data may come from traditional consumer price surveys, household or store scanner data, ...). Alternative and related methods such as using crowd-sourced data (e.g. Numbeo) offer prices based on a relatively large sampling of prices, however since these are not based on random selections from a population frame, reliability may pose significant challenges and the number of food items included is generally very low.

In the current project we choose to compute the FRBs based on hand-collected pricing methods because it allows to calculate budgets in an accessible and a cross-country comparable manner, the resulting basket can be guaranteed to be fully compliant with the outlined dietary and quality guidelines and the budgets are acceptable to low-income citizens.

a) Cross-country comparability and accessibility

Hand-collected pricing allows to collect prices in a cross-country comparable manner, since there are limited differences in access to store-based or online data and prices are accessible in a comparable manner in each country at a relatively low cost. Prices from stores are easily accessible at any point in time for price collection purposes. Ideally, the prices can be collected online, reducing the cost and effort of collecting prices compared to in-store pricing. Other price data sources often come with barriers restricting their usability for the construction of RBs. Furthermore, the manner in which national price data are collected in the context of consumer price index evolution is not uniform across Europe- some countries use web scraping methods, other buy retail scanner data for fast-moving

consumer goods, other countries rely on national price surveys or a combination of either of these methods, which may impact cross-country comparability. Additionally, to the extent that these data are collected by commercial third parties, the cost of obtaining detailed price data can be very high. Even when national statistics offices have access to scanner data from a large sample of retailers, these data are not necessarily available to external parties. In addition, official price surveys do not always cover the full (price) range of all relevant goods and services included in RBs. Household budget surveys data are often freely available for research purposes, but contain expenditure data rather than prices and there is sometimes a considerable delay between the collection of such data and the availability of these datasets for external parties. An additional advantage of hand-collected pricing is that all participating countries can theoretically update prices at any given point in time. With hand-collected pricing methods, one is not dependent on data from governmental surveys or other data sources which are collected either at different points of time in different member states (hindering the cross-country comparability of the RB for food) or at irregular intervals (risking breaks in series).

b) Compliance with quality and product characteristics

Hand-collected pricing allows a level of detailedness in terms of quality and product characteristics in such a manner that prices can be selected for items that are fully compliant with dietary characteristics or quality characteristics for durable kitchen equipment items. The calculated final budgets thus reflect an exemplary fulfillment of minimal needs rather than based on arbitrary cut-offs where one would assume that it is sufficient to allow the fulfillment of minimal needs.

Hand-collected pricing allows to identify the quality and specific characteristics of a product in terms of package size, content of nutrients, fat percentages and so on for food items, and certain minimal requirements in terms of materials, energy labeling, and other criteria for durable kitchen equipment items. Choosing these products by hand collected pricing allows complete control over the content of a food reference basket in a way other pricing strategies⁵ cannot. Either these items may not be available in the national price survey data used for updating the consumer price index, some products may only be covered by one or a few price observations which appeared to be rather expensive and it is often not possible to guaranty that quality characteristics of products in the food basket are included (e.g. the 25th percentile price level of sandwich meat in scanner or price survey data does not necessarily represent the price of a high quality, unprocessed, low fat option needed to fulfill this need in a healthy diet).

Hence, the budgetary end result of a hand-collected pricing procedure is a normative budget which shows the minimal price level needed to satisfy minimal needs rather than being based on arbitrary cut-offs along real expenditures, which is taken to reflect by proxy the cost to satisfy minimal needs.

c) Transparent and acceptable to low-income citizens

In order for a healthy FRB to be acceptable by both the group of low income inhabitants who might have to be consigned to live of them as well as policy makers, both the content of a food budget as well as how these contents are priced needs to be both acceptable and be made transparent.

⁵ With the possible exception of retail scanner data, but this would require much data wrangling. To some extent, price scanner data also allow this level of detailedness on product characteristics (EAN codes also differ for package sizes and products with different characteristics). From what we understand from the experience in the Netherlands is however that some more detailed information regarding origins of produce, distinctions between bulk products or prepackaged fresh products or certain sustainability aspects is not necessarily available from these scanner data.

Acceptability requires that RBs are based on a rationale and pricing method that has some ‘face validity’ (Citro and Michael, 1995).

In terms of face validity, the monetary end result (RB for healthy food) needs to correspond to what low income people would have to spend when trying to buy the content of the food basket. The choices made within a hand-collected pricing procedure reflect actual shopping choices and the pricing strategy can be documented and made transparent, increasing face validity and acceptability for low-income citizens.

Using hand-collected pricing, prices can be collected at stores and for items that reflect the actual choices people with limited incomes make. Since the aim of compiling a RB for food is to give an indication of the minimal cost for healthy food and related items in different EU states which is accessible for low-income consumers, the hand-collected pricing method ensures that the prices contained within the food basket represent indeed such a food budget. Scanner data on the other hand use either prices from all participating stores, or a subset of prices from the stores that allow to use this information of average price calculations. This means that these may include a volume of prices from stores which are not accessible or frequented by people with low incomes and scanner data may exclude those which are frequented more by lower-income consumers. Scanner data are also weighted based on sales volume, so that more frequently sold brands (even if these are the more expensive premium brands) have a larger weight in the final price, which may not necessarily be considered as minimal. Similarly, consumer price data⁶ (to the extent that they are accessible) are collected primarily with a focus on tracking changes in food prices for price indexes and tend to track prices of easily identifiable foods, for example certain brands, which are not necessarily the cheaper products and brands chosen by lower income households. Also, due to hedonic quality adjustments, an increased observed cost of certain items with changed characteristics is not necessarily reflected in a similar increase in CPI. In contrast, when pricing using hand-collected pricing methods, this increased cost will be included in the RB and the resulting basket prices will closer match the actual purchasing prices that consumers encounter. Finally, when using national price data and selecting the lowest price for each product independent of the retailer, the resulting FRB would imply that in order to satisfy minimal food needs at that budget level, consumers would need to visit several retailer locations in order to be able to obtain similar prices. This assumption is also not realistic for most consumers. The prices identified should give people the ability to shop low-cost products in a single common low-cost retailer. Using a hand-collected pricing procedure, the prices included in the RBs can be chosen to reflect a low price paid for food at an acceptable quality level and bought at one location rather than sampled across retailers.

⁶ Also, in national price statistics such as a consumer price index (CPI), some countries use hedonic quality adjustment. Because the CPI measures the average change in price over time of consumption goods, a problem occurs when their characteristics, not just their prices, changes over time as new versions of items are introduced. This is particularly the case for consumer appliances and electronics, which are also included in the kitchen equipment part of the food basket. Hedonic quality adjustment is one of the techniques the CPI uses to account for changing product quality within some CPI item samples. Hedonic quality adjustment refers to a method of adjusting prices whenever the characteristics of the products included in the CPI change due to innovation or the introduction of completely new products. The hedonic quality adjustment method decomposes an item into its constituent characteristics, estimates the value of the utility derived from each characteristic, and uses those value estimates to adjust prices when the quality of a good changes.

By providing an illustrative food basket of individual food products and collecting store prices at actual shopping locations or online-shops, the face validity of this pricing method is also considerably more straightforward to explain and understand, compared to other more data-driven and technical solutions. Both laypeople and experts can clearly link the content of a food basket and the prices hand-collected in a store to the actual resulting RB for food.

d) Other potential advantages

Hand collected pricing theoretically allows for regional variations, both geographically as in terms of distinguishing between urban and rural areas. However, given that pricing is often done at (online-) stores which employ national prices, this is not always the case in practice. If the focus is on identifying regional differences, hand-collected pricing in local stores which use different price settings based on location could reveal such differences. Scanner data of nationally collected price data theoretically may also allow for some regional variation, although for example in the Netherlands regional price differences are not made available for researchers from NIBUD.

Economies of scale can be included in the pricing method to reflect actual household shopping choices by buying products in larger packages or greater quantities which is often cheaper, rather than introduced post-hoc based. For example, in hand collected pricing a four-pack of yoghurt could be priced for a single person because a larger quantity might perish before it is consumed, but for a family of four this is not the case and a much cheaper 12-package item could be priced. Whereas this is theoretically also possible using scanner data, in practice⁷ economies of scale are usually applied after calculating the food budgets as a whole based on recalculated package prices.

Finally, similar to other pricing methodologies, hand-collected pricing also allows to investigate the impact of some pricing assumptions on the resulting food budgets. However, to investigate the impact of retailer choices, price-level choices and the impact of sales, often additional information needs to be collected. Choices regarding different weighting procedures for a number of food products and variations of depreciation periods for kitchen equipment for example is however possible.

e) Disadvantages of hand-collected pricing

Previous research has also identified some important drawbacks of the hand-collected pricing method. The most important disadvantages are the time-consuming nature of the hand-collected pricing procedures limits the frequency of price updating and the reliability and robustness of the price data which are sensitive to the choices of stores, specific sampling of items and human errors.

Even using online-accessible price data, checking and meticulously noting appropriate prices within the constraints of quality requirements for a large number of food products and kitchen equipment is quite time-consuming. Whereas we think a well-documented, clear and standardized hand-collected pricing procedure is indispensable to set the price level of a healthy FRB, a regular updating of such budget would be quite costly in terms of staff costs. At the same time, given that food prices might fluctuate over time, regular updating of the FRB is necessary to allow an accurate assessment of the affordability of food and adequacy of social benefit schemes. A workable solution might consist in

⁷ For example, in the Netherlands, an 'average' price of yoghurt per person would be calculated, and the final food budget will be increased (for a single household) or decreased (for >2 persons household) with a fixed factor (NIBUD, 2022, personal communication).

regularly updating the healthy FRB using detailed price evolution indices from the national statistical offices and to re-evaluate the food prices by hand-collecting pricing at larger intervals.

Hand-collected pricing methods also result in relatively less robust price data since these are sensitive to choices of stores and specific sampling of items, as well as human errors. First of all, the number of products included in a hand-collected pricing procedure is relatedly limited, since the prices are not based on a sample of a large number of items but by choosing the cheapest (or x^{th} cheapest exemplar) in a selected retailer. Hence, in terms of representativeness of the entire array of product variations, the hand collect pricing method is weak. However, since the aim of pricing the food items and kitchenware is not to obtain a representative sample of all prices, but an estimate of a realistic minimum price level for certain food items, this lack of representative prices is not necessarily problematic because a focus on selecting prices representative of lower income shopping choices is present in the hand-collected pricing strategy.

A reliable price-collection strategy ought to be replicable: would the same results be achieved if the research is conducted by a different researcher, or if it is repeated in a similar context? Whereas on this criterion, hand-collected pricing may be rated somewhat less than other methods, the replicability of the hand-collected pricing procedures can be increased when the methodological choices made are transparent, adequately documented and available. Hence, an important aspect of the hand-collected pricing method is its transparent documentation, which should include very detailed list of goods and services with necessary attributes, a list of suppliers and the criteria for choosing them as well as the price levels, an assumed life span of products and a detailed price list. This thorough documentation also contributes to the transparency of the procedure and its acceptability for target groups.

Hand-collected pricing methods are also prone to human particularities in choices and decisions made during pricing and human errors, which could have a disproportionately strong impact given that the number of products and items sampled is small. Other methods which rely on either larger samples of products and items and/or on database-provided data (such as scanner data) are more accurate in the sense that the prices match those paid at the counter rather than the ones listed in the store and the statistical reliability is much higher. For instance, in a large-scale study for Sweden about 9% of the items in a manual survey could not be found in the shops and of about 6% of the items the price shown on the package or shelf was different from the one to be paid at the cash desk (cf. Sammar et al., 2012). Here, the impact of these particular choices and errors could be reduced by having multiple researchers noting down prices for the same items and checking the disparities between them.

In summarizing, we proposed to use a hand collected pricing procedure with a number of adjustments to adapt and obtain a workable, representative and standardized pricing procedure for constructing cross-nationally comparable RBs for food.

3.3 Pricing strategy procedure in the current project

The hand-collected procedure applied in earlier projects such as Pilot, Improve and ABSPO offers a good starting point. We propose some minor adaptations in order to further standardize the pricing strategy as much as possible. Therefore, we used an ordered list of criteria to select retailers and the

collection of additional information on selected retailers in order to guide the country teams in the choice of stores to price both kitchen equipment items as well as food items. Furthermore, an ordered list of criteria regarding the choice of items to price was included as additional guidelines regarding delivery costs, availability of items and the inclusion of sales items. This is discussed more in detail below.

Additionally, we included alternative sustainability aspects at the level of the choice of food items. In the previous section, the importance of the development of a sustainable food budget was already introduced. In the development of a sustainable food basket, sustainable RBs for two profiles were developed (30–60-year-old male and female) by adapting the diet composition to fit within the EAT-Lancet recommendations. This adaptation has relatively little influence on the pricing procedure since most items included in the sustainable diet were already included in the regular basket or could be easily added to the list of items to price in each country (e.g. full-cream dairy products). However, apart from diet composition, other factors of food consumption such as country of origin, packaging and seasonality may also influence sustainability.

3.3.1 Pricing instructions standardization: choice of stores

The hand-collected procedure applied in earlier projects such as Pilot, Improve and ABSPO offers a good starting point. We propose some minor adaptations in order to further standardize as much as possible by using an ordered list of criteria to select retailers and the collection of additional information on selected retailers. The procedures for choosing the retailers used in the EuSocialCit project can be found in annexes 7.2.1 and 7.2.2.

The ordered list of criteria for the retailer selection for pricing food items included the following requirements: items should be available at relatively low prices (not necessarily the cheapest in the country, but among the cheaper half of the market), the store should offer a wide variety of food products which was to be checked to see if most of the food products listed in the ‘food’ basket were available, prices should be available online for the large majority of products available in the physical store at a similar price level of a metropolitan physical store and the store should provide online information on nutritional characteristics (e.g. % fat for charcuterie and meat,...), the country of origin of fresh fruit, fresh vegetables, fresh meat and charcuterie and farmed fish or fishing region (FAO) for wild fish.

In order to gather similar information regarding the characteristics of the chosen stores for food products, we asked the country teams to indicate the price level of the store compared to other retailers, number of stores per square km or per number of inhabitants and a sample of the distance to a public transport access point for a number of selected stores.

For the choice of shops for kitchen equipment, country teams could price at several locations since some of the kitchen equipment items can be priced in the retailer used to price the food basket (dishwashing liquid, plastic bags, ...) while furniture and/or electrical appliances are typically bought in different shops.

For furniture and smaller household items (such as plates, glasses, pots and pans) as well as electrical appliances, the ordered list of criteria for selection of the store was the following: the store should carry a sufficient range of each type of furniture and/or the majority of common household items (e.g. not a few tables, but a variety to choose from) or electrical appliances, the items should be available at relatively low prices, but should not necessarily be the cheapest in the country (not sell specialty or expensive items only), prices are available online for the large majority of products available in the physical store at a similar price level and the online information on price and products allows to select items based on certain characteristics (size of furniture, material of kitchen utensils, energy labels, delivery cost can be estimated online for large and heavy items,...). We additionally collected information on the price level of the store compared to other furniture/houseware/electronics stores if available, the geographic spread over the country and the distance to which a selected store's physical location was connected to public transport facilities.

3.3.2 Pricing instructions standardization: choice of items

Regarding the choice of items to price, we included additional guidelines regarding delivery costs, availability of items and the inclusion of sales items. Details on the food items to price and their minimal characteristics can be found in annex 7.2 .

For the pricing of **food items**, a distinction was made between pricing more elementary food items where there is not a lot of variation in the utility derived from different brands (for example salt, cristalized sugar, ...) or where variation is not deemed necessary from a nutritional point of view (e.g. coffee, tea, ...) and food items or categories where variation is important. For the former type of items, country teams selected the lowest price for each item that fully satisfied the criteria, with a 'similar' package size as the one indicated in the excel sheets. Regarding the latter, we provided country teams with sample lists for each food item category (e.g. fresh fruit) which could be used as a starting point to note down the lowest price per kilo for each item within the list, and which could be extended to include other items not listed but available in store.

Country teams were asked to always first write down the cheapest price without multipack- volume discounts or promotions of the 'buy two, get one free' variety. However, the cheapest price could be a promotional price. If this was the case, the lowest price without discounts taken into account was also noted. If an item was not available, country teams were asked to explicitly indicate this. For all products in the 'food' sheet, the store, the brand of the item, the content per package in g or ml, the number of pieces per package and the lowest price per package with or without promotion was noted.

For a number of items, we supplied an example list of products within that item category and country teams were free to add other available different items within the same category complying to the criteria. Such list were supplied for fresh fruit and vegetables, fruit puree, canned fruit, frozen fruit, dried fruit, canned vegetables, frozen vegetables, legumes, nuts, ripened (not-cottage cheese type) cheese, charcuterie, 'white' meat (poultry products), 'red' meat (fat % of max 10%), fresh fish, frozen fish and canned fish. The lists also outlined what items could be seen as one instance (for example: only include the price of one color of paprika/bell pepper/capsicum) and what somewhat similar items could be priced separately (e.g. white and red cabbage are quite different nutritionally and hence both

prices were included). Bread was bought in the food retailer unless this is a very uncommon practice in one's country.

For the pricing of **kitchen equipment**, we provided a list of kitchen equipment items with specified requirements as well as an example of the product previously bought if available. Country teams were instructed to note the lowest price of the item per piece that satisfies all the requirements and to only consider items that are available for sale at the time of pricing (and not to include prices from an out-of-stock item) for all items except electrical appliances (here, we asked to consider appliances that are available at the moment of pricing or with a delay of no more than two weeks. When a web shop indicates an item is not available without a specified delay, country teams were instructed to not take this item into account). If the cheapest item was a promotion or discounted or sales price, this was noted and the price without discount was also recorded. Country teams were asked for each item to write down the store, a short item description if needed and the price per piece. Sometimes we asked for a set price, if this is the case, it was indicated in the requirements. For the freezer, refrigerator, stove and dishwasher we also required country teams to check the delivery cost of these items to a first-floor address approx. 15 km from the store. If delivery is not free, country teams had to estimate the delivery cost for each item separately and write it down

3.3.3 Cost of sustainable food item choices

Here, we built upon earlier work by Carrillo-Álvarez et al. (2021). In the Spanish Sustainable Food Reference Basket (SSFRB) different levels of sustainability based on different factors of food that influence sustainability were developed: diet composition (level 1), country of origin, packaging and seasonality (level 2), acquisition point (level 3). In the current project, the development of a Level 1 sustainable food basket differs from the regular healthy food basket mostly in terms of reference food based dietary guidelines, without any reference to country of origin or packaging, and is thus situated at level 1. This diet and the differences with the regular reference basket was discussed in detail earlier. However, additional sustainability parameters can be included which are situated at the level of choosing an item to price. Comparable to the methodology used in Carrillo-Álvarez et al. (2021), we adapt the pricing procedure to allow additional pricing of an alternative sustainable food budget using the sustainability criteria of seasonality of fresh fruit and vegetables, the country of origin of fresh products and packaging type of fresh fruit and vegetables (level 2). For this Level 2 sustainable food basket, we will test to what extent the criteria from the Spanish sustainable food basket can also be applied to other European countries by collecting additional information at the same general retailer where the pricing of the healthy food basket takes place. A food basket calculated at Level 3 would include prices based on local markets or distribution points. Within the context of cross-culturally comparable food reference baskets, this inherently results in very different patterns of acquisition. Additionally, in terms of the time needed to collect such prices, it seems unfeasible to implement this strategy in the context of the current proposal.

The pricing instructions to select items within a store were extended in order to include these sustainability criteria. However, rather than selecting food items that comply to all three criteria at once, as was the case in Carrillo-Álvarez et al (2021), we asked country teams to note for a number of fresh food items:

- The price of the cheapest food item with the specified requirements (e.g. cheapest apple, pear, ... for fresh fruit), this price was used for the regular food basket
- To indicate whether this food item is currently in season or not if applicable using a national/regional table indicating the seasonality of fresh fruit and vegetables.
- The price of the cheapest food item with the specified requirements from one's own country or neighboring countries (reduced impact of transportation cost). For fish the country of origin is either country of farming or fishing region. For BE, this means a local product originates from BE or if no product is available from BE, from NL, FR, LU or DE. For ES the fresh products are from ES, or otherwise PT, MA or FR. For FI preferably from FI, or else from SE, NO or EE and for HU fresh products can originate from HU, or also from neighboring AT, SI, RO, SK, HR, RS or UA. Conversely, for fish, we asked to note the price for locally farmed fish (same countries of fish has a ASC label), or if the fish product has a MSC label denoting it is wild fish, to check the availability and price of local regions (FAO 27 and 37 for BE, FI and HU; FAO 27,37 and 34 for ES).
- The price of the cheapest food item with the specified requirements available with minimal packaging (sold in bulk) if this was available
- The price of a local product that is sold with minimal packaging (bulk)

This will allow us to calculate the financial cost (or advantage) of including mostly local products (level 2a) or local and seasonal fresh products with minimal packaging (level 2b) in one's diet.

More details on the exact instructions for selecting retailers and products within stores, including items following certain sustainability criteria, can be found in annex 7.2.3.

3.3.4 Adapting the procedure for calculating a unit price of fresh food items

From the Pilot project we learned that there were considerable differences in the number of items included in the weighted procedure for fresh food items. A comparison between the weighted pricing procedure and a more simplified procedure for vegetable, fruit and meat/fish products (a simple 'cheapest 7' or cheapest 14 average price) yielded an overall lower food budget when calculating a simple average lowest price. While these budgets without weighted prices may be more strictly referring to minimal prices, at the same time they are more restrictive and limiting the freedom of choice of low-income consumers. Hence, in the current project, we tried to optimize this procedure to be at the same time aligned with the idea of providing enough opportunities for variation as well as by restricting unwanted variations in per kilo price that are the result of differences in the availability in a particular retailer or due to particular calculations made to arrive at this per kilo price.

In the current project, we therefore examined in a preliminary phase the earlier used weighted average procedure in more detail. We first checked to what extent the actual resulting per kilo prices for fresh products were related to the number of items included in the list of food items noted down in retailers for the countries involved in the Pilot project. For all but two items (cheese and lean meat) there was no significant association between the unit price and the number of items included. For cheese and lean meat, there was a positive association which still remained significant after controlling for the average price level of basic products such as sugar and milk. In these cases, the more items a list contained, the higher the resulting weighted average price. However, this effect was partly due to a few countries contributing product lists that were more than double compared to most other countries

(for France, more than 40 different cheeses were included compared to about 15-20 in many other countries). Hence, it seems that for some items, at least some type of reference products list or common list to start from, combined with an upper limit of the number of 'specialty' items to consider in a weighted pricing procedure might provide a more robust method of collected cross-nationally comparable prices compared to the fully weighted procedure which can be dependent on the total number of products priced.

Therefore, as part of the current pricing procedure we provided country teams with quite extensive lists of example items, but also restricted the number of extensions that could be made. For example, rather than including many types of mixed vegetable mixes in frozen vegetable list, we asked teams to price the three cheapest different mixes. Additionally, we proposed a slightly modified average weighted procedure by restricting the number of items in case country teams still provide a very extensive list of items.

In general, the following procedure was followed to calculate a weighted average unit price. This is much in line with earlier cross-country comparable RB projects, but some additional refinements were introduced.

- all item lists were sorted from lowest to highest price per kilo
- the most expensive 10% items (rounded to high) from a list were removed (e.g. from a list of 24 items, the 3 highest priced items were removed)
- a weighted average of $\frac{5}{7} * (\text{average price of the cheapest } x \text{ items from the remaining list}) + \frac{2}{7}(\text{average price of the rest of the list above the } x\text{th item, but excluding the top 10\% most expensive items})$.
 - In case a list without the most expensive 10% items contained only x items⁸ or less, the average price of the cheapest x items was weighted $\frac{5}{7}$ and the price of the individual x th item (now the most expensive) was weighted $\frac{2}{7}$
 - In case the list was very extensive, a cut-off point of 21 items was set for the remainder of the list
- $X=14$ for all vegetable products, $x=7$ for all fruit items, $x=5$ for fish, lean and red meat, cheese, charcuterie and legumes

3.3.5 Sensitivity analysis of lifespan assumptions for kitchen equipment

In the current project, we will also include a sensitivity analysis using different lifespan assumptions for kitchen equipment. Whereas appropriate average monthly quantities are easy to determine for food items which are consumed only once and whose quantity can be based on guidelines and recommendations available, this is much more difficult to establish for items which are used over a much longer period of time. Here, assumptions need to be made about the amount of time that the product is assumed to last. This period from product acquisition to discarding of the product by the final owner is called the lifespan (Murakami et al., 2010). The average 'amount' per month of a product

⁸ In earlier projects, the procedure in this case was to just take the average of the x items. However, this calculation is then very sensitive to changes in the number of items around this x . When x is 14, the resulting per kilo price is just the average of the 14 items, adding just a single item to the list will result in a weighted average of $\frac{5}{7} * \text{average price of the 14 cheapest items} + \frac{2}{7} \text{price of the 15th, more expensive item}$ which could yield a very different result.

is inversely proportional to its lifespan. The longer the lifespan, the lower the average amount per month, and the lower the average monthly cost for a fixed purchase price.

Whereas for certain items, there exists research on product lifespans, typically this is conducted for either larger durable consumption goods (fridges, washing machines) or high involvement products such as cars or mobile phones (see for example Murakami et al. , 2010 for consumer durables and cars in Japan; Wang et al, 2013, for Dutch electric and electronic products and Prakash et al., 2016 for electric and electronic products in Germany). For example, in Germany in 2012 the average lifespan of a freezer was about 16 years, a refrigerator about 15 years and a cooking unit 14 years (Prakesh et al 2016). However, similar data are hard to find for smaller and cheaper items such as a set of knives or a saucepan. An additional complication (in often survey based data) is that for certain items, consumers choose to replace them because they desire a newer or more advanced type of product before the items have reached their actual end-of life point or before the functionality of the item is in decline. For example, in a consumer survey in the UK it was found that a significant portion of a wide range of products was still functioning when discarded, reaching more than half for mobile phones and computers (Cooper, 2004). Hence, data on average replacement /discarding rates does not always match the actual lifespan of a product (Prakash et al, 2016), although this seems to be more the case of high involvement items such as notebooks rather than low-involvement items such as fridges which are typically kept until they break down (Hendriksen, 2007; Hendriksen, 2009). In the context of RBs however, we are interested most in what an appropriate lifespan assumption is for adequate social participation. This would require information about functional lifespans (the time the functional utility of a product can be maintained on average), actual lifespans (the time people use an item before discarding it) and economically optimal lifespans (newer products may be more resource efficient so it would be economically more optimal to discard a product before reaching its functional lifespan, Cooper, 2004; Downes et al., 2011). To the best of our knowledge, there is a lack of reliable information on all three types of lifespans (functional, actual, economical) for a wide range of products.

The lifespan assumptions in the original Belgian RBs built upon the lifespan assumptions of other existing RBs in the United Kingdom, Australia and the Netherlands. For example, in the Netherlands, lifespans for kitchen equipment in RBs are presumed to be generally 10 years for most durables, with the exception of plates and glasses which are set at 5 years, based on insurance company lists for replacement- costs (NIBUD, personal communication). These lifespans were further informed and adapted if needed by expert advice and focus group discussions in Belgium. In the earlier Pilot projects, the lifespans for budgets in other countries started from the Belgian RBs that were completed in 2009 and were adapted only if the country research teams had good reasons to deviate from the original lifespan assumptions. In these earlier RB projects including data from multiple countries, changing assumptions about product lifespans of kitchen equipment items demonstrated an impact on the total food basket cost. In the Pilot study, the impact of doubling or halving the lifespans of all kitchen equipment items was limited to an increase of the total food basket budget of max. 6% or a decrease of max. 3.7%, (depending on the household composition, largest changes among single households), resulting in a relatively small impact on the overall RB. Given the relatively small impact, the use of intervals is probably not very useful. Decreasing lifespans in the Pilot project also had a stronger impact than increasing lifespans.

Because we are lacking a concrete list of lifespans that could be used for constructing comparable RBs in Europe, we again started from the lifespans used in previous RB projects. In the current project, we presumed similar product lifespans across products priced in different countries and we gave country teams the opportunity to adapt these if necessary, however there was a consensus on nearly all comparable products. We will examine to what extent the level of FRBs is sensitive to different assumptions regarding the lifespan of these durable kitchen equipment items.

Combined, both the sensitivity analysis on kitchen equipment lifespans as well as the investigation of the pricing method for fresh food will contribute to increase the validity of the current and future pricing procedures in order to achieve cross-culturally comparable food reference baskets.

4. Results

In this section we first present the contents of the developed FRBs in the current project and their nutritional analysis. We aim to identify the main differences from the preliminary baskets and provide an overview of how food baskets vary across the lifespan (from childhood to old age) as well as across countries. Secondly, we give an overview of the minimum monthly necessary budget for healthy (and sustainable) food and kitchen equipment for the different countries. Next, we discuss the cross-national comparability of the developed FRBs. Finally, we provide some preliminary results of the analysis of food affordability based on the developed FRBs.

4.1 Contents of the EuSocialCit food baskets

In this section we describe the contents of the food baskets in the current project, both in terms of nutritional values as in terms of food categories. We compare the results of the EuSocialCit project with the results of previous EU projects and make the comparison between the four countries. For more details on the specific food and nutritional content from all profiles and countries, please refer to Annex 7.1.

4.1.1 Energy and macronutrients content of the EuSocialCit regular food baskets

Figures 4-7 compares the energy content from the initial baskets of EU projects (ABSPO or ImPRovE) and the regular EuSocialCit baskets against EFSA DRVs energy recommendations (kcal). All the details can be found in section 2. Below we display the results for the 10 years old child, 14-year-old adolescent, 30–60-year-old adult and >60 year older adult male and female.

When it comes to children aged 10y, the boy profile departed in all countries from the ABSPO/ImPRovE 6–10-year-old child basket. In the case of girls, the departure point for BE and FI was the ASPBO basket, whereas for ES and HU was the newly updated EuSocialCit 10-year-old boy basket. The analysis of the baseline baskets (ASPBO/ImPRovE), showed that the Belgian basket was the most aligned with the recommendations, with only 6% variance in the girls' basket (BE: 1928kcal vs DRV: 1816kcal) and almost none in the boys' (BE: 1928kcal vs DRV: 1936kcal). Spain and Hungary showed the greatest deviation, displaying an energy content of 35% (ES) - 22% (HU) and 44% (ES) - 30% (HU) for boys and girls, respectively, above the recommendations. These differences appeared to come from the high content in carbohydrates which was corrected in the updated baskets. Contrary to this, Finland was the country with the lowest calories reported in the initial basket (Boys: 1644 kcal; Girls: 1644 kcal). Food amounts, in general, had to be increased in order to meet the energy target while bearing in mind that macronutrients (protein, fats and carbohydrates) were already proportionally balanced. The changes applied in each profile to obtain the EuSocialCit updated baskets can be seen in Annex 7.1.

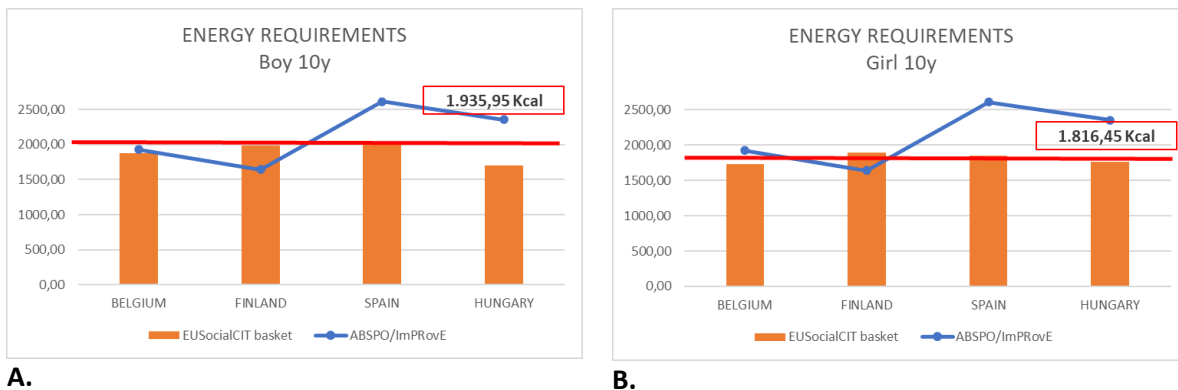


Figure 4. Comparison of the basket energy content (kcal) between the initial basket (blue line) and the updated EuSocialCIT basket (orange bars) for a 10 year old child (A: Boy; B: Girl). The red line indicates the reference intake.

The departing ABSPO/ImPRovE baskets for adolescents' boys and girls yielded varying alignments with the EFSA recommendations. Only the Belgian basket for boys was in line with the energy requirements. However, the basket for girls was 17% above the reference value (2534kcal). Spain was generally 30% and 25% above the recommendations in the case of boys (3261kcal) and girls (2710kcal). Finland and Hungary fell short in both genders, being the 14 years old boy Hungarian basket the one with greater differences (1877kcal, 25% below EFSA recommendations). Macronutrients were proportionally balanced in all profiles except for Finland where carbohydrate basket content was 5% below the recommendations in both genders. Additionally, the Hungarian basket had 4% more fat content than recommended. Adjustments were made in order to reach the lower recommended threshold of carbohydrates and to the remaining baskets to be aligned with the energy requirements.

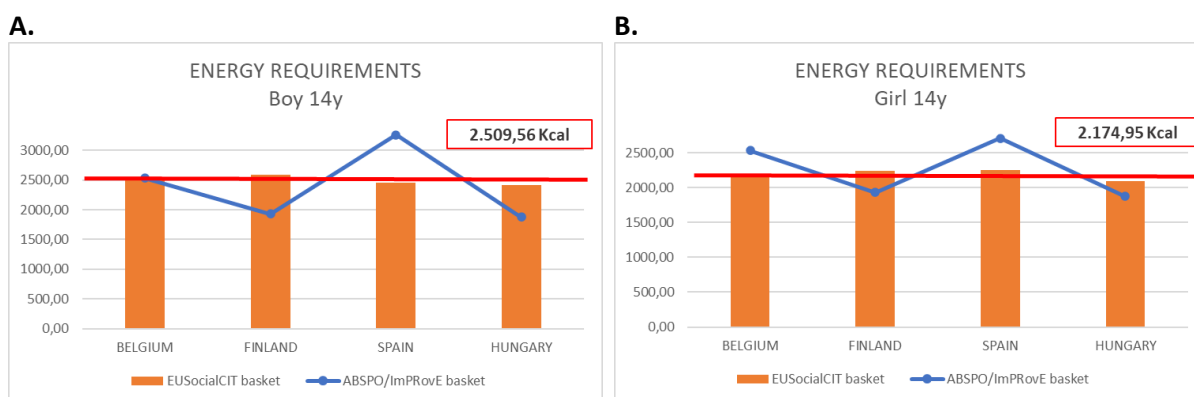


Figure 5. Comparison of the basket energy content (kcal) between the initial basket (blue line) and the updated EuSocialCIT basket (orange bars) for a 14 year old adolescents (A: Boy; B: Girl). The red line indicates the reference intake.

In regard to the 30-60 years old baskets, all of them departed from the homologue profile with 18-60 years old from either the ABSPO or ImPRovE project except the Hungarian basket. In this case, the EuSocialCIT basket for adults aged 18-29 years was used for being closer to the targeted energy content.

The Finnish and Hungarian male baskets were the only ones meeting EFSA recommendations as they contained 2659kcal and 2426kcal, respectively. The female profile from the same countries surpassed the energy requirements by 18% (2423kcal) in Finland, and 21% (2480kcal) for Hungary. The Spanish basket also exceeded the recommendations by 12% (male) and 17% (female). The Belgian basket was

about 10% short in calories for both males and females. Macronutrients met in all cases the EFSA recommendations, except for Finland, where both baskets' carbohydrate content were 2-3% below the requirements, and the Hungarian female basket whose fat content was 3% above.

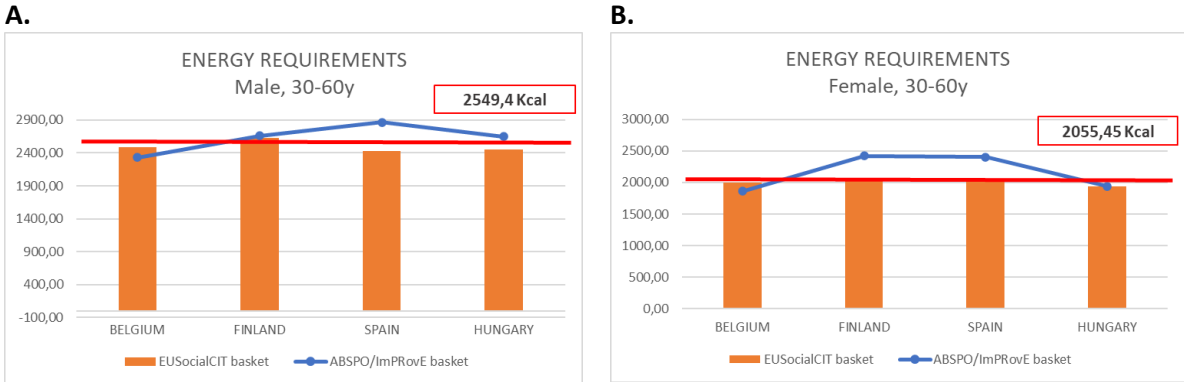


Figure 6. Comparison of the basket energy content (kcal) between the initial basket (blue line) and the updated EuSocialCit basket (orange bars) for a 30-60 year old adult (A: Man; B: Woman). The red line indicates the reference intake.

Finally, the baskets from Belgium and Hungary from the elderly group were aligned with EFSA DRV recommendations, except for the male basket which was roughly 350kcal above DRV. Finland's male basket slightly surpassed the energy recommendations by 7% (2446kcal). The female's basket exceeded the recommendations by 32% (2446kcal), probably because the ABSPO basket only included a single basket for this age group which overestimated the energy requirements. In line with this, the Spanish baskets significantly exceeded the recommendations by 30%, in the case of women, and 26%, in the case of men. Once again, the Finnish basket was the only one falling short in meeting carbohydrate basket content thus adjustments were made in order to reach the lower threshold (45%).

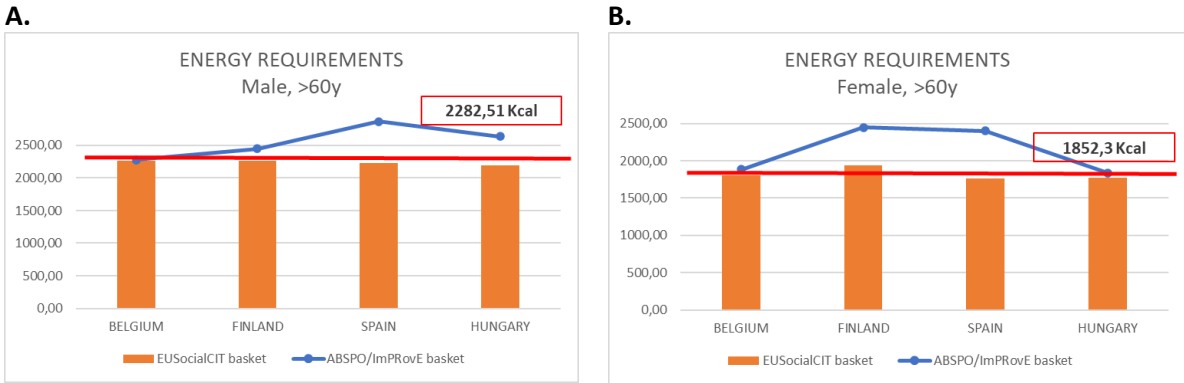


Figure 7. Comparison of the basket energy content (kcal) between the initial basket (blue line) and the updated EuSocialCit basket (orange bars) for a +66 year old adult (A: Man; B: Woman). The red line indicates the reference intake

All updated baskets resulted in a full alignment with the EFSA DRVs recommendations, allowing up to a 5% variation from these recommendations.

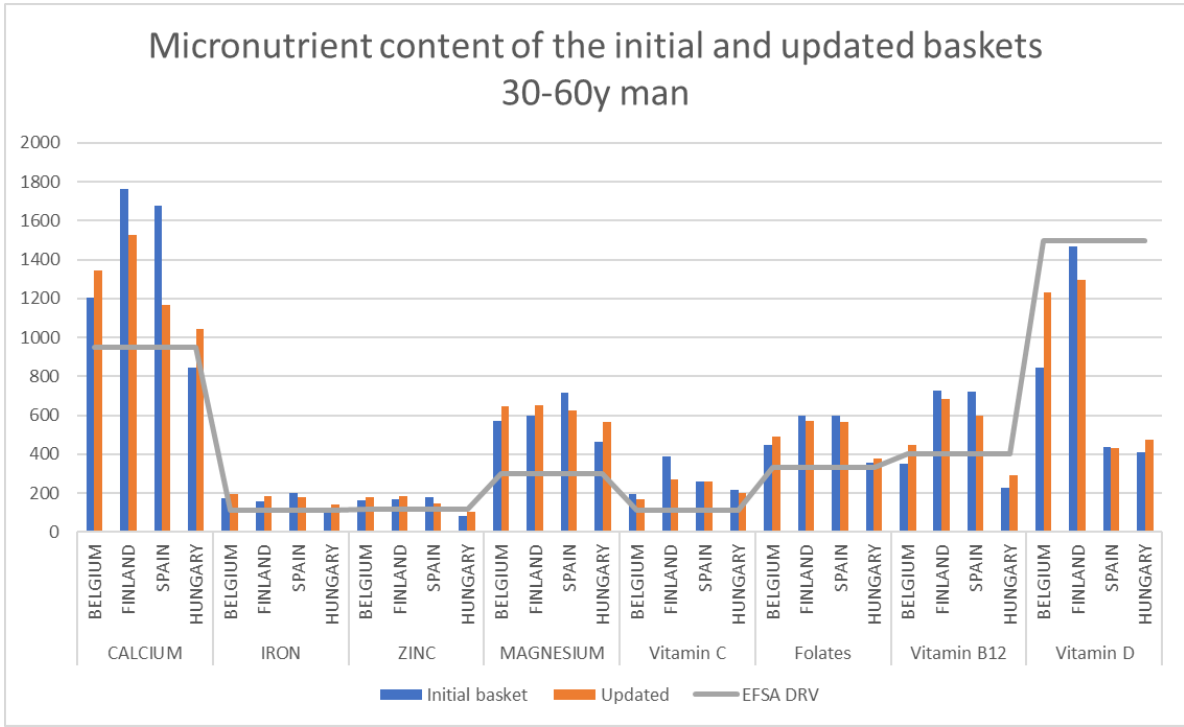
4.1.2 Micronutrient content of the EuSocialCit regular food baskets

The analysis of the baskets' micronutrient content allows to easily target foods that could be increased or decreased to improve the nutritional adequacy of the food baskets. Figure 8 displays the micronutrient basket content from the 30-60 years old male and female baskets. It compares the nutrient profile from the preliminary basket and the updated ones against EFSA DRVs.

Magnesium, vitamin C and folates were the nutrients with higher degree of alignment with EFSA DRVs. Iron was difficult to meet in the female ABSPO baskets from Belgium, Hungary and Finland which can be explained by two main factors: 1) baskets were lacking some of the main dietary sources of iron such as legumes, whole grains and/or fatter meat; 2) the requirements of this mineral are higher among women in reproductive age thus making this group more vulnerable to iron deficiency. The Belgian ABSPO basket also fell short in vitamin B12. This vitamin can only be obtained from animals therefore this shortage can be explained by the low content of animal protein in the Belgian basket (man: 95g - BE vs 199g - FI , 185g - ES, 150g HU; woman: 86g - BE vs 199g - FI , 185g - ES, 150g HU).

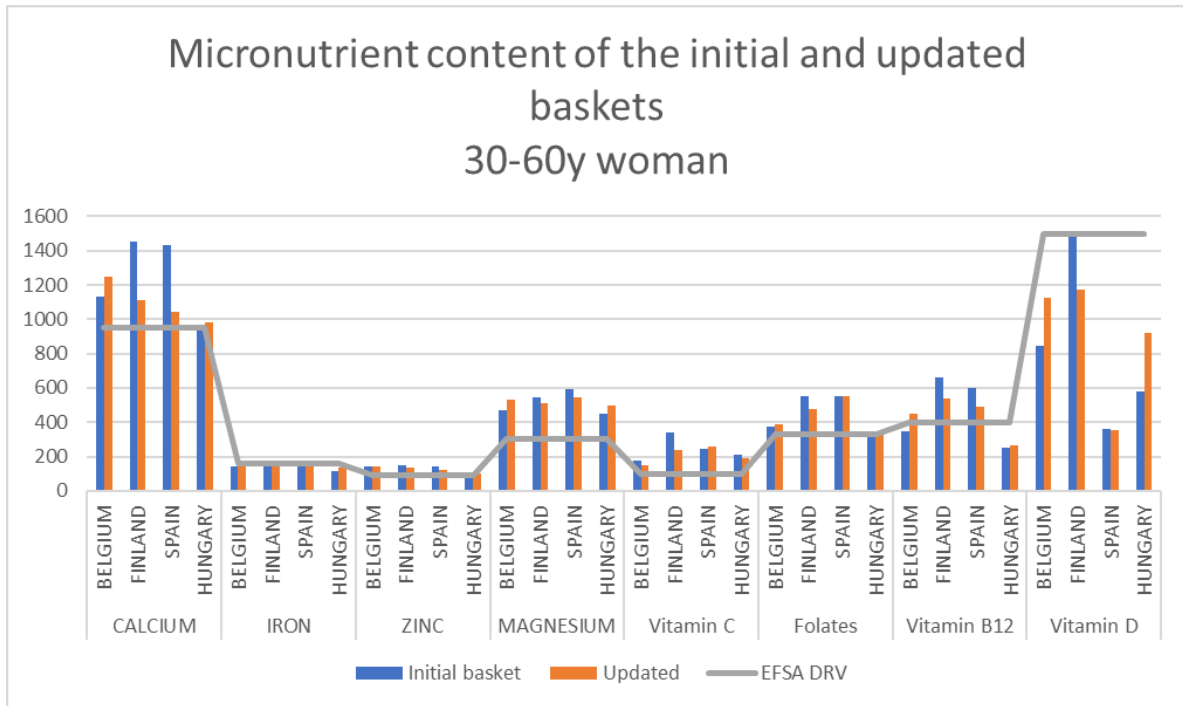
The Hungarian ABSPO basket was also deficient in vitamin B12 and zinc. The Hungarian ABSPO basket was also deficient in vitamin B12 and zinc. Despite the different modifications, the requirements in the EuSocialCit basket are still not met. This is due to the high amount of missing values found in the national food composition database. Although we hypothesize that micronutrient requirements are met due to the resemblance with the remaining baskets, it is fundamental to update the Hungarian food composition database so a reliable estimate of the food basket nutritional is made. We did not use the food composition database from another country since they are characteristic of the type of foods supplied in each country and therefore results would be at risk of bias.

Except for this particularity, all EuSocialCit baskets reach EFSA DRV's from the targeted micronutrients, except for vitamin D, which is systematically deficient across countries and baskets, except for the Finnish ABSPO basket. In this case, vitamin D was almost met probably because of the high amount of dairy included (almost 750ml per day) and the vitamin D fortification of spreadable fat. However, as previously explained, we do not intend to meet the reference intake but monitor it.



A.

B.



Note: nutrient content has been multiplied by 10 or 100 in order to ease the graphical interpretation.

Figure 8. Comparison of the basket micronutrient content between the initial basket (blue line) and the updated EuSocialCit basket (orange bars) for a 30-60 years old adult (A: Man; B: Woman). The grey line indicates the reference intake.

4.1.3 Differences among the ASPBO and the regular EuSocialCit food baskets

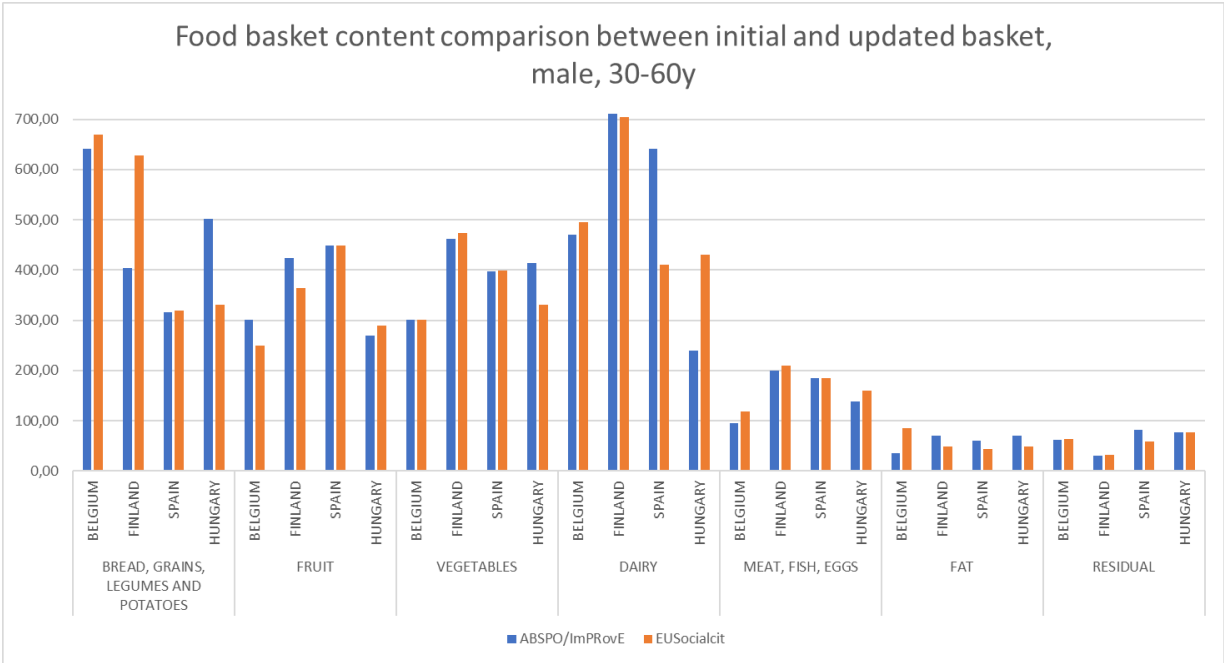
Taking as a reference the nutritional analysis described in the previous sections, changes to the ABSPO/ImPRovE basket to build the EuSocialCit basket can be better understood. Figure 9 displays food basket content differences across countries and by food groups from both male and female aged 30-60 years old. As it can be observed, the content of bread, grains, legumes and potatoes (referred as starches hereinafter) from the male Finnish and Belgian basket was significantly increased, as well as the Hungarian female basket. In the case of Belgium, the increase was applied to correct the energy deficiencies observed in the preliminary basket. The increase in the Hungarian female basket is explained by the energy deduction that occurred by diminishing the fat content of the basket, which initially exceeded EFSA recommendations. Contrary to this, although the male Finnish basket was already aligned with the energy requirements, the proportion of carbohydrates was too low due to the high amount of fats coming from dairy. Hence, full-cream products such as cooking cream and sour cream were reduced which implied a significant reduction of calories. To compensate for this loss, the group of starches was increased.

In Belgium, processed fruit such as canned fruit, fruit puree and fruit juice were reduced in order to decrease the energy contribution from added sugars. Fruit consumption was also reduced in Finland from three to two pieces per day. Vegetables were slightly increased only in the Spanish and Hungarian female basket. In regard to dairy, the greatest changes were observed in Spain in order to adjust the energy content of the basket by reducing high caloric foods such as mature and cottage cheese. Further changes to reduce the energy content were applied in the Finnish female basket reaching up to 226g

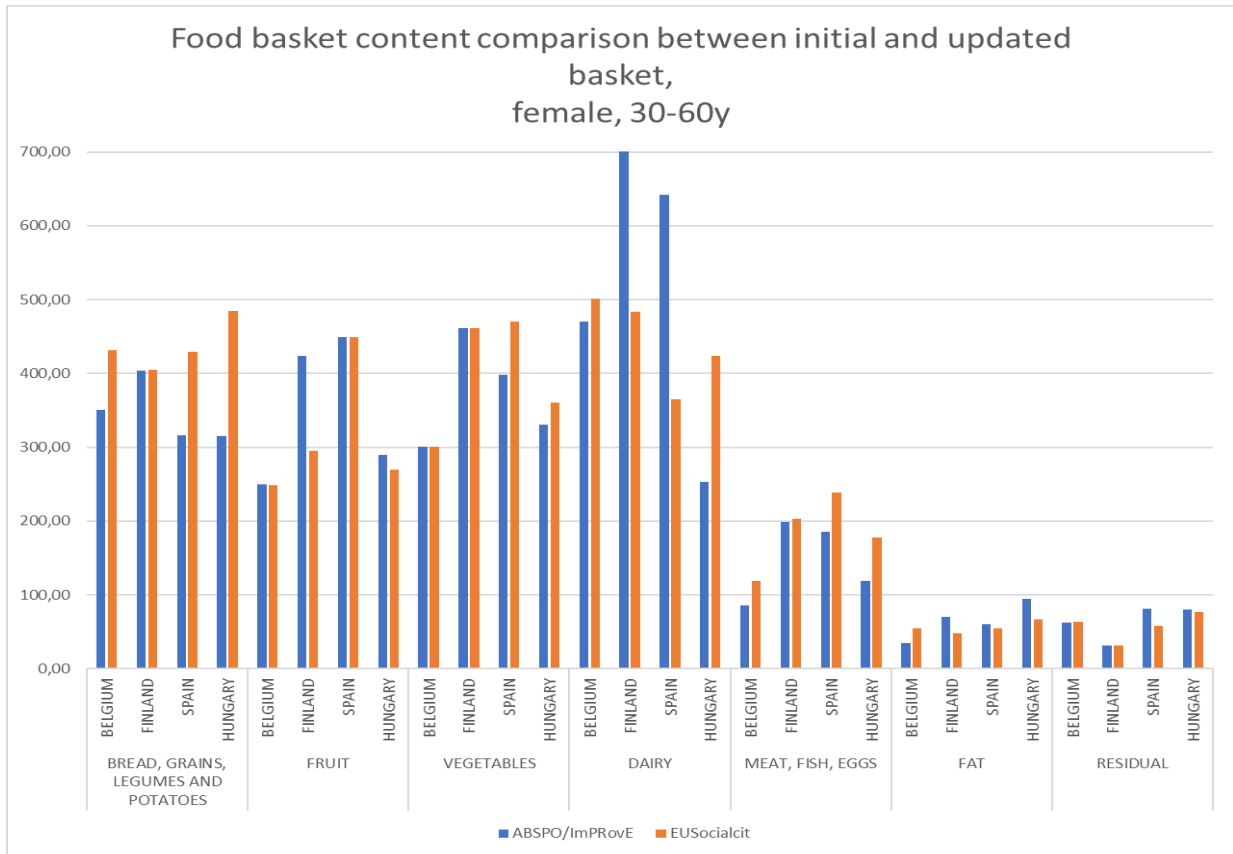
deduction. Contrary to this, the content of dairy in the Hungarian basket was increased for both genders to meet the DRV and dietary guidelines. In Belgium, as opposed to the other countries, a glass of plant-based milk was added following the recommendations from national FBDG. Animal protein was slightly increased across countries. In Belgium, the reason behind was to reach the DRV of vitamin B12. In Finland, a portion of fatter meat per week was added in order to facilitate achieving iron requirements. In regard to Hungary, the increase in animal protein is explained by the larger portion sizes attributed to lean meat and eggs.

Different approaches have been followed in regard to the fat content from each basket. Nuts and cooking fats from the Belgian basket were increased to facilitate reaching energy requirements. Contrary to this, in Finland, spreadable fat portion size was reduced and in Spain nuts consumption was also reduced. The Hungarian basket experienced a reduction in the fat content since the initial basket had abnormally high amount of spreadable fats (60g daily) and olive oil (125ml daily). Regarding the residual group, the Spanish basket was the one receiving greater changes. In order to adjust the energy content of the female and male basket surplus foods such as jam and mayonnaise had to be reduced.

Across all baskets, the applied changes followed the recommendations from the national FBDG on frequency of consumption and food portion sizes, when available. However, in some cases slight transgressions to the FBDG had to be made in order to meet the EFSA DRVs such as setting smaller portion amounts of cheese in Spain or higher frequency of consumption of fats in Belgium.



A.



B.

Figure 9. Comparison of the basket food content between the initial basket (blue bars) and the regular EuSocialCit basket (orange bars) for a 30-60 year old adult (A: Man; B: Woman).

4.1.4 Differences in the EuSocialCit regular, sustainable, and harmonized sustainable food baskets

This section presents the results from deriving the regular EuSocialCit basket into the sustainable and harmonized sustainable one. The sustainable basket was made for the 30-60 years old man and woman, and allowed to narrow the variety of food content among countries by adding a third element of reference, namely the EAT-Lancet guidelines, common to all baskets.

Starches were reduced in Belgium and Finland in order to be aligned with the EAT-Lancet recommendations. In Hungary, bread, pasta and rice were reduced to be aligned with the sustainability thresholds but potatoes and legumes were increased to compensate for this reduction. Spain basket also observed a decrease in starches, especially bread, which was compensated with an increase in legumes.

The content of fruit was reduced in Finland and Spain to not surpass the upper threshold from EAT-Lancet. In the case of Belgium, fruit content was increased to be aligned with the remaining baskets. In Belgium, the total amount of vegetables was increased due to higher portion size, and also in order to be more aligned with the remaining countries.

Dairy products experienced significant changes across countries both in qualitative and quantitative terms. First, semi/skimmed dairies were replaced by full-fat by-products. Second, the dairy content

was slightly reduced across baskets (7ml-35ml reduction in the HU and ES baskets, respectively). In the Finnish male basket, the reduction was more pronounced (roughly 200ml reduction) not to exceed EAT-Lancet upper threshold.

Regarding animal protein, all countries except Belgium had to diminish their content in order to be aligned with the sustainable recommendations. When this happened, protein intake was compensated by increasing the amount of legumes and/or nuts. Belgium animal protein was slightly increased to be more comparable with the remaining countries while keeping aligned with national FBDG.

The content of fat was increased in Finland through nuts to compensate for the reduction of fat due to the reduction in animal protein. In Spain and Hungary fat sources were enhanced to adjust the energy content that was lost after reducing the amount of animal protein, and also dairy in regard to Spain. The Belgian basket only received slight changes in the harmonized sustainable basket by adding sunflower oil to compensate for the elimination of mayonnaise.

The harmonized sustainable basket, which derived from the sustainable one, was only created for the male profile. This received slight changes with the sole purpose of increasing comparability across countries. In this regard, those food groups whose content differed greatly in some countries compared to others such as fruit in Spain or dairy in Finland were modified. However, the content of starches in the Spanish harmonized sustainable basket was still significantly lower than the other countries albeit efforts to increase its content following FBDG were applied. The applied changes can be found in section 3.7 and a graphical comparison of the three male baskets can be seen in Figure 10.

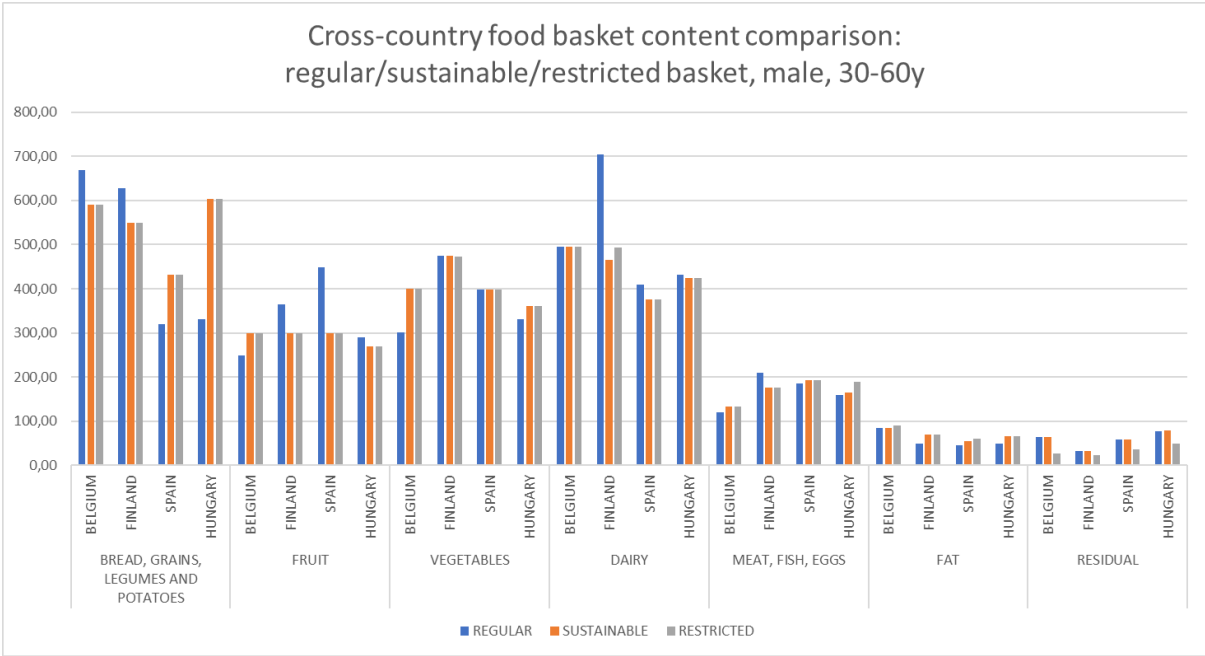


Figure 10. Comparison of the basket food content between the regular EuSocialCit basket (blue bars), the sustainable basket (orange bars) and the harmonized sustainable basket (grey bars) for a 30-60 years old man

4.2 Food Reference Budgets of the EuSocialCit project

The food items of the baskets were priced according to the pricing strategy explained in section 3. In this section, we describe the FRBs for some illustrative household types and we discuss the impact of

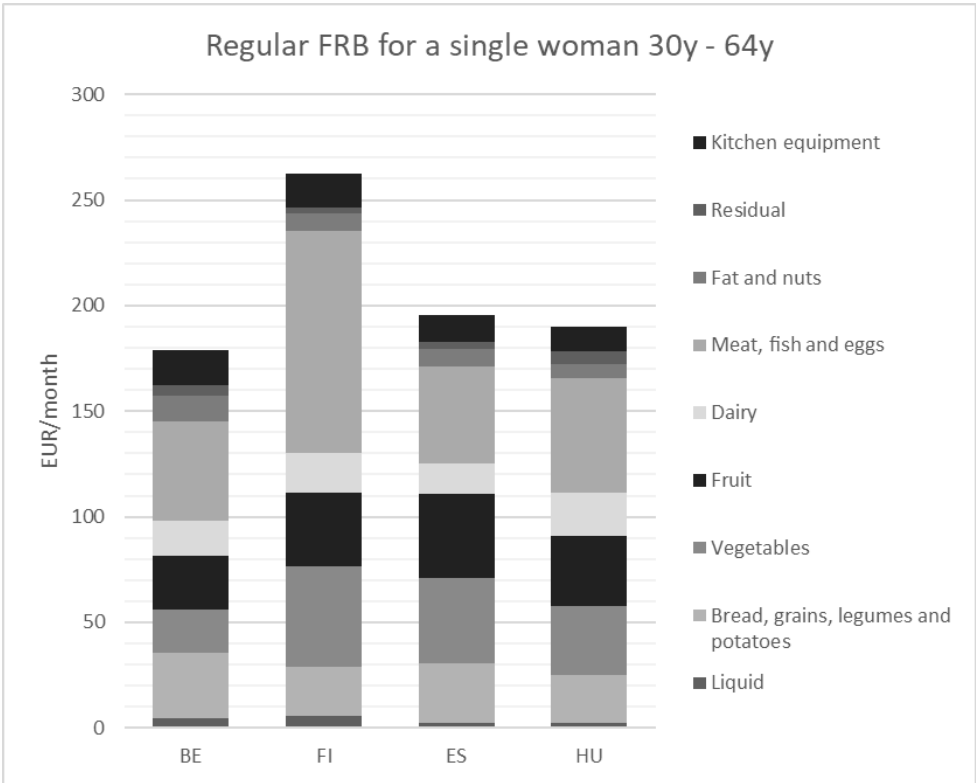
the different sustainability criteria on the minimum necessary budget of healthy food in the different countries. Furthermore, we conducted a sensitivity analysis of the lifespan of durable products (e.g. fridge) in the healthy food basket. An overview of each country’s FRBs for different profiles can be found in Annex 3.

4.2.1 Minimum budgets of the regular EuSocialCit food baskets

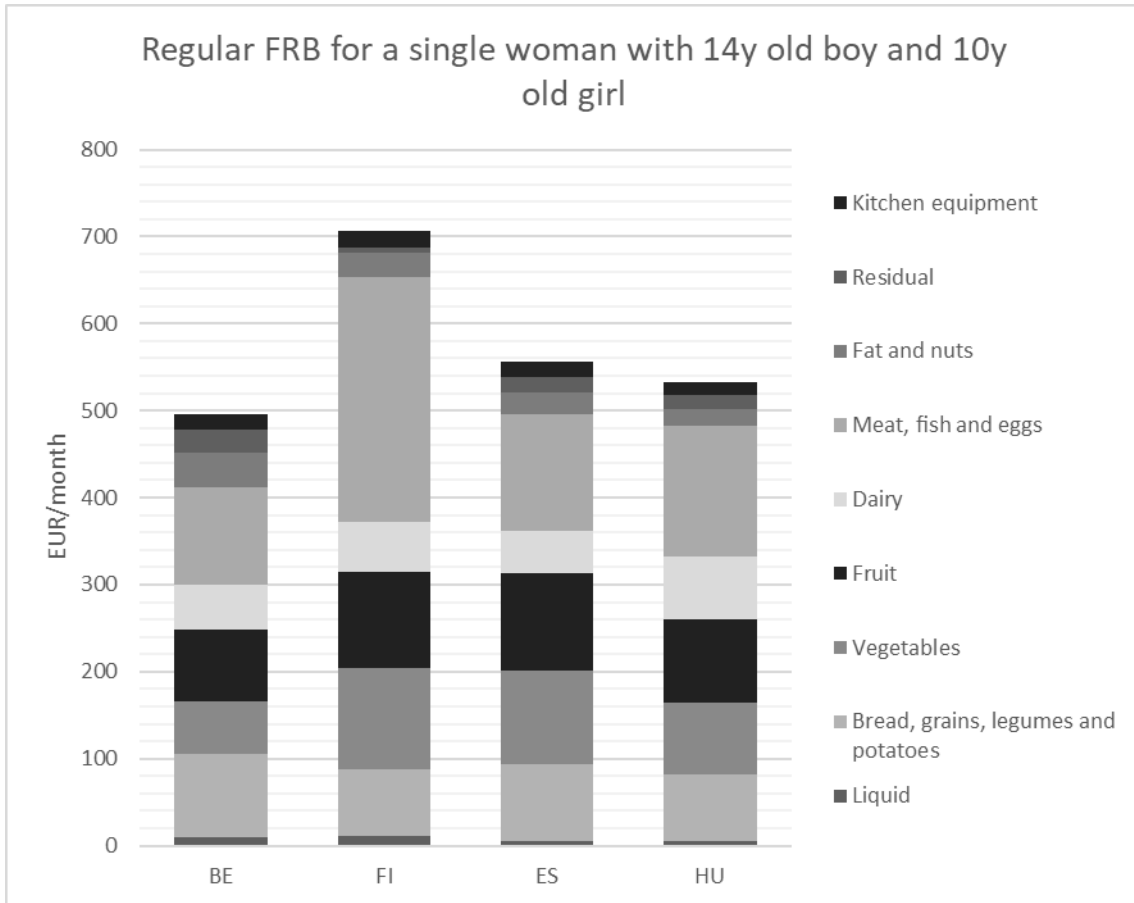
The FRBs of the four countries are developed for hypothetical households for which several assumptions are made, as explained in section 2.6.4. The FRBs of the EuSocialCit project contain the minimum necessary cost for a healthy diet. Products that mainly contribute to the other functions of food (psychological, cultural and social), such as eating out or takeaway meals, are not incorporated in this exercise. Because the assumption is made that the households buy, prepare, consume and preserve their food in an economical way, the FRBs include kitchen equipment (such as a refrigerator, cutlery, pots and pans).

Figure 11 shows that the FRBs in Finland are the highest of the four countries for the hypothetical households (between 262 EU/month for a single woman and 986 EUR/month for a couple with a 14y old boy and 10y girl), followed by Spain and Hungary. Healthy food is the least expensive in Belgium. In all four countries and for all the hypothetical households the category “meat, fish and eggs” takes the largest bite out of the monthly budget for healthy food due to the large price per weight of meat and fish: EUR 11,36 per kilo in Belgium; EUR 14,30 per kilo in Finland; EUR 7,87per kilo in Spain and EUR 9,55 per kilo in Hungary.

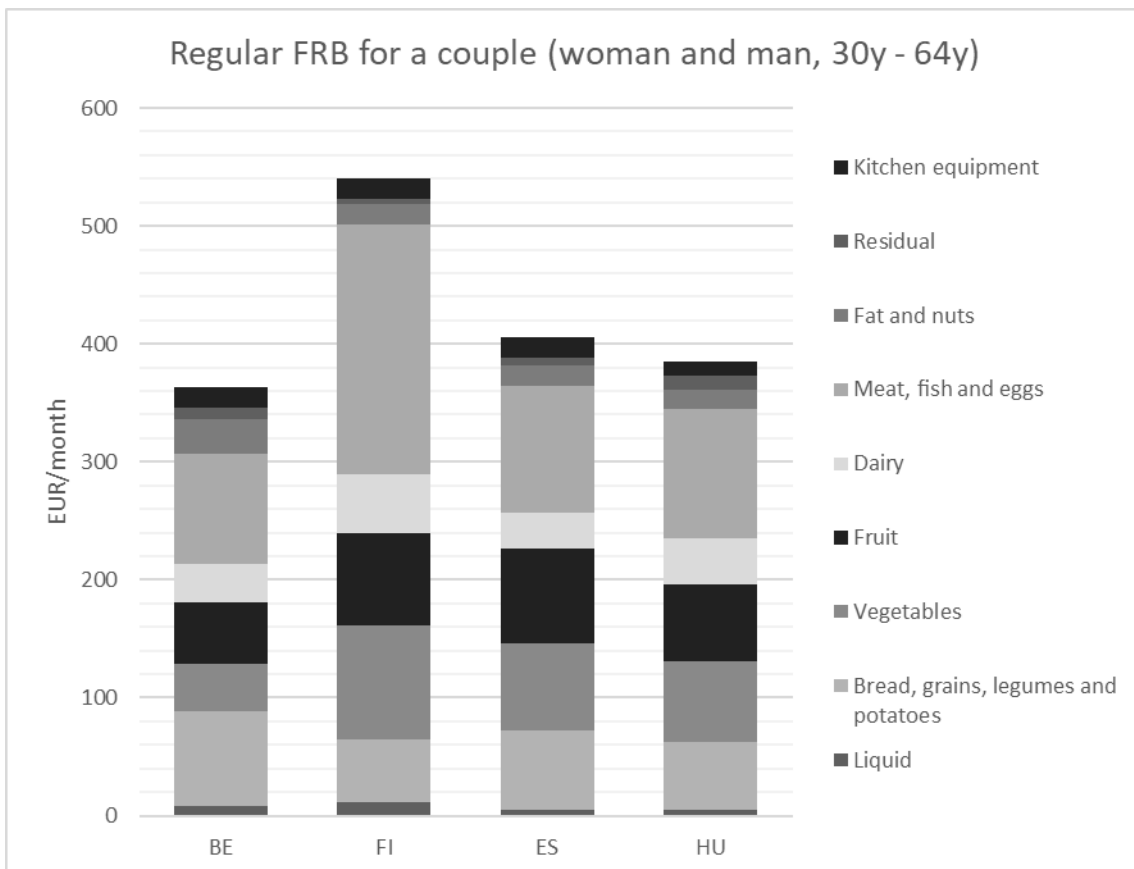
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B.



C.



D.

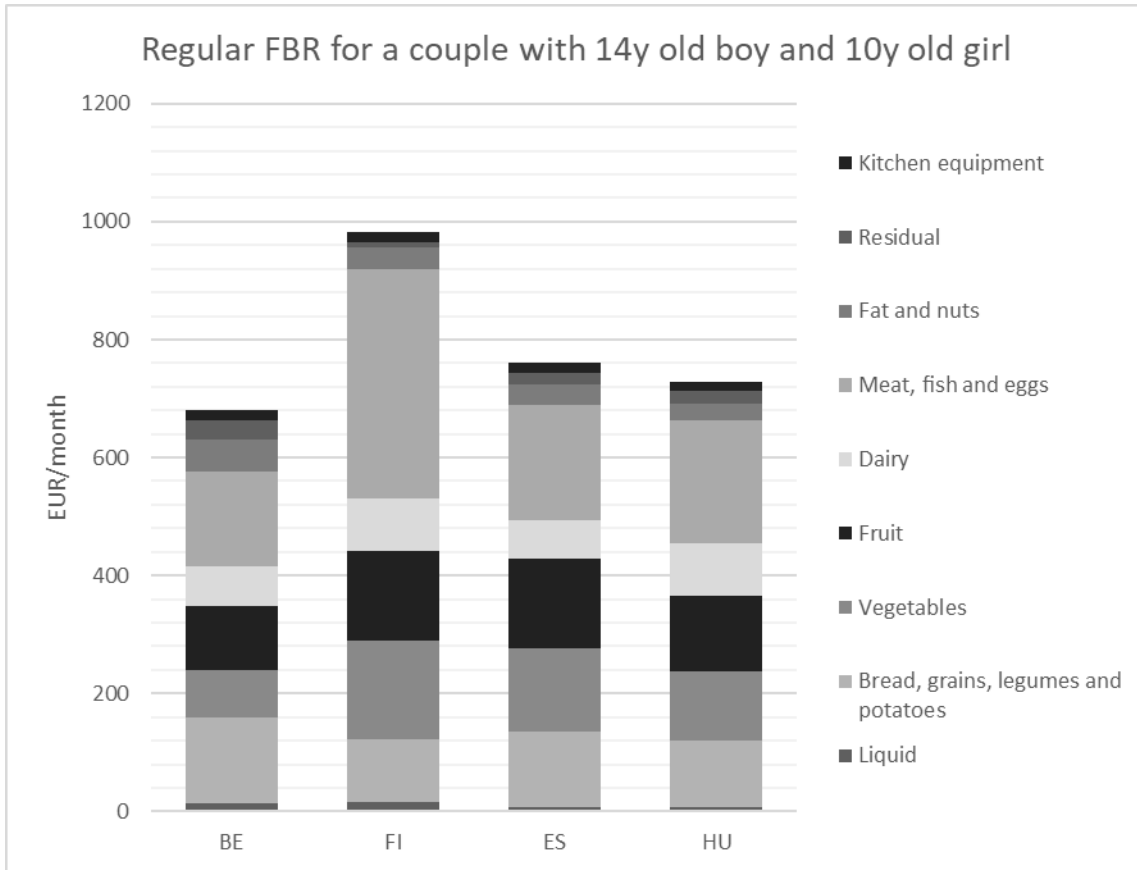


Figure 11. Food Reference budgets (FRBs) for (A) a single women, (B) a single woman with a 14-year-old boy and 10-year old girl, (C) a couple and (D) a couple with a 14-year old boy and 10-year old girl for Belgium, Finland, Spain and Hungary (EUR/month, June 2022).

The unit prices in Figure 12 clearly show that the Finish products are often more expensive in comparison with the other countries, with the exception of items in the grain category. Belgian prices are often below average with the exception of the unit price for fat. Because the amount of fat in a diet is very limited, this does not have a great impact on the monthly FRB.

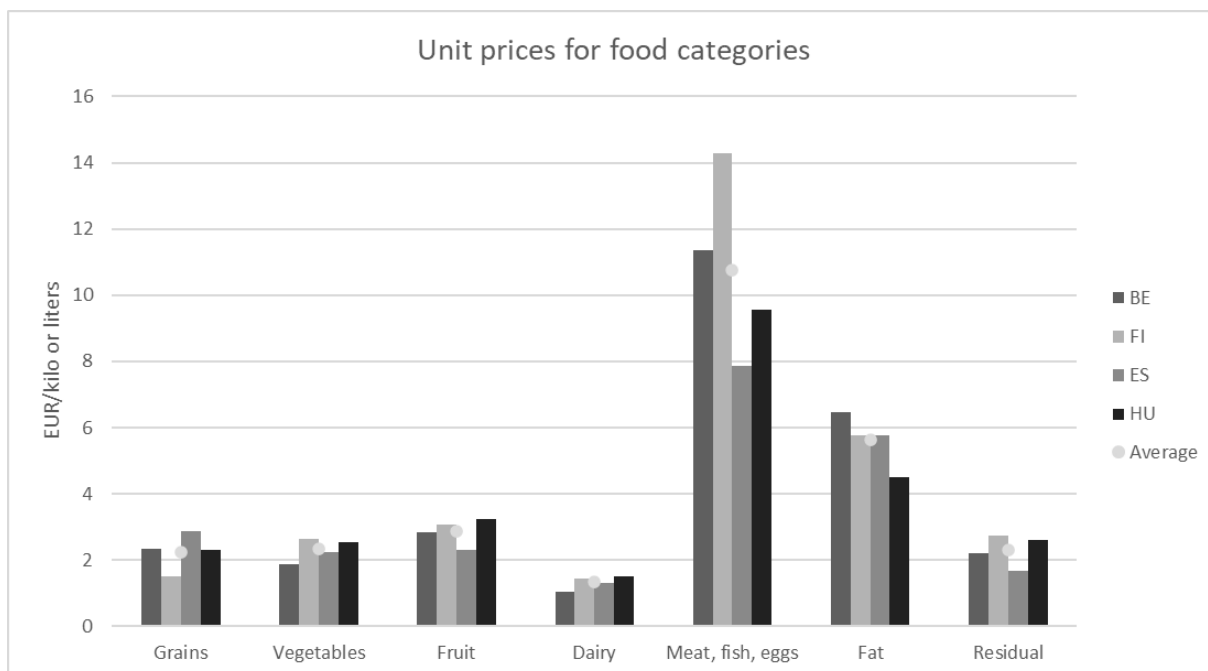


Figure 12. Unit prices (EUR/ kilo or litres) of the regular EuSocialCit baskets for Belgium, Finland, Spain and Hungary (June 2022), liquids are not included.

4.2.2 Feasibility of sustainability criteria and impact on the minimum budget for healthy food

As explained in section 2.6 we analyzed the impact of adding sustainability criteria to the healthy food baskets by applying the EAT-Lancet guidelines (level 1 of sustainability) which resulted in adaptations of (the amounts of) the food items for a healthy diet. Additionally, we added sustainability criteria at the level of pricing (see section 3.3.3) by selecting fresh food items that are either bought locally (level 2a of sustainability), meaning that the selected food items originate from the same country as the country for which the FRB is developed, or from a neighboring country. In a final step we selected fresh fruit, fresh vegetables and potatoes that are not only bought local but also in bulk (no packaging) and in season (the products were selected in June) (level 2b of sustainability). If there were no food items meeting all three criteria, we dropped the 'seasonality' criterion (e.g. for fresh fruit and vegetables in Finland).

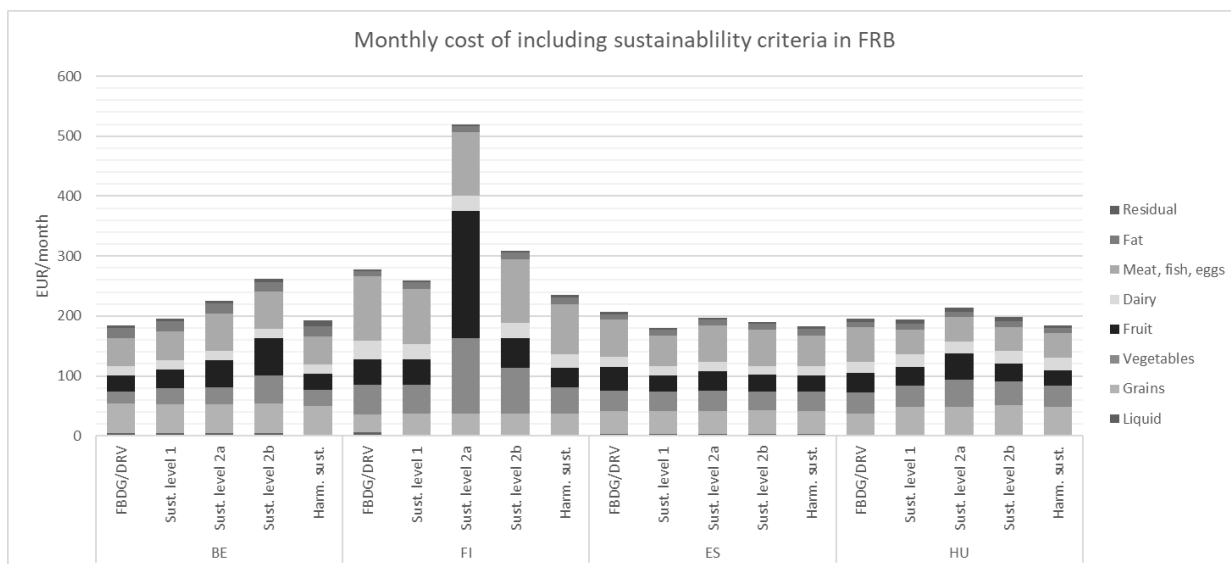


Figure 13. Food reference budget (FRB) (euro/month) for a single male in Belgium, Finland, Spain and Hungary for the food baskets developed within the EuSocialCit project, without the minimum necessary cost for kitchen equipment (June 2022)

Figure 13 compares the minimum necessary budget for the different food baskets developed within the EuSocialCit project for a single male. The FRB for a sustainable diet in line with the EAT-Lancet recommendations (indicated as Sust. level 1 in the graph) is lower than the FRB for the regular EuSocialCit basket (indicated as FBDG/DRV in the graph) for Finland, Spain and Hungary. In Belgium, the FRB for a sustainable diet is slightly higher than the regular food basket because the national FBDG of Belgium already considers recommendations for sustainable diets and is rather strict. When we do not only take into account a sustainable diet but also select 'local' food items (Sust. level 2a) the price for the FRB increases in all four countries with Finland being the major outlier. The price per kilo of all the selected food items increased in the four countries with the exception of fresh fish and lean meat in Hungary (see Table 9 in Section 7.4). The steep increase of the FRB in Finland for buying local products is due to the high price per kilo of fresh fruit in Finland (22,44 euro/kilo for local fruit in comparison with 2,55 euro/kg when no sustainability criteria are applied at the pricing level). Since only four fruits meet the 'local' criterion in Finland, two expensive fruit varieties (strawberries and raspberries) have a major impact on the price per kilo. When we apply the additional criteria of 'in bulk' and 'in season' for buying potatoes, fresh vegetables and fresh fruit (Sust. Level 2b), the FRB in Belgium for a single male increases but slightly declines in the other three countries compared to the FRBs only applying the 'local' criterion (Sust. Level 2a).

In Belgium, Finland and Hungary, the number of food items meeting the price-level sustainability criteria within one food category (e.g. fresh fruit) is very limited. For instance, only four fruit varieties meet the criterion 'local' and only one fruit variety meets the three criteria 'local', 'in bulk' and 'in season' for the countries Belgium, Finland and Hungary. Consequently, consumers in these countries have limited freedom of choice if the sustainability criteria 'local', 'in bulk' and 'seasonality' are taken into account. In Spain, this problem presents itself much less since about a dozen fruit varieties meet the three price-level sustainability criteria. The strongly limited freedom of choice for consumers in Belgium, Finland and Hungary conflicts with one of the basic principles of the RBs, which is to ensure that the RB is feasible for households who have to live on such a budget. Hence, it is currently not

advisable to include sustainability criteria other than those related to the food content when constructing cross-nationally comparable food baskets within Europe.

To achieve maximum cross-nationally comparable contents of food baskets, various product groups of the sustainable food baskets were harmonized across the four countries in order to remove arbitrary differences (see section 2.7). The FRB for the harmonized sustainable basket is significantly lower for Finland, Spain and Hungary (respectively 236 EUR/month, 182 EUR/month and 184 EUR/month) in comparison with the regular food baskets (respectively 277 EUR/month, 206 EUR/month and 196 EUR/month) mainly due to the decreased amounts of meat in Hungary and Finland, the decreased amounts of fruit in Finland and the decreased amounts of potatoes and the deletion of some specific residual products in Spain. In Belgium, the harmonized sustainable FRB is slightly higher in comparison with the regular food basket: 192 EUR/month versus 185 EUR/month due to an increase of the amount of fresh vegetables and fruit. A standard deviation of 25,14 for the FRBs of the harmonized sustainable baskets, 35,24 for the FRBs of the sustainable baskets and 41,82 for the FRBs of the regular baskets indicates that the four countries' minimum necessary budgets for healthy food are closest for the harmonized sustainable baskets.

4.2.3 Cost of kitchen equipment and lifespan sensitivity analysis

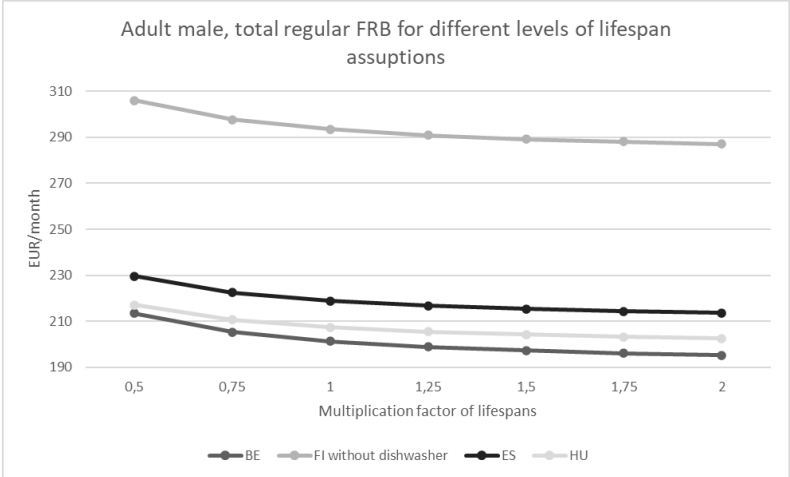
We calculated a cost for healthy food, which includes not only the cost of food products, but also the cost of the acquisition of kitchen equipment. These are all the items needed to prepare, consume, serve and store food items. In Figure 11, FRBs were shown for a single women, single woman with a 14-year old boy and 10-year old girl, couple and a couple with a 14-year old boy and 10-year old girl for Belgium, Finland, Spain and Hungary which included the monthly cost for kitchen equipment. As can be seen from these graphs, the monthly budgetary contribution of these items is relatively small. Depending on household type and country, at least 2% and at most 7% of a households' total food budget is set aside for durable kitchenware. Since the budget for kitchen equipment is strongly affected by economies of scale, the relative weight in the food budget for a small household is considerably higher (6-7% of the total food budget) than the relative weight in the total food budget of a larger household (typically 3% of the total food budget).

We also examined to what extent the level of FRBs is sensitive to different assumptions regarding the lifespan of goods. In order to assess this, we first assigned all kitchen equipment items into two categories, either having a varying lifespan ("durables") or non-varying lifespan ("consumables"). For the latter category, we refer to all products that are actually consumed and whose quantity decreases during use, for example detergent, tin foil or paper coffee filters. For all durable items, we allow the lifespan to vary by 50 to 200 percent of the original lifespan. The price per month of these items is changed accordingly in an inversely proportional manner, whereas the price per month of the consumables is kept constant. We have performed the exercise for two family types: a single male and a couple with two children (girl aged 14 – secondary school, boy aged 10 – primary school).

The graphs below show the impact of making different assumptions regarding the lifespan of the varying items. We multiply the original lifespans with a factor ranging from 0.5 to 2.0 and recalculate the total cost of the regular FRB for the two households. Halving the lifespans results in a relative

increase of the FRBs with between 2 and 6 % in BE, 2 to 4 % in FI, 2 to 5 % in ES, and between 2 to 5% in HU. However, doubling the lifespan results in a decrease of RBs with only between 1 and 3 %. In absolute terms (EUR), the total cost of a FRB for a single changes quite similarly in the different countries when halving the lifespan (decrease of 12 EUR in BE, 13 EUR in FI, 10 EUR in ES, and 11 EUR in HU); for a couple with children there is a more marked increase in FI compared to the other countries (13 EUR in BE, 22 EUR in FI, 12 in ES and 12 EUR in HU), this is due to the increased cost of a shorter lifespan for the dishwasher which was only allocated to certain family types. Doubling the lifespan decreases the total cost of the regular FRB with about 5 to 6 EUR for singles, and about 6 to 7 EUR for a couple with two children except in FI where the total budget decreases with nearly 11 EUR due to the same reason mentioned above.

A.



B.

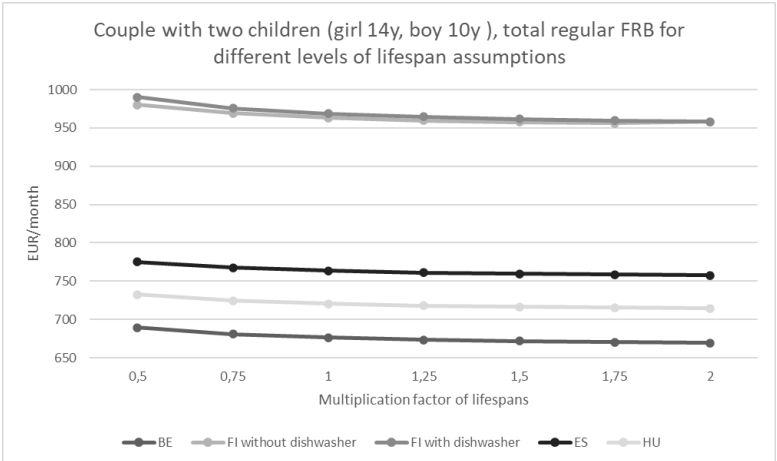


Figure 14. Total cost of the regular FRB with kitchen equipment lifespans multiplied with factors ranging from 0.5 to 2 for (A) a single male and (B) a couple with two children (girl 14y boy 10y (EUR/month, June 2022)

Ideally, the list of kitchen equipment would include durable items with an empirically validated expected lifespans. While there is a growing literature on the topic of product lifetimes and the issue of improving waste management becomes more prominent in the transition towards a less resource-intensive society, at the moment we are unaware of a solid and reliable overview of the different types of lifespans for a wide range of products sold in West European countries. Because the share of these durable goods in the FRB is relatively low, the impact of lifespan assumptions on the total FRB is

relatively small. However, when developing RBs for other baskets wherein the illustrative lists included a larger share of non-consumables or durable goods, these lifespan assumptions may have a much larger impact and should be carefully considered when communicating about the resulting RBs.

4.3 Comparability of the Food Reference Budgets

One of the major goals of the development of the optimized food baskets was improving the cross-comparability by including common guidelines (the EFSA DRVs and EAT-Lancet recommendations) to determine the content of the food baskets and by optimizing and streamlining the pricing strategy. To evaluate the cross-national comparability of the resulting baskets within the EuSocialCit project, we conducted shift share analyses to investigate the variation of the FRBs due to differences in *diets* and due to differences in *prices* across the four countries.

A shift share analysis was conducted by calculating the average quantity and average cost of each food item in the diets across the four countries. In the analyses we compare the minimum cost of healthy food based on that country's diet and national prices with the minimum cost of healthy food based on the average diet and national prices. The difference in cost between the two results is explained by the difference in diet. These analyses were carried out not only for the differences in diet but also for the differences in national prices, comparing the healthy food basket with national prices and national diet with the FRB for that country's national diet and average prices. To give a better understanding of the shift share analyses, we added Figure 15 which illustrates the shift share analyses for the regular (FBDG/DRV) food basket of Spain.

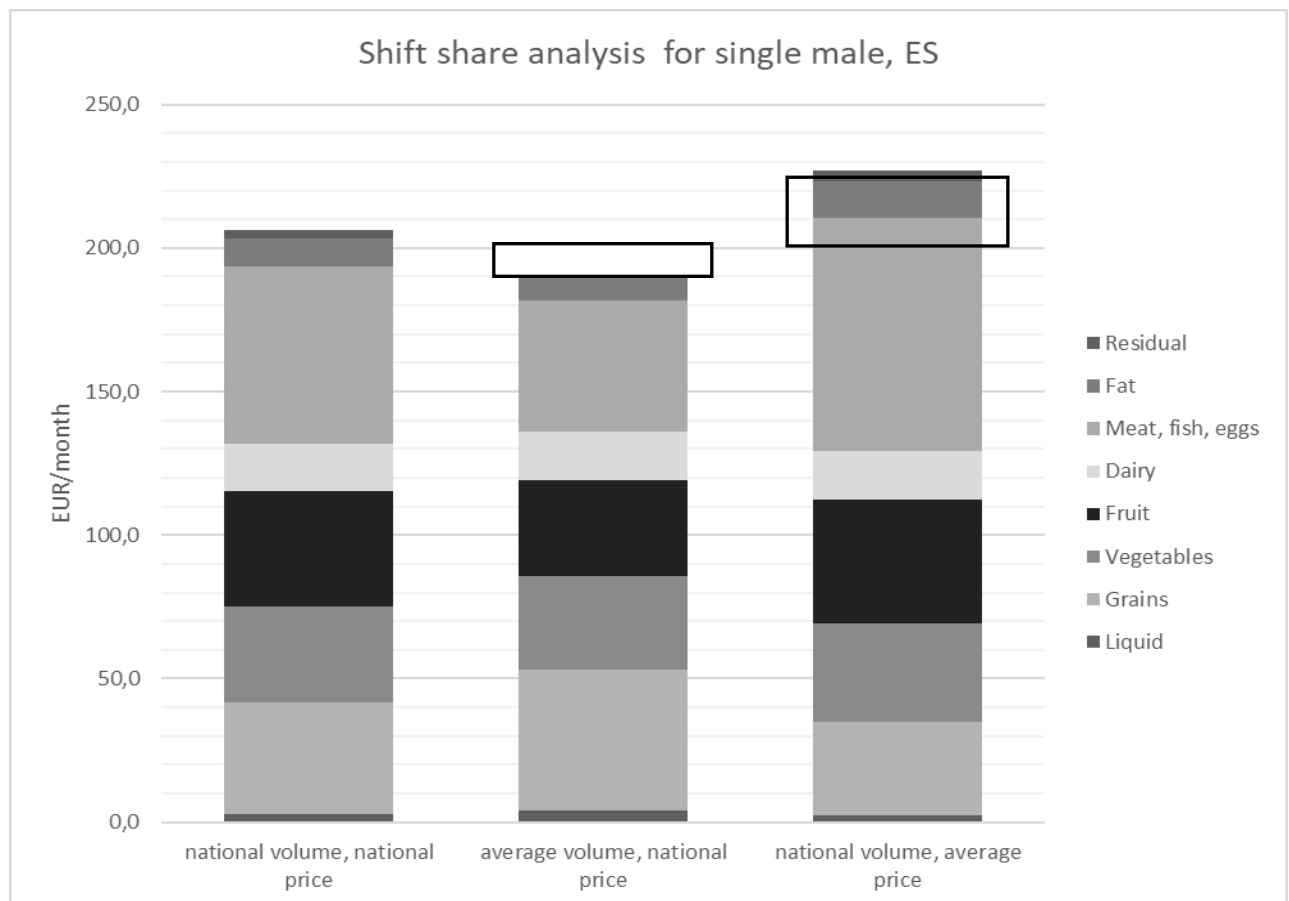


Figure 15. Illustration of the shift share analyses conducted on the regular FBDG/DRV basket (without kitchen equipment) for a single male for Spain (June 2022).

A shift share analysis of the difference due to the *diet* (indicated by the shaded rectangle in the second bar) compares the first bar with the second bar as the differences between these two bars can only be explained by differences in volumes of food items (both bars are based on the same national prices of food items). A shift share analysis for the price differences (indicated by the black outlined rectangle in the third bar) compares the first bar with the third bar as the differences between these two bars can only be explained by price differences (both bars are based on the same national volumes of food items). These analyses were carried out for the four countries and for four different food baskets: the food basket of the Pilot project (based solely on the national FBDG) and the three food baskets of the EuSocialCit project. Figure 16 summarises the results of the conducted shift share analyses.

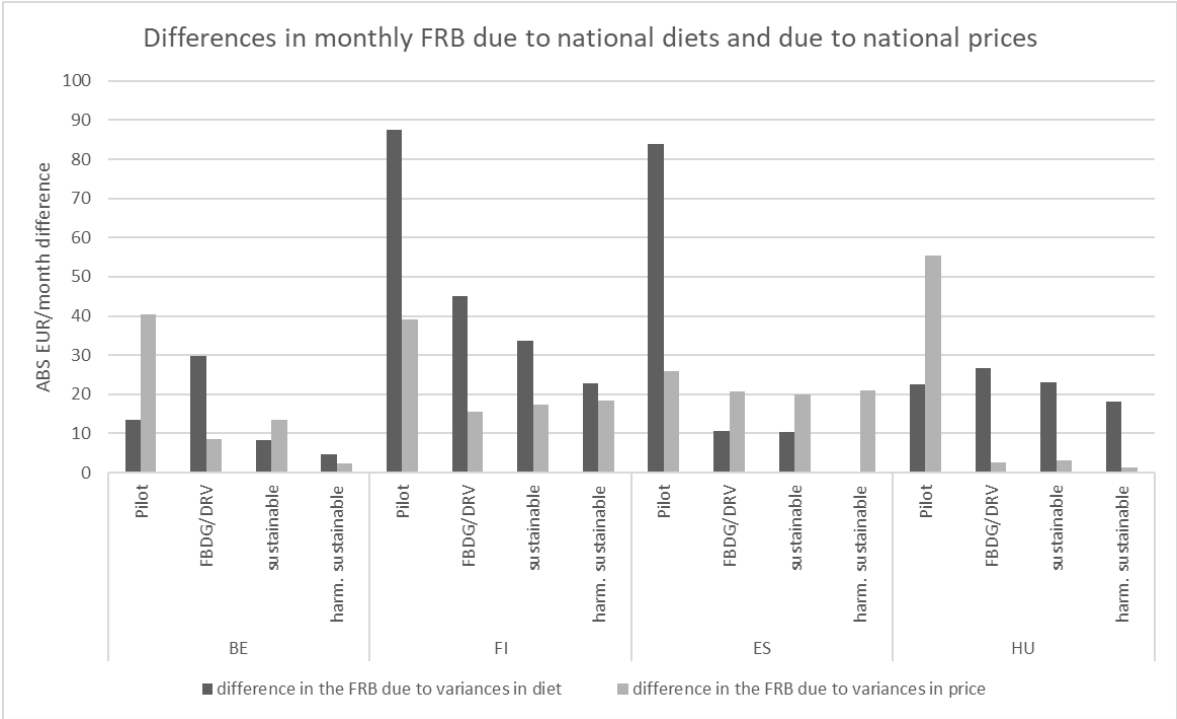


Figure 16. Absolute amount of variance in the FRBs (expressed in EUR/month) for a single male adult due to differences in diets and prices in Belgium, Finland, Spain and Hungary for the food baskets without kitchen equipment developed in the Pilot project (these amounts are corrected for inflation) and the EuSocialCit project (June 2022)

The sum of the absolute amounts of variation of the four countries in the cost of healthy food attributable to differences in diets (darker bars in Figure 16) is higher in the Pilot project (EUR 207.5, adjusted for inflation) compared to the three food baskets in the EuSocialCit project: EUR 112.1 in the FBDG/DRV basket; EUR 75.4 in the sustainable basket and EUR 46.1 in the harmonized sustainable basket. The total decrease in variation due to differences in diets for the four countries is the strongest between the Pilot food basket and the FBDG/DRV basket which suggest a better cross-comparability due to the use of common guidelines. Adding the EAT-Lancet criteria to adjust the content of the food baskets also still considerably reduces the variation between countries. The reduction is less pronounced between the sustainable and the harmonized sustainable food baskets. As the variation in food budgets attributable to differences in diets between countries is the lowest for harmonized sustainable food baskets, these baskets can be considered the most preferable in pursuing the most cross-national comparability.

The effect of national price variations on the variation in the FRBs (lighter bars in Figure 16) was also higher in the Pilot project (sum of absolute amount of variation: EUR 160.7, adjusted for inflation)

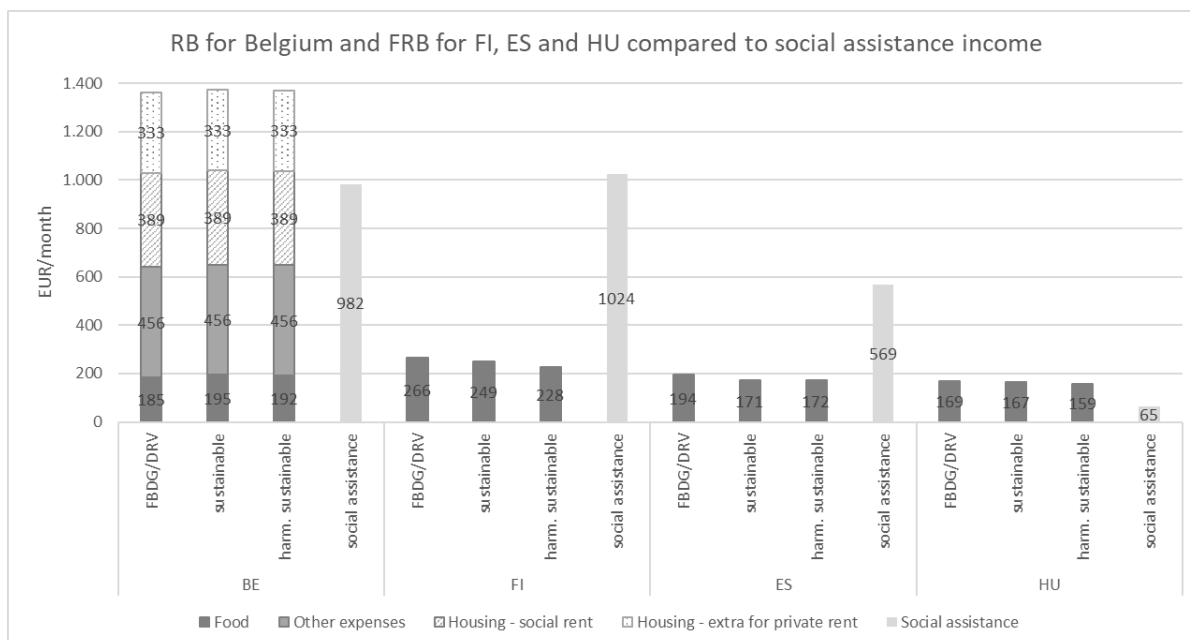
compared to the three food baskets of the EuSocialCit project: EUR 47.7 in the FBDG/DRV basket; EUR 53.9 in the sustainable basket and EUR 42.9 in the harmonized sustainable basket. These results suggest that the refinement and more extensive standardization of the hand-collected pricing procedure (as described in section 3) has decreased the overall cross-country variability due to pricing differences between countries. However, this decrease in variations in FRB due to price variations may also be (partially) due to alignments in the market prices across the four countries between 2015 and 2022. Additional research using other data sources is needed to further identify the causes of this decrease.

4.4 Affordability of food

If we want to use RBs as a policy indicator on the European level, highly cross-national comparable RBs are required. RBs reflect the minimum necessary budget for a hypothetical household to purchase the goods and services that enables social participation (Storms, 2012). RBs translate the vague concept of 'social participation' into a concrete financial benchmark that can be used by various governments to implement and monitor poverty policies. In doing this, they reveal the mutual relationship between an adequate income and the affordability of necessary goods and services: an income is only adequate when it enables households to purchase all necessary goods and services, and goods and services are only affordable when households have sufficient income to afford them. It also follows that healthy food is only affordable if the household can still purchase all other necessary goods and services (e.g., energy use) after purchasing the healthy food. This so-called 'heating-or-eating' dilemma (Castaño-Rosa, 2019) that occurs when household cannot afford both goods (in this case healthy food and energy) applies to the assessment of affordability of all necessary goods and services such as housing, healthcare, clothing and education. A need-based indicator, unlike an indicator solely based on income, takes into account (all) other needs of the household.

Ideally, we should have RBs for all baskets that represents the minimum needs namely housing, clothing, a healthy diet, personal hygiene and health care, rest and leisure, maintaining social relations, security in childhood, mobility, security and lifelong learning. In the EuSocialCit project, we only developed cross-national comparable RBs for a healthy (and sustainable) diet. Without the minimum cost of other essential needs, they cannot be used to evaluate the affordability of healthy food taking into account the 'heating-or-eating' dilemma. However, in this section we demonstrate an illustrative exercise to give an idea of the potential of RBs as an indicator. By comparing the constructed food baskets for a single male (indicated by the dark grey bars in Figure 17) with the disposable income⁹ from social assistance (indicated by the light grey bars in Figure 17) (Marchal, 2018) tentative assessments can be made about the affordability of a healthy and sustainable diet in Belgium, Finland, Spain and Hungary.

⁹ The disposable income includes gross income, adjusted with child benefits, social security contributions and personal income tax. For Finland, a housing benefit is included if applicable. See The authors would like to thank Elise Aerts (UAntwerp) for updating the calculations to 2021.



Note: Other expenses: sum of the RBs for clothing, mobility, health and personal care, rest and leisure, maintaining social relationships and security. Housing – social rent: RB for social housing including rent in the social housing market, utilities and maintenance. Housing – private rent: additional calculated cost of rent in the private market compared to the rent in the social market. The most recent data on social assistance refers to 2021. Therefore, the developed food baskets of the EuSocialCit project were recalculated using the harmonized index of consumer prices (Eurostat, 2022).

Figure 17. Comparison of the FRBs developed within the EuSocialCit project and the RB of Belgium with the disposable income of social assistance for a single person for Belgium, Finland, Spain and Hungary (2021).

Measuring food affordability using an income-ratio approach compares the food costs faced by households with the (disposable) households' income. Ward et al (2013) constructed an income-ratio for measuring food affordability claiming that families who have to spend more than 30% of their household income on a healthy food basket; experience 'food stress' and are pushed to buy less or inferior quality food. Figure 17 indicates that single males living in Belgium and Finland do not experience 'food stress' as they spend 20% and 22% of their disposable income on healthy and sustainable food (calculated by the harmonised sustainable food basket, including kitchen equipment). Single males in Spain need to spend 30% of their income on this healthy food basket. In Hungary, a single male receiving social assistance cannot afford healthy and sustainable food since the monthly budget necessary for this diet is 2,5 times the disposable income. According to the income-ratio of Ward et al. (2013), single males in Spain and Hungary are in 'food stress'. This indicator is entirely income-based, not taking into account the above mentioned 'heating-or-eating' dilemma.

A more appropriate approach is the residual-income approach, comparing the minimal budget of healthy (and sustainable) food with the residual income, i.e. the income that remains after purchasing for all other (than healthy food) necessary goods and services. RBs are well suited to measure food affordability using the residual income approach as they normatively reflect the minimum necessary expenditures of households. This requires fully developed up-to-date RBs which are, for the moment, only available for Belgium (see Figure 17). On top of the minimum cost for healthy food, the Belgian RBs include the minimum cost for social housing (shaded bars), the additional cost to rent a private house (i.e. the difference in minimum cost between renting a private and social house, visualised in the pointed bars) and other minimum necessary costs (grey bars) such as clothing, maintaining social

relations, mobility, personal care and health care. The RB in Belgium (2021) was EUR 1.370 per month for single males renting an private house and EUR 1.037 per month when renting a social house, taking into account the harmonised sustainable food basket. This results in residual incomes for single males of EUR -196/month when renting a private house and EUR 137/month when renting a social house. In both cases the residual income is insufficient to buy healthy and sustainable food. When we measure food affordability using the residual income approach and taking the minimal costs of all needs into account, we found that healthy and sustainable food is not affordable for single males receiving social assistance. The reverse is applicable when we apply the methodology of Ward et al (2013) to single males receiving social assistance in Belgium. This exercise illustrates that the construction of the indicator to measure affordability of food (or other necessary goods and services) has an impact on the size and composition of the group of people for whom food is considered (un)affordable.

When measuring the affordability of necessary goods and services with normative; complete (taking all minimal needs into account) and up-to date RBs for a household with a certain income, we are simultaneously measuring the adequacy of that income. Indeed, when all minimum necessary goods and services are affordable for a household with a certain income, the income is adequate. Based on the above exercise we can conclude that social assistance is not adequate for a single adult to participate fully in society in Belgium. Figure 17 makes this clear as the disposable income of social assistance (EUR 982) is lower than the RB for a single adult renting a private house (EUR 1.370) or a social house (EUR 1.037). RBs reflect a lower bound of the minimum necessary income to enable social participation and therefore assume an optimal personal situation (e.g. family members are in good health) and living context (e.g. quality housing and the family does not need to own their own car to be sufficiently mobile). As these assumptions are not always met in reality, especially not for households living in poverty, the minimum necessary income will often be higher in reality, undermining the adequacy of social assistance for a single adult even more. Measuring adequacy of (minimum) incomes using RBs, gains insight into possible policy measures that can improve adequacy. Figure 17 also indicates the large impact of social housing in Belgium on the adequacy of income. Although we need complete RBs to assess the adequacy of minimum income, we can state that the disposable income from social assistance for a single adult in Hungary is not adequate for full participation in society since it does not even cover the necessary expenses for healthy and sustainable food.

5. Conclusions

The Council Recommendation on adequate minimum income ensuring active inclusion aims to protect Europe's most vulnerable citizens lacking sufficient resources to live a dignified life. In this recommendation, Member States are advised to set the level of adequate minimum income through a transparent and robust methodology taking into account (among other things) specific needs and disadvantaged situations of households. Elsewhere (Storms et al, 2023), we have argued that in order to assess financial deprivation in a substantive way individual living situations and needs should be taken into account. High-quality RBs could provide an additional indicator for assessing and monitoring the adequacy of minimum income protection in EU member states. In order to be used as high quality indicators, RBs should allow for robust and reliable comparisons over time and between countries or regions. This means that fluctuations or differences across time or between countries must always be explainable by changed social expectations in terms of needs or culturally acceptable satisfiers, by a changed supply of necessary goods and services or by changed prices.

However, achieving cross-national comparable RBs is a challenging task. In the current methodological note, we tackle the development of cross-nationally comparable food baskets. Across Europe, multiple healthy dietary patterns, cultural habits and gastronomic traditions exist that prevent a unified approach. We improved the procedures to develop substantively comparable food baskets in terms of the content of the baskets as well as in terms of the pricing strategy. Moreover, we extended the target population by including a sustainability aspect to the RB approach, ensuring that an adequate standard of living is not only guaranteed for the present citizens but also safeguarded for the next generations. National food budgets were worked out for Belgium, Finland, Hungary and Spain.

The steps taken in this exercise have contributed to significantly decrease the variation of the items and amounts included in the four food baskets while still respecting the particularities of each country. Additionally, the improved and adapted pricing procedure indicated that even though important price differences remained between countries, compared to earlier exercise the variation between countries due to price levels was considerable diminished. Applying the EAT-Lancet guidelines, which make countries' food baskets sustainable, does not lead to a significant price increase but, on the contrary, often reduces the minimum monthly cost of food compared to the unsustainable food basket. We also tentatively investigated the applicability of additional sustainability criteria at the level of pricing (choosing local products, in bulk and in season), leading in (non-Southern) countries to a limited choice of products which puts pressure on the feasibility of the food budget. Therefore, we recommend (for now) not including sustainability criteria other than those related to food content, and conducting further research on how to take sustainable purchasing strategies into account in a feasible and acceptable way.

Previous projects constructing cross-country comparable RBs had already revealed a number of challenges, but also suggested avenues for further research that the current project has successfully incorporated. We think the results from the progress reported in the current methodological note can

be fruitfully applied in future research endeavours. More specifically, a promising future area for extension would be in the development of high-quality FRBs that are comparable across EU member states. Rather than developing complete baskets of goods and services for a large number of countries, we think it wise to first focus on prioritizing the development of high quality harmonized targeted indicators which are able to show the direct cost for households in a particular domain such as food. The food basket has the advantage of allowing more insight into issues of food insecurity and the impact of financial constraints on the ability of affording a healthy and sustainable diet. For the future, we recommend that the process of constructing comparable food baskets is preferably coordinated by a team of national nutritionists as they can discuss and agree on the interpretation of the criteria and have a good knowledge of local dietary habits. Additionally, the newly developed food baskets should always be discussed by focus groups in order to assess the feasibility and acceptability of the food baskets. Further research is needed to investigate the gap between the cost of sustainable food in a specific country on the one hand and current dietary habits and supply of sustainable food on the other. Policymakers need to be aware that healthy and sustainable nutrition policies do not only lead to a more restricted diet for low-income families, but that they are seen as doable and acceptable for all, especially for the group of people on a limited budget who have to live on it.

In order to have regularly updated FRBs, a fruitful avenue of investigation lies in complementing hand-collected prices with existing price survey data from NSI's. This could be in the form of either a combination of x-yearly hand-collected pricing and survey data (inflation corrections) for updating yearly, or by adopting a shadowing procedure where prices are updated using hand-collected pricing and comparing these evolutions to yearly CPI changes and following the deviations between these two methods. Obviously, if actual price information (rather than price evolutions) are available, it would be possible to estimate a 'low price level' at various cut-off point (for instance at the 20th or 25th percentile) and assess its future usability to reliably and cost-effectively estimate a price for reference basket items, but this is a less likely scenario given the strongly restricted access to such data.

Although food budgets alone are insufficient to fully assess the adequacy of minimum incomes, in this note we have also illustrated how comparable food baskets are a first step to measure both affordability problems and income adequacy in a comprehensive way across Europe. Of course, affordability of necessary goods and services is only one aspect of adequate minimum income. Other important aspects are: full take up of targeted cash or benefits in kind, optimal coverage, sound governance mechanisms, sufficient supply, knowledge and use of quality goods and services, and appropriate competences of citizens to manage their own budget carefully. All these aspects need sufficient attention when designing and monitoring adequate minimum income policies. High-quality RBs can also provide an excellent source of inspiration for the last three.

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7 Annexes

7.1 Nutritional content of the food baskets developed in the EuSocialCit Project

Table 5. Changes applied when updating the previous basket (Spain - ImPRovE)

EuSocialCit Profile	Departing basket	Changes applied
+65y male regular	30-60y male (EuSocialCit)	<p>Initial basket: exceeds the EFSA energy recommendations by roughly 200 kcal. Vitamin D is not met.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: vegetables from 399g to 470g daily. ● Decreases: milk from 249ml to 199ml daily; olive oil from 30ml to 25ml daily; sunflower oil from 10ml to 5ml. ● Elimination: breakfast cereals and white bread. ● Modification: none.
+65y female regular	30-60y female (EuSocialCit)	<p>Initial basket: exceeds the EFSA energy recommendations by roughly 200 kcal. Vitamin D is not met.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: none. ● Decreases: potato from 85g to 68g daily; fruit from 449g to 360g daily; milk from 200ml to 180ml daily; nuts from 14g to 11g daily; sugar from 20g to 5g per day. ● Elimination: breakfast cereals. ● Modification: none.
30-65y male regular	Adult male (ImPRovE)	<p>Initial basket: exceeds the EFSA energy recommendations by roughly 300 kcal and exceeds fat requirements. Vitamin D is not met.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: oatmeal flakes from 0g to 30g; rice and pasta from 80 to 90g per portion. ● Decreases: jam from 20g to 8,57g per day; nuts from 20g each day to 20g five days per week; cottage cheese from 829*7/*0 to 40g five days per week; mature cheese from 60g to 40g twice per week; mayonnaise from 5 to 3 days per week. ● Elimination: none.

		<ul style="list-style-type: none"> ● Modification: none.
30-65y male – sustainable	30-65y male (EuSocialCit)	<p>Initial basket: meets EFSA recommendations but changes on food quantities are applied to achieve the sustainability recommendations from EAT-Lancet (EAT-L)</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: legumes from 68g to 86g daily. ● Decreases: bread from 142g to 128g daily; fruit from 449g to 300g per day; milk from 249ml to 210ml per day; charcuteria from 28g to 14g daily; fatter meat from 18g to 14g daily; eggs from 53g to 25g daily. ● Elimination: none. ● Modification: semi-skimmed dairy for full-fat byproducts.
30-50y male – harmonized sustainable	30-65y male – sustainable (EuSocialCit)	<p>Initial basket: meets EFSA recommendations but changes on food quantities are applied to achieve the sustainability recommendations from EAT-Lancet (EAT-L) and increase comparability between countries.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: legumes from 43g to 86g daily; olive oil from 30ml to 36ml to compensate for fat from mayonnaise. ● Decreases: none. ● Elimination: jam, ketchup and mayonnaise. ● Modification: chocolate for cocoa powder.
30-65y female regular	Adult female (ImPRovE)	<p>Initial basket: exceeds the EFSA energy recommendations by roughly 400 kcal and exceeds fat requirements, but carbohydrate content is below the recommendation whereas fats are exceeded. Vitamin D is not met.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: oatmeal flakes from 0g to 30g daily; vegetables from 300g 470g daily; fruit from 359g to 449g daily. ● Decreases: jam from 20g per day to 8,57g daily; chocolate from 10g to 7g daily; nuts from 20g each day to 20g five days per week; cottage cheese from 57g to 28g daily; mature cheese to 11g to 7g); yogurt from 374g to 125g daily; olive oil and sunflower oil from 40g to 30g per day; mayonnaise from 5 to 3 days per week. ● Elimination: none. ● Modification: refined cereals for wholegrains.
30-65y female - sustainable	30-65y female (EuSocialCit)	<p>Initial basket: meets EFSA recommendations but changes on food quantities are applied to achieve the sustainability recommendations from EAT-L</p>

		<p>Changes</p> <ul style="list-style-type: none"> ● Increases: Legumes from 51g to 77g daily; nuts from 14g to 21g daily. ● Decreases: fruit from 449g to 300g per day; eggs from 43g to 25g daily. ● Elimination: none. ● Modification: semi-skimmed dairy for full-fat byproducts.
18-29y male regular	30-65y male (EuSocialCit)	<p>Initial basket: energy content is almost 250kcal below EFSA's recommendations.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: oatmeal flakes from 30g to 50g daily; rice from 40g to 50g daily; pasta from 34g to 43g daily; nuts from 14g to 20g daily. ● Decreases: legumes from 68g to 53g daily. ● Elimination: none. ● Modification: none.
18-29y female regular	30-65y female (EuSocialCit)	<p>Initial basket: energy content is around 100 kcal below EFSA recommendations.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: oatmeal flakes from 30g to 50g. ● Decreases: none. ● Elimination: none. ● Modification: none.
14y boy regular	6-12y (ImPRovE)	<p>Initial basket: energy content is around 100kcal above EFSA's recommendations.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: oatmeal flakes from 0g to 30g daily. ● Decreases: bread from 227g to 137g daily; yogurt from 249g to 125g daily; sunflower oil from 20g to 5g per day; chocolate from 20g daily to 10g twice a week; jam from 20g daily to 15g three times per week; sugar from 20g daily to 5g per day. ● Elimination: none. ● Modification: none.

14y girl regular	14y boy (EuSocialCit)	<p>Initial basket: exceeds EFSA's energy recommendations by roughly 250 kcal.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: none. ● Decreases: charcuterie from 40g to 30g per portion; potatoes from 200g to 180g per portion; rice and pasta from 80g to 70g per portion; English bread from 60g to 50g per portion; bread from 60g to 50g per portion. ● Elimination: none. ● Modification: none.
10y boy regular	6-12y (ImPRovE)	<p>Initial basket: exceeds EFSA's recommendations by roughly 800 kcal.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: oatmeal flakes from 0g to 30g daily; mature cheese from 11g to 14g daily. ● Decreases: bread from 227g to 97g daily; potatoes from 114g to 85g daily; pasta from 34g to 25g daily; rice from 40g to 30g daily; fruit from 449g to 359g daily; yogurt from 249g to 125g daily; lean meat from 43g to 34g daily; eggs from 51g to 43g daily; sunflower oil from 20g to 5g per day; chocolate from 20g daily to 10g twice a week; jam from 20g daily to 15g three times per week; sugar from 20g daily to 5g per day. ● Elimination: none. ● Modification: none.
10y girl regular	10y boy (EuSocialCit)	<p>Initial basket: exceeds EFSA's recommendations by roughly 200 kcal.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: none. ● Decreases: fish from 110g to 100g per portion; eggs from 5 to 3 medium-sized eggs per week; mature cheese from 50g to 25g per portion; cottage cheese from 57g to 22g daily; cocoa powder from 20g to 10g per day; charcuterie from 21g to 9g. ● Elimination: none. ● Modification: none.
6y boy regular	3-5y child (ImPRovE)	<p>Initial basket: meets EFSA's energy and macronutrients requirements, except for fat which falls short.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: rice from 40g to 50g per portion; fish from 40g to 70g per portion; meat from 30g to 60g per portion.

		<ul style="list-style-type: none"> ● Decreases: yogurt from 196g to 125g daily. ● Elimination: honey. ● Modification: none.
6y girl regular	6y boy (EuSocialCit)	<p>Initial basket: exceeds EFSA's energy recommendations by roughly 100 kcal.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: none. ● Decreases: bread from 70g to 50g per day; potato from 150g to 140g per portion; one yogurt from 11 to 10 portion per week; olive oil from 35 to 30g per day. ● Elimination: none. ● Modification: none.
2.5y child regular	1-3y child (ImPRovE)	<p>Initial basket: energy content is about 100kcal bellow EFSA's recommendations.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: fruit from 11 to 14 portions per week; milk from 250ml to 150ml daily; yogurt from 196g to 125g; cottage cheese from 13g to 17g daily; fish from 35g to 65g per portion; meat from 25g to 45g per portion. ● Decreases: sugar from 10g to 5g daily. ● Elimination: none. ● Modification: none.

Note: DRV: Dietary Reference Values; UL: Upper Limit

Table 6. Changes applied when updating the previous basket (Belgium - ABSPO)

EuSocialCit Profile	Departing basket	Changes applied
+65y male regular	+65y male (ABSPO)	<p>Initial basket: energy content is only 10kcal below EFSA recommendations, but some modifications are made to be more aligned with the adult male.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: rice and pasta from 70g to 90g grams per week; potatoes from 200g to 250g daily; legumes from 1 to 3 portions per week; egg from 2 portions to 3 portions per week; fish from once to twice per week. ● Decreases: none. ● Elimination: none. ● Modification: distribute cooking fat between olive and sunflower oil; 1 glass per week of milk is replaced by vegetable drink; refined cereals for wholegrains.
+65y female regular	+65y female (ABSPO)	<p>Initial basket: energy content is EFSA recommendations, and vitamin D is the only nutrient not met. However, some modifications are made to be more aligned with the adult male</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: fish from once to twice per week, wholegrain bread from 64g to 120g. ● Decreases: none. ● Elimination: none. ● Modification: distribute cooking fat between olive and sunflower oil; 1 glass per week of milk is replaced by vegetable drink; refined cereals for wholegrains.
30-65y male regular	19-65y male (ABSPO)	<p>Initial basket: doesn't reach the energy requirements set by EFSA, and neither B12 nor vitamin D.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: rice and pasta from 70g to 90g grams per week; nuts from 20g to 25g per day; cooking fat content from 15g to 25g per day; legumes from 1 to 3 portions per week; yoghurt from 225g to 250g per day; red meat from 1 portion and a half to 2 portions per week; fish from once to twice per week; egg from 2 portions to 3 portions per week.

		<ul style="list-style-type: none"> ● Decreases: none. ● Elimination: none. ● Modification: cooking fats are distributed between sunflower and olive oil; 1 glass per week of milk is replaced by vegetable drink (=150ml); refined cereals for wholegrains.
30-65y male – sustainable	30-65y male (EuSocialCit)	<p>Initial basket: meets EFSA recommendations but changes on food quantities are applied to achieve the sustainability recommendations from EAT-L</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: legumes from 3 to 4 portions per week; fruit from 250g to 300g; vegetables from 300g to 400g; lean meat from 2 to 3 portions per week ● Decreases: potatoes from 250g to 150g. ● Elimination: none. ● Modification: skimmed dairy for full-fat ones
30-65y male – harmonized sustainable	30-65y male - sustainable (EuSocialCit)	<p>Initial basket: meets EFSA recommendations but changes on food quantities are applied to achieve the sustainability recommendations from EAT-Lancet (EAT-L) and increase comparability between countries.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: cocoa powder from 0g to 5g daily; sunflower oil from 10g to 15g; fish from 1 ● Decreases: none. ● Elimination: mayonnaise, ketchup and jam. ● Modification: vegetable broth for vegetable cubes.
30-65y female regular	19-65y female (ABSPO)	<p>Initial basket: doesn't reach the EFSA energy recommendations by roughly 200kcal and neither met iron, vitamin D and B12 DRV.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: nuts from 15g to 20g daily, legumes from 1 to 2 portions per week; bread from 120g to 180g daily; yogurt from 225g to 250g daily; cottage cheese from 14g to 20g daily; red meat from 1 to 2 portion per week; egg from 1 portion and half to 3 portions per week; fish from once to twice per week.

		<ul style="list-style-type: none"> ● Decreases: none. ● Elimination: none. ● Modification: 1 glass per week of milk replaced by vegetable drink; distribute cooking fat between olive and sunflower oil; refined cereals for wholegrains
30-65y female - sustainable	30-65y female (EuSocialCit)	<p>Initial basket: meets EFSA recommendations but changes on food quantities are applied to achieve the sustainability recommendations from EAT-L</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: none. ● Decreases: fish from 2 to 1 portion per week. ● Elimination: none. ● Modification: skimmed dairy for full-fat ones.
18-29y male regular	19-65y male (ABSPO)	<p>Initial basket: doesn't reach the energy requirements set by EFSA, and neither B12 nor vitamin D.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: rice and pasta from 70g to 90g grams per week; nuts from 20g to 25g per day; cooking fat content from 15g to 30g per day; legumes from 1 to 3 portions per week; yoghurt from 225g to 250g per day; red meat from 1 portion and a half to 2 portions per week; fish from once to twice per week; egg from 2 portions to 3 portions per week. ● Decreases: none. ● Elimination: none. ● Modification: cooking fats are distributed between sunflower and olive oil; 1 glass per week of milk is replaced by vegetable drink; refined cereals for wholegrains
18-29y female regular	19-65y female (ABSPO)	<p>Initial basket: energy content is around 250kcal below the recommendations, and neither iron, vitamins B12 and D are met.</p> <p>Changes</p>

		<ul style="list-style-type: none"> ● Increases: bread from 120g to 150g daily; rice and pasta from 70g to 90g weekly; legumes from 1 to 2 portions; fruit from 250g to 300g; nuts from 15g to 25g; yogurt from 225g to 250g; fish from 1 to 2 portions per week; red meat from 1 portion and a half to 2 portion per week; egg from 1 portion and half to 3 portions per week; spreadable fat from 15g to 20g daily. cooking fat from 15g to 25g ● Decreases: none. ● Elimination: none. ● Modification: cooking fats are distributed between sunflower and olive oil; 1 glass per week of milk is replaced by vegetable drink; refined cereals for wholegrains.
14y boy regular	12-17y adolescent girl (ABSPO)	<p>Initial basket: energy requirements are met and only vitamin D is not reached.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: spreadable fat from 32,5g to 35g daily; cooking fat from 15g to 25g; nuts from 15g to 25g daily. ● Decreases: none. ● Elimination: none. ● Modification: cooking fats are distributed between sunflower and olive oil; 1 glass per week of milk is replaced by vegetable drink; refined cereals for wholegrains.
14y girl regular	12-17y adolescent girl (ABSPO)	<p>Initial basket: energy content is roughly 300kcal above the recommendations.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: none. ● Decreases: bread intake from 195g to 120g. ● Elimination: none. ● Modification: cooking fats are distributed between sunflower and olive oil; 1 glass per week of milk is replaced by vegetable drink; refined cereals for wholegrains.
10y boy regular	6-11y boy (ABSPO)	<p>Initial basket: energy requirements are met and only vitamin D is not reached. However, some changes have been applied to keep consistency across profiles.</p> <p>Changes</p>

		<ul style="list-style-type: none"> ● Increases: legumes from 100g to 150g per portion; egg from 1 portion and half to 2 portions per week; nuts from 15g to 25g per portion. ● Decreases: none. ● Elimination: none. ● Modification: cooking fats are distributed between sunflower and olive oil; 1 glass per week of milk is replaced by vegetable drink; refined cereals for wholegrains
10y girl regular	6-11y Boy (ABSPO)	<p>Initial basket: energy requirements are 100kcal above EFSA recommendations and only vitamin D is not reached.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: none. ● Decreases: bread from 150g to 120g daily. ● Elimination: none. ● Modification: cooking fats are distributed between sunflower and olive oil; 1 glass per week of milk is replaced by vegetable drink.
6y boy regular	6-11y Boy (ABSPO)	<p>Initial basket: energy content is around 300kcal above the recommendations. Zinc reference intakes surpass UL, as well as from folate and vitamin A. Vitamin D is not reached.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: none. ● Decreases: bread intake from 150 to 90g per day; mayonnaise from once daily to 4 times per week; red meat from 2 to 1 portion per week; spreadable fat from 15g to 10g per day; oat flakes from 40g to 30g. ● Elimination: none. ● Modification: 100ml of skimmed yogurt replaced by calcium fortified vegetable drink; cooking fats are distributed between sunflower and olive oil; refined cereals for wholegrains.
6y girl regular	6-11y Boy (ABSPO)	<p>Initial basket: energy content is around 400kcal above the recommendations. Zinc reference intakes surpass UL, as well as from folate and vitamin A. Vitamin D is not reached.</p> <p>Changes</p>

		<ul style="list-style-type: none"> ● Increases: ● Decreases: bread from 150 to 90g per day; potato intake from 225g to 200g per day; red meat from 2 to 1 portion per week; spreadable fat from 15g to 10g per day; oat flakes from 40g to 30g. ● Elimination: ● Modification: 100ml of skimmed yogurt replaced by calcium fortified vegetable drink; cooking fats are distributed between sunflower and olive oil; refined cereals for wholegrains.
2.5y child regular	2,5y child (ABSPO)	<p>Initial basket: doesn't meet the EFSA energy requirements by 100kcal and neither DRV for carbohydrates, iron and vitamin D. Fat content is exceeded.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: fruit intake from 150g to 200g; vegetables from 75g to 100g per day; legumes from 70g to 125g; potatoes from 50g to 100g daily; pasta from 0g to 10g daily; rice from 0g to 10g daily; oatmeal flakes from 0g to 30g daily; fish from 38g to consume 50g of fish per week; red meat from 76g to 100g portion per week; lean meat from 76g to 100g per week; egg from ½ to 3 portions per week; chocolate from 0g to 5g daily. ● Decreases: full cream from 500ml to 350ml daily; margarine from 10g to 5g daily; olive oil intake from 15g to 10g daily; refined cereals for wholegrains. ● Elimination: none. ● Modification: none.

Note: DRV: Dietary Reference Values; UL: Upper Limit

Table 7. Changes applied when updating the previous basket (Hungary - ABSPO)

EuSocialCit Profile	Departing basket	Changes applied
+65y male regular	30-65y male (EuSocialCit)	<p>Initial basket: energy content is around 200kcal above the recommendations.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: cottage cheese from 14g to 21g daily; eggs from 40g to 56g daily. ● Decreases: bread from 200g to 150g daily; potatoes from 164g to 150g daily; rice from 30g to 20g daily; pasta from 23g to 20g daily; nuts from 11.43g to 8.57 daily; lean meat from 60g to 55g daily; fatter meat from 50g to 27g daily. ● Elimination: none. ● Modification: none.
+65y female regular	30-65y female (EuSocialCit)	<p>Initial basket: energy content is 100kcal above the recommendations.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: egg from 2 to 5 times weekly. ● Decreases: spreadable fat from 30g to 20g; potatoes from 120g to 90g daily; rice and pasta from 19g to 15g daily; lean meat from 60g to 50g daily; fatter meat from 50g to 20g daily. ● Elimination: none. ● Modification: none.
30-65y male regular	18-29y male (EuSocialCit)	<p>Initial basket: energy content is around 150kcal below EFSA recommendations.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: lean meat from 55g to 60g daily; eggs from 27g to 40g daily. ● Decreases: yogurt from 250g to 200g per day; mature cheese from 147g to 70g weekly; cottage cheese from 147g to 98g weekly; fatter meat from 56g to 50g daily. ● Elimination: none. ● Modification: none.

30-65y male – sustainable	30-65y male (EuSocialCit)	<p>Initial basket: energy content is around 90kcal below EFSA recommendations.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: potatoes from 164g to 200g daily; legumes from 43g to 171g daily; eggs from 40g to 56g daily; fresh vegetables from 220g to 250g daily. ● Decreases: bread from 200g to 160g daily; lean meat from 60g to 55g daily; fatter meat from 50g to 27g daily ● Elimination: none. ● Modification: none.
30-65y male – harmonized sustainable	30-65y male - sustainable (EuSocialCit)	<p>Initial basket: is already aligned with EFSA recommendations.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: fatter meat from 27g to 50g daily. ● Decreases: none. ● Elimination: canned fruit, fruit puree, fruit juice, dried fruit, jam, nutmeg, mayonnaise, tomato sauce and breadcrumbs. ● Modification: none.
30-65y female regular	18-29y female (EuSocialCit)	<p>Initial basket: energy content is roughly 200kcal below the recommendations.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: eggs from 20g to 25g daily; lean meat from 50g to 60g daily; spreadable fat from 30g to 40g daily. ● Decreases: potatoes from 137g to 120g daily; yogurt from 250g to 200g daily; mature cheese from 147g to 70g weekly; after meat from 56g to 50g daily. ● Elimination: none. ● Modification: none.
30-65y female - sustainable	30-65y female (EuSocialCit)	<p>Initial basket: energy content is around 100kcal below EFSA recommendations</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: potatoes from 120g to 137g daily; legumes from 43g to 86g daily.

		<ul style="list-style-type: none"> ● Decreases: cottage cheese from 21g to 14g daily; lean meat from 60g to 50g daily; fatter meat from 50g to 20g daily ● Elimination: none. ● Modification: none.
18-29y male regular	19-65y adult man (ABSPO)	<p>Initial basket: energy content is 439kcal below EFSA recommendations.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: oatmeal flakes from 0g to 25g daily; milk from 164ml to 200ml daily; mature cheese from 16g to 21g daily; cottage cheese from 2g to 21g daily; yogurt from 16g to 250g daily; egg from 16g to 27g daily; nuts from 0g to 11g daily; legumes from 0g to 43g daily. ● Decreases: spreadable fat from 60g to 40g daily; bread from 285g to 200g daily; vegetables from 414g to 360g daily. ● Elimination: white bread, frozen prepared vegetables, canned vegetables, olive oil, nutmeg, yogurt drunk, fruit yoghurt and chocolate milk. ● Modification: refined cereals for wholegrains.
18-29y female regular	19-65y adult female (ABSPO)	<p>Initial basket: energy content is roughly 300kcal below EFSA recommendations.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: milk from 164ml to 200ml daily; mature cheese from 16g to 21g daily; cottage cheese from 2g to 21g daily; yogurt from 22g to 250g daily; fish from 11g to 14g daily; lean meat from 27g to 50g daily; egg from 16g to 20g daily; nuts from 0g to 9g daily; legumes from 0g to 43g daily; oat flakes from 0g to 30g daily. ● Decreases: spreadable fat from 35g to 30g daily; cooking fat from 15g to 10g daily; bread from 240g to 100g daily; vegetables from 384g to 330g daily. ● Elimination: white bread, frozen prepared vegetables, canned vegetables, olive oil, nutmeg, yogurt drunk, fruit yogurt and chocolate milk. ● Modification: refined cereals for wholegrains.

14y boy regular	6-11y boy (ABSPO)	<p>Initial basket: energy content is around 600 kcal below EFSA recommendations, total fat exceeds the requirements and several micronutrients are not met (iron, zinc, vitamin B12, folate and vitamin D) .</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: oatmeal flakes from 0g to 30g daily; potatoes from 123g to 160g daily; rice and pasta from 17g to 27g daily; legumes from 0g to 43g daily; fresh fruit from 220g to 240g daily; fruit puree from 13g to 18g daily; mature and cottage cheese from 15g and 2g to 29g and 23g daily, respectively; yoghurt from 22g to 250g daily; milk from 164ml to 200ml daily; fish portion size from 70g to 120g; meat portion size from 86g to 120g; egg from 15g daily to 40g; nuts from 0g to 8,57g daily. ● Decreases: bread from 220g to 160g daily; vegetables from 351g to 310g daily; jam from 17g to 10g. ● Elimination: white bread, frozen prepared vegetables, canned vegetables, olive oil, nutmeg, yogurt drunk, fruit yogurt and chocolate milk. ● Modification: refined cereals for wholegrains.
14y girl regular	12-17y adolescent girl (ABSPO)	<p>Initial basket: energy content is almost 300 kcal below EFSA recommendations, total fat exceeds the requirements and several micronutrients are not met (iron, zinc, vitamin B12, folate and vitamin D) .</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: oatmeal flakes from 0g to 30g daily; legumes from 0g to 43g daily; mature and cottage cheese from 15g and 2g, respectively, to 23g daily; yoghurt from 22g to 250g daily; milk from 164ml to 200ml daily; fish portion size from 70g to 105g; meat portion size from 86g to 120g; egg from 15g daily to 25g (3 weekly portions); nuts from 0g to 8,57g daily. ● Decreases: bread from 220g to 120g daily; vegetables from 351g to 310g daily; fruit puree from 27g to 18g daily; spreadable and cooking fats from 55g to 40g; jam from 17g to 10g. ● Elimination: white bread, frozen prepared vegetables, canned vegetables, olive oil, nutmeg, yogurt drunk, fruit yogurt, chocolate cake and chocolate milk. ● Modification: refined cereals for wholegrains.
10y boy regular	6-11y boy (ABSPO)	<p>Initial basket: energy content is roughly 400kcal above EFSA recommendations, fat requirements are not met and neither some micronutrients (vitamin B12 and vitamin D)</p>

		<p>Changes</p> <ul style="list-style-type: none"> ● Increases: oatmeal flakes from 0g to 30g daily; rice and pasta from 17g to 20g and 4.50 daily, respectively; legumes from 0g to 41g daily; fruit puree from 13g to 27g daily; mature and cottage cheese from 15g and 2g, respectively, to 23g daily; yoghurt from 22g to 200g daily; milk from 164ml to 200ml daily; fish portion size from 70g to 100g; nuts from 0g to 6,43g daily. ● Decreases: bread from 220g to 140g daily; vegetables from 351g to 200g daily; jam from 17g to 10g; fresh fruit from 220g to 200g daily. ● Elimination: white bread, frozen prepared vegetables, canned vegetables, olive oil, nutmeg, yogurt drunk, fruit yogurt, chocolate cake and chocolate milk. ● Modification: refined cereals for wholegrains.
10y girl regular	6-11y boy (ABSPO)	<p>Initial basket: energy content is roughly 530kcal above EFSA recommendations, fat requirements are not met and neither some micronutrients (vitamin B12 and vitamin D) .</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: oatmeal flakes from 0g to 30g daily; legumes from 0g to 27g daily; fruit puree from 13g to 18g daily; mature and cottage cheese from 15g and 2g, to 17g and 23g daily, respectively; yoghurt from 22g to 200g daily; milk from 164ml to 200ml daily; fish portion size from 70g to 100g; nuts from 0g to 4g daily. ● Decreases: bread from 220g to 120g daily; vegetables from 351g to 200g daily; jam from 17g to 10g; fresh fruit from 220g to 180g daily; ● Elimination: white bread, frozen prepared vegetables, canned vegetables, olive oil, nutmeg, yoghurt drunk, fruit yoghurt, chocolate cake and chocolate milk. ● Modification: refined cereals for wholegrains.
6y boy regular	6-11y boy (ABSPO)	<p>Initial basket: energy content is roughly 750kcal above EFSA recommendations, fat requirements are not met and neither some micronutrients (vitamin B12 and vitamin D).</p> <p>Changes</p>

		<ul style="list-style-type: none"> ● Increases: legumes from 0g to 56g weekly; milk from 164ml to 200ml daily; yoghurt from 22g to 200g daily; mature cheese from 15g to 17.14g daily; cottage cheese from 2g to 17.14g daily; nuts from 0 to 3 portions per week; oatmeal flakes from 0g to 5.70g daily. ● Decreases: bread from 170g to 100g daily; vegetables from 351g to 170g daily; cooking fat from 15g to 10g daily; spreadable fat from 35g to 20g daily. ● Elimination: white bread, frozen prepared vegetables, canned vegetables, olive oil, nutmeg, yoghurt drunk, fruit yoghurt, chocolate cake and chocolate milk. ● Modification: refined cereals for wholegrains.
6y girl regular	6-11y boy (ABSPO)	<p>Initial basket: energy content is roughly 848kcal above EFSA recommendations, fat requirements are not met and neither some micronutrients (vitamin B12 and vitamin D).</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: legumes from 0g to 56g weekly; milk from 164ml to 200ml daily; yoghurt from 22g to 200g daily; cottage cheese from 2g to 11g daily; nuts from 0 to 3 portions per week; oatmeal flakes from 0g to 5.7g daily. ● Decreases: bread from 220g to 100g daily; vegetables from 351g to 140g daily; mature cheese from 15g to 14g daily ● Elimination: white bread, frozen prepared vegetables, canned vegetables, olive oil, nutmeg, yoghurt drunk, fruit yoghurt, chocolate cake and chocolate milk. ● Modification: refined cereals for wholegrains.
2.5y child regular	6y girl (EuSocialCit)	<p>Initial basket: -</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: oatmeal flakes, legumes. ● Decreases: all food amounts are 0.7 lower in respect to the 6y old girl basket. ● Elimination: cocoa powder, mayonnaise, ketchup ● Modification: refined cereals for wholegrains.

Note: DRV: Dietary Reference Values; UL: Upper Limit

Table 8. Changes applied when updating the previous basket (Finland - ABSPO)

EuSocialCit Profile	Departing basket	Changes applied
+65y male regular	+65y older adult (ABSPO)	<p>Initial basket: the energy content is 200kcal above the recommendations, carbohydrates content is not met and neither vitamin D.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: rice portion size from 46g to 70g; oatmeal flakes from 5 to 6 portions per week; legumes from 0 to twice per week; fatter meat from 0 to once per week; bread from 137g to 172g daily. ● Decreases: mature cheese portion size from 27g to 15g; curdled milk portion size from 200ml to 100ml; sour cream portion size from 50g to 40g; cooking cream portion size from 42g to 25g; spreadable fat portion size from 8g to 4g; fruit from 424g to 295g; rice from 4 to 3 portions per week; fresh fruit from 21 to 14 portions per week; lean meat from 6 to 4 portions per week. ● Elimination: white bread. ● Modification: none.
+65y female regular	+65y older adult (ABSPO)	<p>Initial basket: the energy content is 300kcal above the recommendations, carbohydrates content is not met and neither vitamin D and iron.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: rice portion size from 46g to 50g; oatmeal flakes from 5 to 6 portions per week; legumes from 0 to twice per week; fatter meat from 0 to once per week. ● Decreases: bread from 137g to 107g daily; mature cheese portion size from 27g to 15g; curdled milk portion size from 200ml to 100ml; sour cream portion size from 50g to 40g; cooking cream portion size from 42g to 25g; skimmed milk portion size from 200ml to 150ml; potatoes from 239g to 180g; rice from 4 to 3 portions per week; spreadable fat portion size from 8g to 4g; fruit from 424g to 295g; meat portion size from 160g to 140g; lean meat from 6 to 4 portions per week; nuts from 20g daily to 20g every two days; fresh fruit from 21 to 14 portions per week. ● Elimination: white bread. ● Modification: none.

30-65y male regular	18-65y male (ABSPO)	<p>Initial basket: energy content surpasses EFSA recommendations by roughly 100kcal and carbohydrate requirements are not met.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: rice portion size from 50g to 70g; wholemeal bread from 137g to 217g daily; oatmeal flakes portion size from 40g to 63g; oatmeal flakes from 5 to 6 portions per week; legumes from 0 to twice per week; fatter meat from 0 to once per week. ● Decreases: mature cheese portion size from 62g to 30g; cooking cream from 42ml to 25ml daily; rice from 4 to 3 portions per week; fresh fruit from 21 to 14 portions per week; spreadable fat portion size from 8g to 4g; lean meat from 6 to 4 portions per week. ● Elimination: white bread. ● Modification: none.
30-65y male – sustainable	30-65y male (EuSocialCit)	<p>Initial basket: meets EFSA recommendations but changes on food quantities are applied to achieve the sustainability recommendations from EAT-L.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: pasta from 0 to 2 portions per week; legumes from 1 portion and a half to 5 portion and a half per week; oatmeal flakes from 54g to 67g daily; frozen berries from 36g to 100g daily; nuts from 20g to 25g daily; spreadable fat from 18g to 34g daily ● Decreases: bread from 207g to 133g daily; potatoes from 269g to 100g daily; fresh fruit from 329g to 200g daily; charcuterie from 16g to 10g daily; lean meat from 4 to 3 portions per week; fatter meat from 1 portion and a half to 0,75 portion per week. ● Elimination: sour cream, cooking cream ● Modification: skimmed and semi-skimmed milk for full fat dairy.
30-65y male – harmonized sustainable	30-65y male – sustainable (EuSocialCit)	<p>Initial basket: meets EFSA recommendations but changes on food quantities are applied to achieve the sustainability recommendations from EAT-Lancet (EAT-L) and increase comparability between countries.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: cocoa powder from 0g to 5g daily; vinegar from 0ml to 2ml

		<ul style="list-style-type: none"> ● Decreases: none. ● Elimination: breadcrumbs, potato flour, mustard, lemon juice. ● Modification: frozen prepared vegetables for frozen unprepared vegetables; prepared vegetable products for fresh vegetables; frozen fruit for fresh fruit; curdled milk for yogurt; fresh fish split between fresh fish and frozen fish; mature cheese split between mature and cottage cheese.
30-65y female regular	18-65y female (ABSPO)	<p>Initial basket: energy content surpasses EFSA recommendations by roughly 400kcal and carbohydrate requirements are not met, neither iron, B12 and vitamin D.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: rice portion size from 46g to 50g; oatmeal flakes from 40g to 63g; oatmeal flakes from 5 to 6 portions per week; oatmeal flakes from 5 to 6 portions per week; legumes from 0 to twice per week; fatter meat from 0 to once per week. ● Decreases: rice from 4 to 3 portions per week; potatoes portion size from 239g to 180g; mature cheese portion size from 27g to 15g; skimmed milk portion size from 200ml to 150ml; curdled milk portion size from 200ml to 100ml; sour cream portion size from 50g to 40g; cooking cream portion size from 42g to 25g; spreadable fat portion size from 9g to 4g; fresh fruit from 21 to 14 portions per week; lean meat from 6 to 4 portions per week. ● Elimination: white bread. ● Modification: none.
30-65y female - sustainable	30-65y female – sustainable (EuSocialCit)	<p>Initial basket: meets EFSA recommendations but changes on food quantities are applied to achieve the sustainability recommendations from EAT-L.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: pasta from 0 to 2 portions per week; legumes from 1 portion and a half to 4 portion per week; frozen berries from 36g to 100g daily. ● Decreases: potatoes from 154g to 50g daily; fresh fruit from 259g to 150g daily; charcuterie from 16.24g to 10g daily; lean meat from 4 to 3 portions per week; fatter meat from 1 portion and a half to 0,80 portion per week; oatmeal flakes from 54g to 33g daily.

		<ul style="list-style-type: none"> ● Elimination: sour cream, cooking cream ● Modification: skimmed and semi-skimmed milk for full fat dairy.
18-29y male regular	18-65y male (ABSPO)	<p>Initial basket: energy requirements are met but carbohydrate content is scarce.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: rice portion size from 50g to 70g; whole grain bread from 137g to 217g daily; oatmeal flakes portion size from 40g to 63g; oatmeal flakes from 5 to 6 portions per week; legumes from 0 to twice per week; fatter meat from 0 to once per week. ● Decreases: mature cheese from 60g to 30g daily; cooking cream from 42ml to 25ml; rice from 4 to 3 times per week; fresh fruit from 21 to 14 portions per week; lean meat from 6 to 4 portions per week. ● Elimination: white bread. ● Modification: none.
18-29y female regular	18-65y female (ABSPO)	<p>Initial basket: energy content surpasses EFSA recommendations by roughly 300kcal and carbohydrate requirements are not met, neither iron, B12 and vitamin D.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: oatmeal flakes from 5 to 6 portions per week; legumes from 0 to twice per week; fatter meat from 0 to once per week; bread portion size from 30g to 40g; rice portion size from 46g to 70g; fresh fruit portion size from 130g to 165g. ● Decreases: rice from 4 to 3 times per week; fresh fruit from 21 to 14 portions per week; potatoes portion size from 239g to 180g; mature cheese portion size from 27g to 12g; curdled milk portion size from 200ml to 100ml; sour cream portion size from 50g to 40g; cooking cream portion size from 42g to 25g; spreadable fat portion size from 9g to 4g; lean meat from 6 to 4 portions per week. ● Elimination: white bread. ● Modification: none.

14y boy regular	12-17y adolescent girl (ABSPO)	<p>Initial basket: energy content is around 600kcal below EFSA recommendations, carbohydrate requirements are not met, neither calcium nor vitamin D.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: oatmeal flakes from 5 to 6 portions per week; legumes from 0 to twice per week; fatter meat from 0 to once per week; bread from 132g to 227g daily; potatoes portion size from 155g to 240g; rice portion size from 33g to 100g; fresh fruit portion size from 130g to 165g; skimmed milk portion size from 129ml to 200ml; egg portion size from 48g to 58g; nuts portion size from 20g to 30g; rapeseed oil portion size from 7ml to 14ml. ● Decreases: rice from 4 to 3 times per week; fresh fruit from 21 to 14 portions per week; cooking cream portion size from 38ml to 20ml; lean meat from 6 to 4 portions per week. ● Elimination: white bread. ● Modification: none.
14y girl regular	12-17y adolescent girl (ABSPO)	<p>Initial basket: energy content is around 250kcal below EFSA recommendations, carbohydrate requirements are not met, neither calcium, iron nor vitamin D.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: oatmeal flakes from 5 to 6 portions per week; legumes from 0 to twice per week; fatter meat from 0 to once per week; bread from 132g to 207g daily; potatoes portion size from 155g to 180g; rice portion size from 33g to 100g; skimmed milk portion size from 129ml to 200ml; egg portion size from 48g to 58g. ● Decreases: rice from 4 to 3 times per week; fresh fruit from 21 to 14 portions per week; cooking cream portion size from 38ml to 20ml; lean meat from 6 to 4 portions per week; curdled milk from 200ml to 100ml daily. ● Elimination: white bread. ● Modification: none.
10y boy regular	6-11y boy (ABSPO)	<p>Initial basket: energy content is around 400kcal below EFSA recommendations, carbohydrate requirements are not met, neither iron nor vitamin D.</p>

		<p>Changes</p> <ul style="list-style-type: none"> ● Increases: oatmeal flakes from 5 to 6 portions per week; oatmeal flakes portion size from 35g to 40g; legumes from 0 to twice per week; fatter meat from 0 to once per week; bread from 98g to 128g daily; potatoes portion size from 93g to 120g; rice portion size from 29g to 100g; fresh vegetables portion size from 19g to 34g; semi-skimmed milk from 143ml to 150ml daily; egg portion size from 10g to 58g; spreadable fat portion size from 5g to 8g. ● Decreases: rice from 4 to 3 times per week; fresh fruit from 21 to 14 portions per week; semi-skimmed milk portion size from 143ml to 11ml; cooking cream portion size from 37g to 20g; nuts portion size from 20g to 15g; lean meat from 6 to 4 portions per week. ● Elimination: white bread. ● Modification: none.
10y girl regular	6-11y boy (ABSPO)	<p>Initial basket: energy content is almost 150kcal above EFSA recommendations, carbohydrate requirements are not met, neither iron nor vitamin D.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: oatmeal flakes from 5 to 6 portions per week; oatmeal flakes portion size from 35g to 40g; legumes from 0 to twice per week; fatter meat from 0 to once per week; bread from 98g to 128g daily; potatoes portion size from 93g to 120g; rice portion size from 29g to 100g; fresh vegetables portion size from 19g to 34g; egg portion size from 10g to 58g; spreadable fat portion size from 5g to 8g. ● Decreases: rice from 4 to 3 times per week; fresh fruit from 21 to 14 portions per week; mature cheese portion size from 32g to 12g; nuts portion size from 20g to 15g; lean meat from 6 to 4 portions per week. ● Elimination: white bread. ● Modification: none.
6y boy regular	6-11y boy (ABSPO)	<p>Initial basket: energy content meets EFSA recommendations, carbohydrate requirements are not met, neither vitamin D.</p>

		<p>Changes</p> <ul style="list-style-type: none"> ● Increases: oatmeal flakes from 5 to 6 portions per week; legumes from 0 to twice per week; fatter meat from 0 to once per week; semi-skimmed milk portion size from 143ml to 200ml; egg portion size from 10g to 58g. ● Decreases: rice from 4 to 3 times per week; fresh fruit from 21 to 14 portions per week; mature cheese portion size from 32g to 12g; cooking cream portion size from 37g to 20g; nuts portion size from 20g to 15g; lean meat from 6 to 4 portions per week. ● Elimination: white bread. ● Modification: none.
6y girl regular	6-11y boy (ABSPBO)	<p>Initial basket: energy content is around 150kcal above EFSA recommendations, carbohydrate requirements are not met, neither vitamin D.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: oatmeal flakes from 5 to 6 portions per week; legumes from 0 to twice per week; fatter meat from 0 to once per week; egg portion size from 10g to 58g. ● Decreases: rice from 4 to 3 times per week; fresh fruit from 21 to 14 portions per week; mature cheese portion size from 32g to 12g; cooking cream portion size from 37g to 20g; nuts portion size from 20g to 15g; lean meat from 6 to 4 portions per week. ● Elimination: white bread. ● Modification: none.
2.5y child regular	0-5y child (ABSPBO)	<p>Initial basket: energy content is around 50kcal above EFSA recommendations, fat requirements are not met, neither vitamin D, nor zinc exceeds UL.</p> <p>Changes</p> <ul style="list-style-type: none"> ● Increases: oatmeal flakes from 5 to 6 portions per week; legumes from 0 to twice per week; fatter meat from 0 to once per week; rice portion size from 20g to 30g; fresh vegetables portion size from 22g to 13g; fresh fruit portion size from 80g to 100g; semi-skimmed milk from 11ml to 150ml; nuts from 0 to 10g daily.

		<ul style="list-style-type: none">● Decreases: rice from 4 to 3 times per week; fresh fruit from 21 to 14 portions per week; bread from 95g to 80g daily; oatmeal flakes portion size from 30g to 15g; charcuterie portion size from 5g to 2.5g; fresh fish portion size from 80g to 50g; lean meat from 6 to 4 portions per week.● Elimination: white bread, skimmed milk, sour cream and cooking cream.● Modification: none.
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7.2 Pricing instructions for the country teams participating in the EuSocialCit project

7.2.1 Selection of the retailer/store to price food products

Please select a food retailer taking into account the following criteria. The criteria are ordered, so please make sure that you first make a list of potential stores that comply to the first criterium, before moving on to the second criterion and so forth.

- 1. The food products should be available at relatively low prices: The retailer should not necessarily be the cheapest in your country, but among the cheaper half of the market
 - o Please provide any recent information you have on the price level of the store compared to other retailers in your country – this can be based on newspaper comparison, consumer organization comparisons, ...
 - If the store you price is the cheapest but maybe not the most well-spread or accessible, please provide a % price distance (price fork) to another retailer with a larger spread of stores/easier accessible by public transport
 - If the store you price in is not among the cheapest, please provide a % price distance to the cheapest retailer with a large variety of products who is less accessible/had a smaller spread of stores
- 2. Wide variety of food products: conduct a brief check if most of the food products listed on the 'food' excel sheet are available in the store
- 3. Prices are available online for the large majority of products available in the physical store at a similar price level
 - o Please indicate if there are geographical differences in online prices for the retailer and if so, select a metropolitan location
- 4. The store provides online information
 - o Nutritional characteristics (e.g., % fat for charcuterie and meat,...)
 - o Country of origin of fresh fruit, fresh vegetables, fresh meat and charcuterie
 - o Country of origin (aquaculture) for farmed fish or fishing region (FAO) for wild fish.

Please also provide information on:

- A. how well the shops are spread over the country: here you can give geographical (number of shops in country/region + # inhabitants) and/or market share information
- B. how accessible by public transportation the shops are:
 - o Check and note for 3 stores located in or near a large city the distance to nearest point of public transport on google maps and note the address of the stores/link to the store

7.2.2 Selection of stores to price kitchen equipment

Some of the kitchen equipment can be priced in the retailer used to price the food basket (dishwashing liquid, plastic bags, ...). Please indicate in the excels for kitchen equipment the store where you buy each item.

Furniture and household items

The basket includes some furniture and smaller household items (such as plates, glasses, pots and pans).

Please select a store taking into account the following criteria. The criteria are ordered, so please make

sure that you first make a list of potential stores that comply to the first criterium, before moving on to the second criterion and so forth:

- 1. The store should carry a sufficient range of each type of furniture and/or the majority of common household items (e.g. not a few tables, but a variety to choose from) – if in doubt, conduct a brief check. It is not necessary that you find a large variety of alternatives for *each* item, especially for less commonly used items such as egg holders, table coasters, ...
- 2. The items should be available at relatively low prices, but should not necessarily be the cheapest in your country. However, the store should not sell specialty or expensive items only
 - o If you have any recent information on the price level of the store compared to other furniture/houseware stores you are welcome to include this
- 3. Prices are available online for the large majority of products available in the physical store at a similar price level
- 4. The online information on price and products allows you to select items based on certain characteristics (size of furniture, material of kitchen utensils, ...)

Please also provide information on:

- A. How well the physical shops are spread over the country: not a single outlet but a number of different stores spread geographically (if possible, indicate the number of stores in your country and any market share information you might have)
- B. If the shops are accessible by public transportation:
 - o Check and note for 1 store located in or near a large city the distance to nearest point of public transport on google maps and add the address.

Electrical appliances

- 1. The store should carry a sufficient range of each type of appliances
- 2. The items should be available at relatively low prices, but should not necessarily be the cheapest in your country. However, the store should not sell specialty or expensive items only
 - o If you have any recent information on the price level of the store compared to other similar stores you are welcome to include this
- 3. Prices are available online for the large majority of products available in the physical store at a similar price level.
- 4. The online information on price and products allows you to select items based on certain characteristics (e.g. energy labels, delivery cost can be estimated online for large and heavy items,...)

Please provide information on:

- A. How well the shops are spread over the country: not a single outlet but a number of different stores spread geographically (if possible, indicate the number of stores in your country and any market share information you might have)
- B. If the shops are accessible by public transportation:
 - o Check and note for 1 store located in or near a large city the distance to nearest point of public transport on google maps.

7.2.3 Selection of food items

Details on the food items to price and their minimal characteristics can be found in the excel sheets which we will prepare. Please select the **LOWEST price** for each item that fully satisfies the criteria.

Package size. In terms of item size, try to choose items with a ‘similar’ package size as the one indicated in the excel sheets.

Sales: always first write down the cheapest price. Write down the cheapest price **without multipack-volume discounts or promotions of the ‘buy two, get one free’ variety**. For fresh products where the price may change daily due to seasonality, take the prices that are displayed during the moment of pricing. We also include a column ‘Is lowest price per unit a promotion: yes (1) or no (0)’, if the lowest price is an item currently in promotion you can indicate this by putting a 1 in this column, otherwise put 0. If you priced a sales item, **please also note the price before/without discount if this is listed**

Not available: If an item is not available, please write **NA** instead of the price.

Food items

For the products in the ‘food’ sheet, find the **LOWEST PRICE PER KILO/LITER** of available products that satisfy all the criteria. Please indicate the store, the brand of the item, the **content per package in g or ml**, the **number of pieces per package** and the **lowest price per package**. In case there the cheapest item is an item currently in promotion/discounted (no volume discounts), also indicate this in the last column.

Tap water: Please indicate the price of tap water per liter for the metropolitan area where you price the food basket.

Bread is bought in the food retailer unless this is a very uncommon practice in your country (in that case you can use prices from local bakeries). Note the lowest price of the items that satisfy the criteria. If available, choose freshly baked bread rather than prepackaged bread (specify this choice in the column ‘description’).

Fresh products: fresh fruit and fresh vegetables

For fresh fruit and vegetables, we supply an example list of fresh products. You are free to add additional fruits and vegetables to this list but keep the number of variations with a type of fruit and vegetable limited.

- Note the lowest price PER KILO for each type of fruit and vegetable that is available in the store at the moment of pricing
 - o If there is no price per kilo, note the price per item/package size in the ‘description’ column. If possible, use an official nutritional table to look up the average weight of such an item, recalculate the price to a price per kilo and include this information in the excel file. Please also add a reference/link to this table in the first sheet (additional info) of the excel file.
- Indicate if the lowest price PER KILO is a discounted/promotion (no volume discounts) item or not
- Note down the country of origin of the item that you priced
 - o In case the cheapest item is not from one’s own country, indicate the price of the cheapest similar item that has a local country of origin if this is available (own country or if no available product from own country- neighboring countries- see list supplied)
 - *LOCAL product:*
 - BE: product from BE (if no product is available from BE, check NL, FR, LU or DE)
 - ES: product from ES (if no product is available from ES, check Portugal, Morocco, FR)
 - FI: product from FI (if no product is available from FI, Sweden, Norway, Estonia)
 - HU: product from HU (if no product is available from HU : Slovenia, Croatia, Serbia, Romania, Ukraine, Austria, and Slovakia)

- Note if the cheapest item is prepackaged or in bulk (without any packaging material so you could bring your own to the store and use this)
 - o In case the cheapest item is prepackaged, indicate the price of the cheapest similar item in bulk if this is available
- Indicate the lowest price per kilo for a BULK item that is also LOCAL if this is available
- Using a national/regional table indicating the seasonality of fresh fruit and vegetables, please indicate in the excel sheet for each type of fruit and vegetable whether it is in season or not (yes or no) in the period May/June (your country may use a different system, e.g. high season, middle season, low season, ... you can also use this). Please also supply a reference to this table in the first excel sheet (additional info).

Example of part of the fruit excel

Items	Requirements	Description	Lowest price per kilo	Is lowest price per unit a promotion: yes (1) or no (0)	Country of origin of lowest price per kilo	Type of package of lowest price product (bulk or prepackaged)	Lowest price per kilo for LOCAL product	Lowest price per kilo for BULK item	Lowest price per kilo for BULK LOCAL item	In season in May or June?
apples			1.2	-	BE	prepackaged	1.2	1.5	1.5	middle
pears			2	-	FR	bulk	2.5	2	3.1	low
Strawberries			6.44	-	ES	prepackaged	9.5	NA	NA	high

In the Excel sheet you will find additional requirements (no fruit salad, no fresh herbs, ...).

Potatoes

Note the lowest price PER KILO for waxy (firm-boiling), white skin potatoes available in the store at the moment of pricing, as well as the other fields in the list (similar to fresh fruit and vegetables)

Fruit puree, canned fruit, frozen fruit, dried fruit, canned vegetables, frozen vegetables, ...

Note the **lowest price per kilo** for the available types. If no price per kilo is available, please mention the package size. We have provided an example list, but feel free to add items that are also available and sufficiently different from the items on the list.

Legumes

Note the **lowest price per kilo** for the available legumes that fit the requirements. If no price per kilo is available, please mention the package size. We have provided an example list, but feel free to add items that are also available and sufficiently different from the items on the list. The type of packaging (can, tetra pack, glass jar, ...) does not matter, only price the cheapest option.

Nuts

Note the **lowest price per kilo** for the available nuts and seeds in the shop that fit the requirements (without husk, no sugar, fat or salt added, no mixes, do not include nut flour/grounded nuts with the exception of 100% peanut butter). If no price per kilo is available, please mention the package size. We have provided an example list, but feel free to add items that are also available and sufficiently different from the items on the list.

Cheese

Note the **lowest price per kilo** for the available types of ripened (not-cottage cheese type) cheese. The requirement for cheese to be included is that the only ingredients should be milk, curdling agent, salt,

and/or ferments. If no price per kilo is available, please mention the package size. We have provided an example list, but feel free to add items that are also available and sufficiently different from the items on the list., However, since especially for cheese, the store may offer many different types, a varied list of more **common cheese types for your country** is sufficient.

Charcuterie

Note the **lowest price per kilo** for the available types of charcuterie that satisfy the requirements in the shop. We will supply a list of common types but you are free to add local types to this list, given that they satisfy the requirements (max 10 % fat and items have a minimum of 80% of meat).

Also note in the excel file the country of origin of the priced item

- If the Country of Origin of the item is not local, check if there is a **local** similar product and note the price

Meat

Note the **lowest price per kilo** for the available types of meats. There are two lists of meat:

- 'white' meat: these include mostly poultry products (chicken, turkey, guinea fowl, ...), raw meat only, no bones
- 'red' meat: these include meats with a fat % of max 10%, raw meat only, no bones

We supply a list of more common meat types but you are free to add local types to this list. However, please check the % fat level (usually displayed on retailers' websites as x g of total fat per 100 g in the product details) to make sure it qualifies.

Also note in the excel file the country of origin of the priced item

- If the Country of Origin of the item is not local, check if there is a **local** similar product and note the price

Fresh fish, frozen fish, canned fish

Note the **lowest price per kilo** for the available types of fresh and frozen fish. We supply a list of fish types, but you are free to add local types to this list. If you do not find a type of fish, just leave the line blank. For fresh and frozen fish: note prices of 'unprepared' fish (no smoked fish, not a fully prepared fish dish or fish fingers coated in breadcrumbs). Shellfish, squid, ... can also be included in this list.

Additionally, for frozen and fresh fish: for the cheapest per kilo item write down the Country of origin.

This is either:

- **Country of farming** for farmed fish . If the fish has a **ASC label, it is farmed fish**.
 - o If fish is not farmed locally, check if there is a local alternative and write down the price of this local alternative
- **Fishing region** for wild fish. If the fish has a **MSC label, it is wild fish**
 - o If fish is not caught locally (FAO's not in the list supplied for your country), check if there is a 'local alternative and write down the price.

WILD FISH LOCAL REGIONS (FAO):

For Spain: 27, 37 & 34

For Finland, Belgium and Hungary: 27 and 37

7.2.4 Selection of kitchen equipment

CONTENTS of the basket: We based the list of kitchen equipment on the previous lists from the ABSPO/Pilot/improve projects. Some items are marked in red, these were items not included in all countries. We ask you to

- price ALL items in the list, including the red items

- indicate for the red items if according to your country team, this item should be included in the kitchen equipment list for a minimal food reference budget for all types of active and non-active age individuals or not.

AMOUNTS: In order to be able to achieve maximal cross-country comparability, we have aligned some of the (slightly divergent) amounts to be more comparable. Please check if you agree with the proposed amounts, if not provide a clarification and alternative for your own country.

Furniture, kitchen equipment, ... other than electric appliances

For each item select and note the LOWEST price of the item per piece that satisfies all the requirements, taking into account the following:

Availability : Only consider items that are available for sale at the time of pricing. Do not take prices from an out-of-stock item.

Sales: Write down the cheapest price. If the cheapest item is a promotion or discounted or sales price, note this in the column 'Is lowest price a promotion: yes (1) or no (0)'. If you priced a sales item, please also note the price before/without discount if this is listed

Write down the **store**, a short item **description** if needed and **the price** per piece. Sometimes we ask for a set price, if this is the case, it is indicated in the requirements. Some items are sold in a set (e.g., plates, towels). If we ask a price per piece, you can **recalculate the price of a single 'item'** (e.g. if you buy a set of 6 big plates, divide the total price by 6). Please note in a remark the original set price and the number of items it contained.

Electric appliances

Note the price of the item that satisfies all the criteria with the LOWEST price, taking into account the following: Write down the store, the price for each item and the requested details for each item.

Availability : Only consider appliances that are available at the moment of pricing or with a delay of no more than TWO weeks. When a web shop indicates an item is not available (without a specified delay), do not take this item into account.

Sales: Write down the cheapest price. If the cheapest option is a promotion or sales item, indicate this in the column 'Is lowest price a promotion: yes (1) or no (0)'. If you priced a sales item, please also note the price before/without discount if this is listed

Energy labeling: For some items, one of the requirements is the energy label. For some items, we also ask you to price the cheapest option with an energy label that is one 'grade' better than the one required by the minimal budget. The required label is indicated in the Excel sheet.

Delivery costs: For the freezer, refrigerator, stove and dishwasher: also check the **delivery cost** of these items to a first floor address approx. 15 km from the store. If delivery is not free, please try to estimate the delivery cost for each item separately and write it in the excel sheet in a separate column ('delivery cost large items').

7.3 Overview of the food reference budgets for different profiles

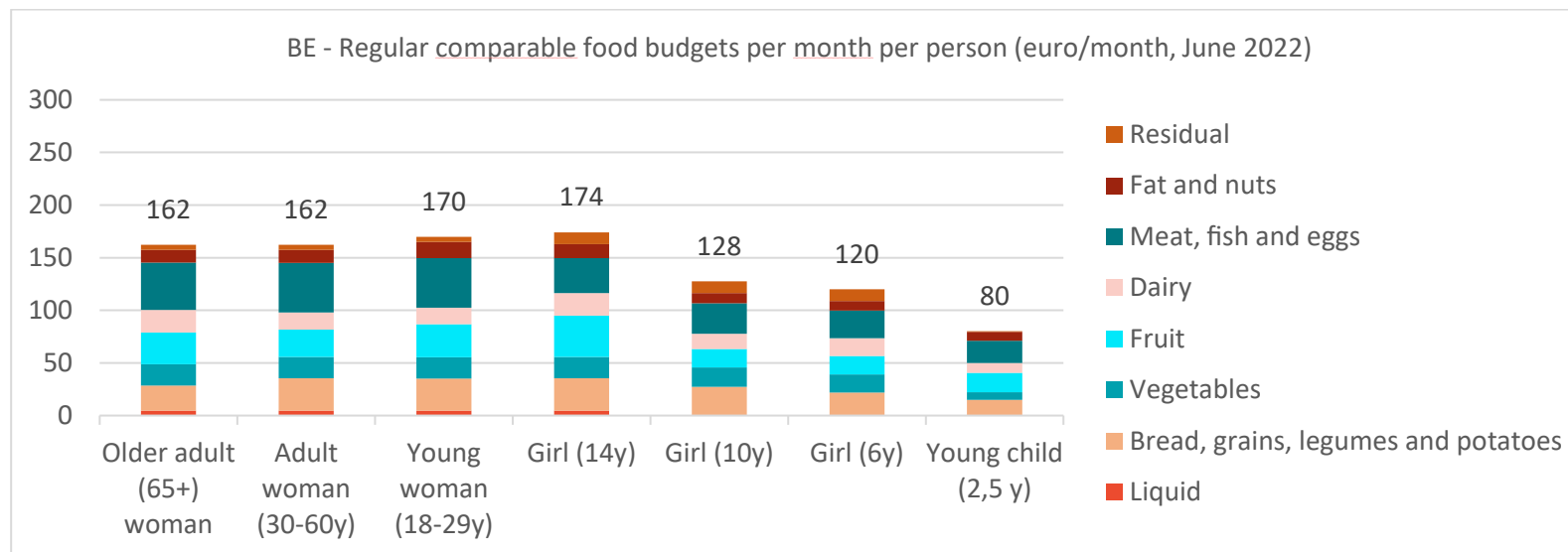


Figure 17. Overview of food budget per person, female profiles, excluding kitchen equipment, in Belgium (EUR/month, June 2022)

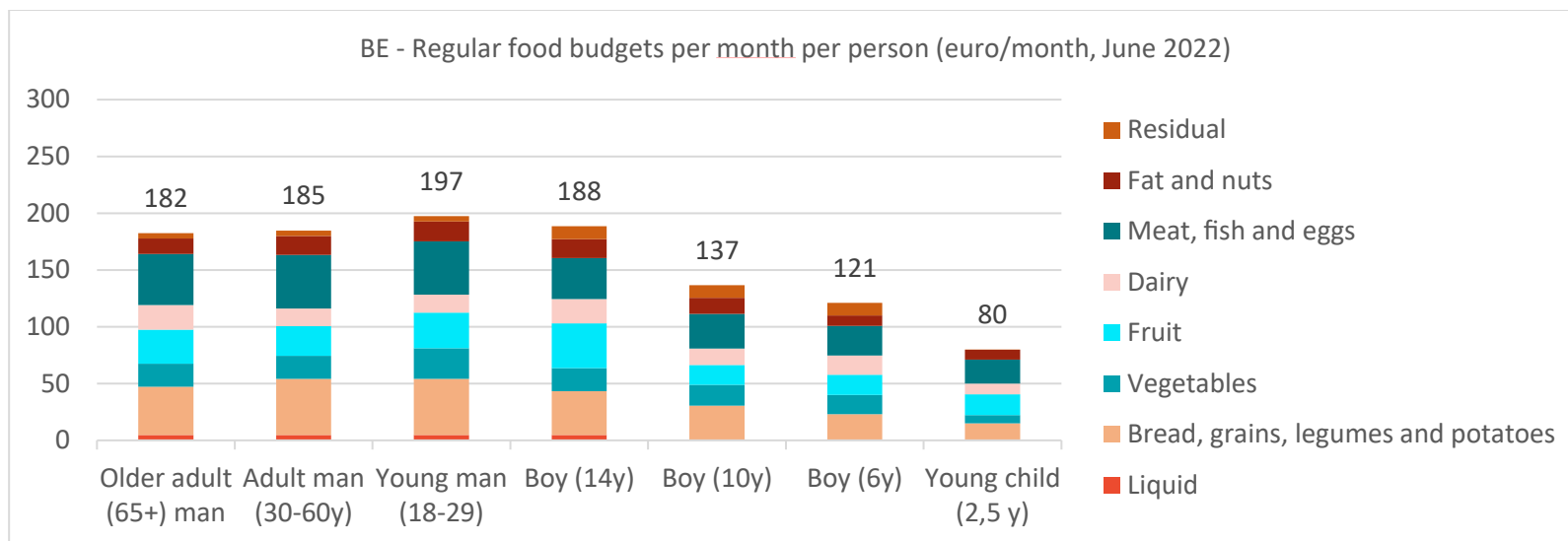


Figure 18. Overview of food budget per person, male profiles, excluding kitchen equipment, in Belgium (EUR/month, June 2022)

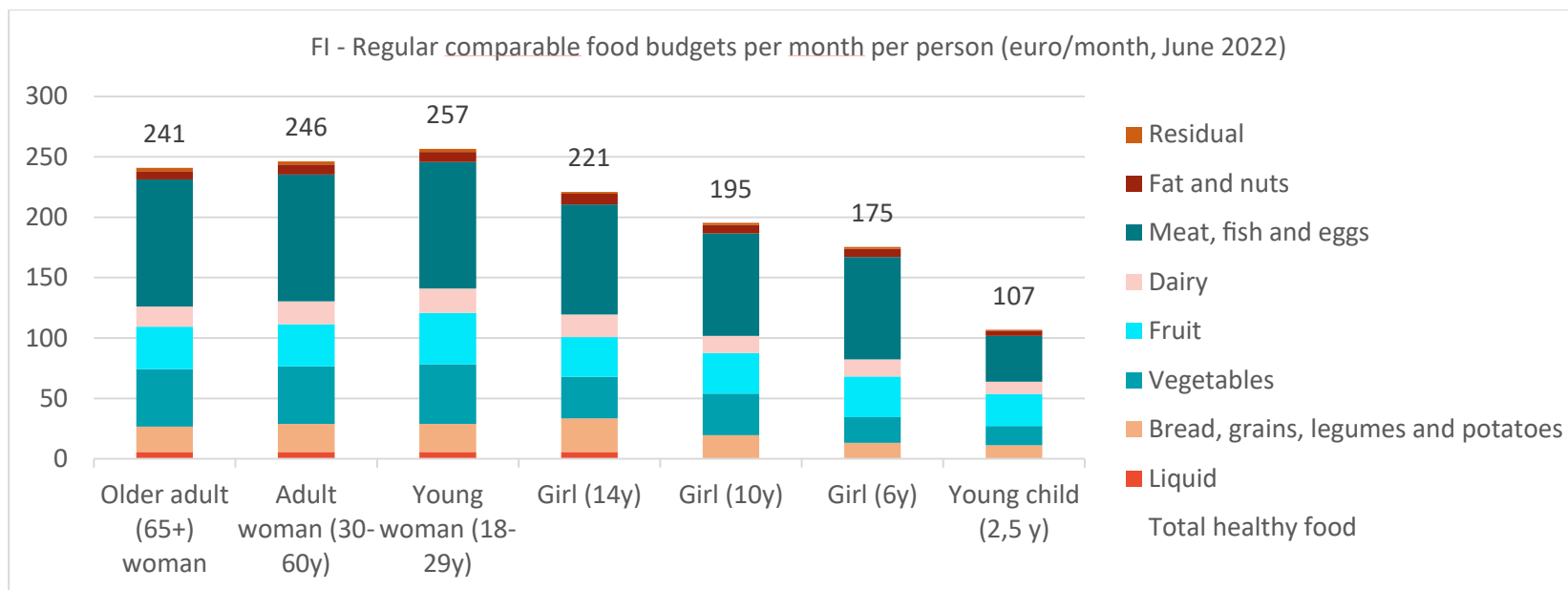


Figure 19. Overview of food budget per person, female profiles, excluding kitchen equipment, in Finland (EUR/month, June 2022)

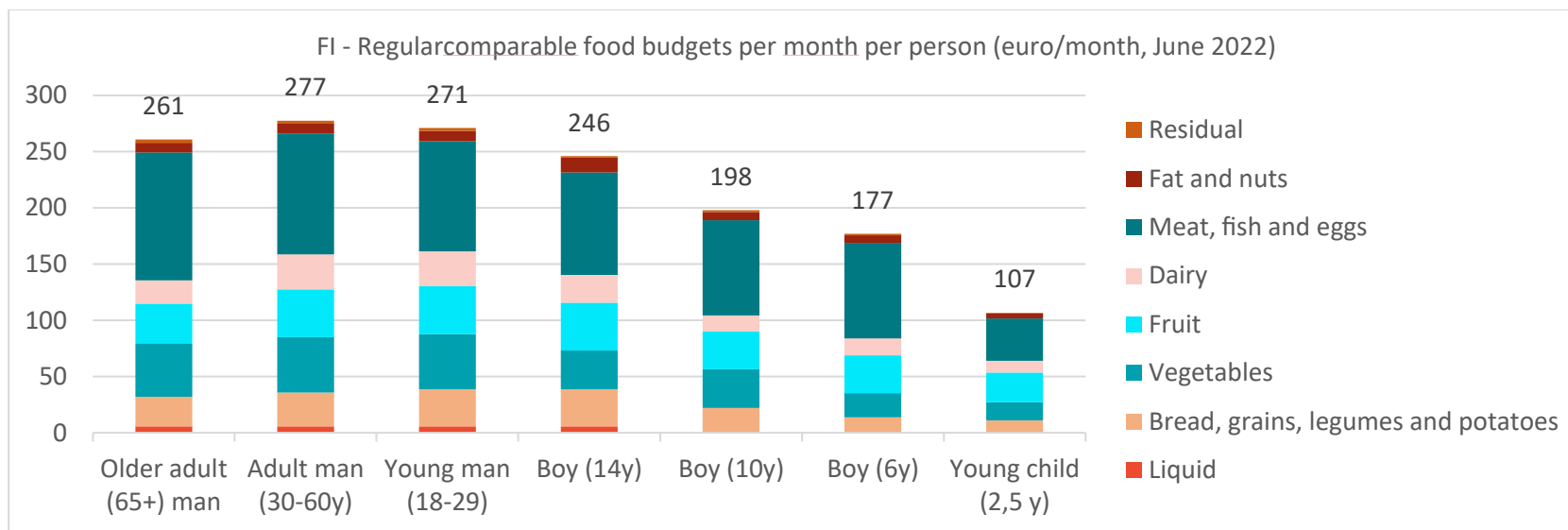


Figure 20. Overview of food budget per person, male profiles, excluding kitchen equipment, in Finland (EUR/month, June 2022)

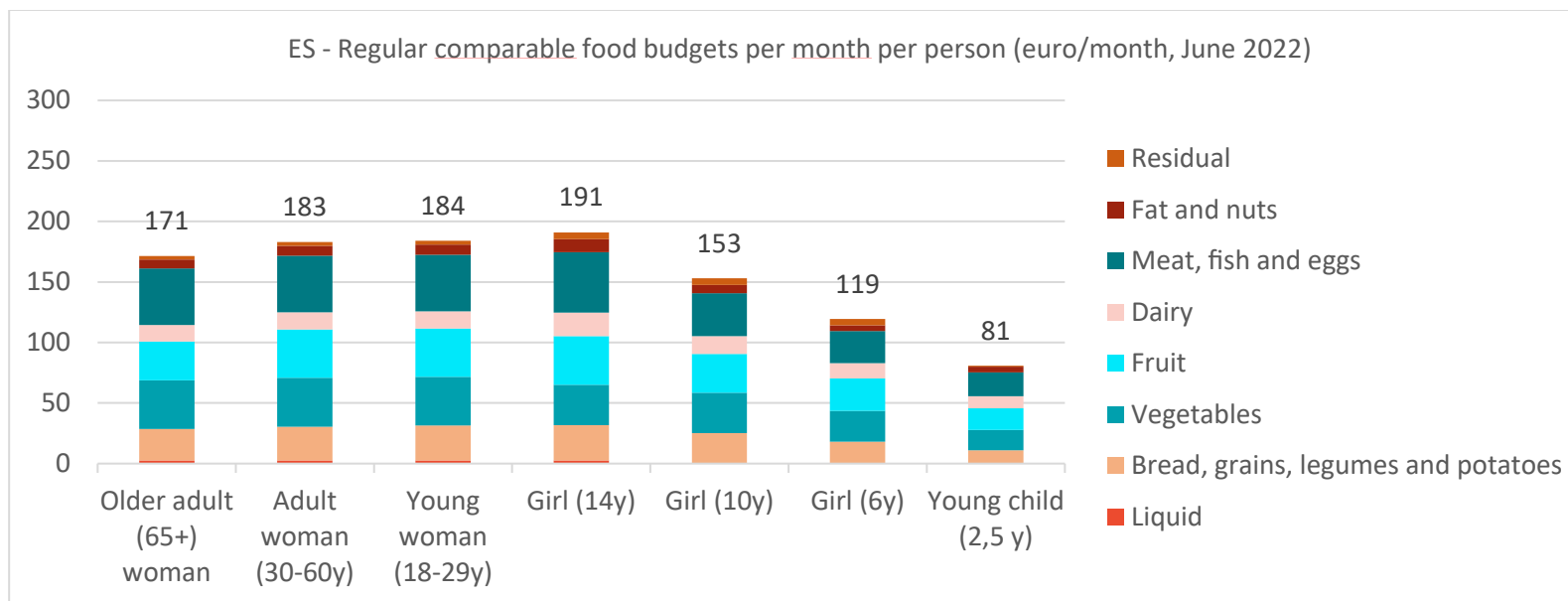


Figure 21. Overview of food budget per person, female profiles, excluding kitchen equipment, in Spain (EUR/month, June 2022)

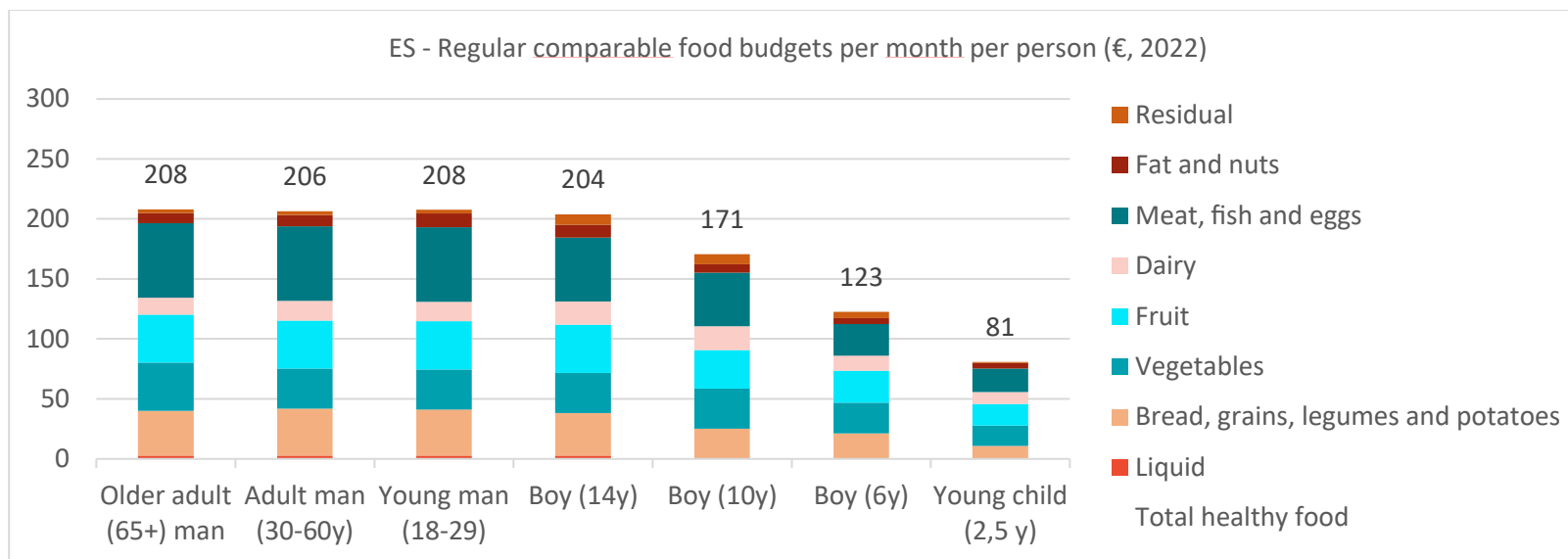


Figure 22. Overview of food budget per person, male profiles, excluding kitchen equipment, in Spain (EUR/month, June 2022)

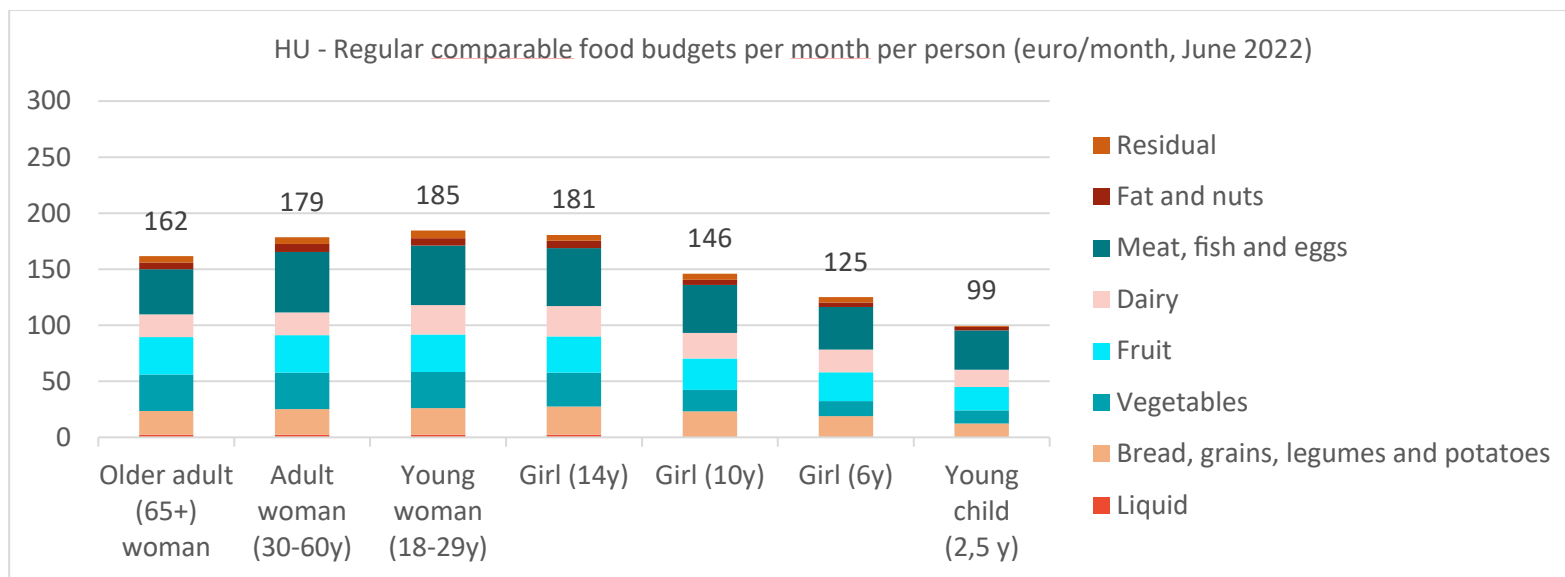


Figure 23. Overview of food budget per person, female profiles, excluding kitchen equipment, in Hungary (EUR/month, June 2022)

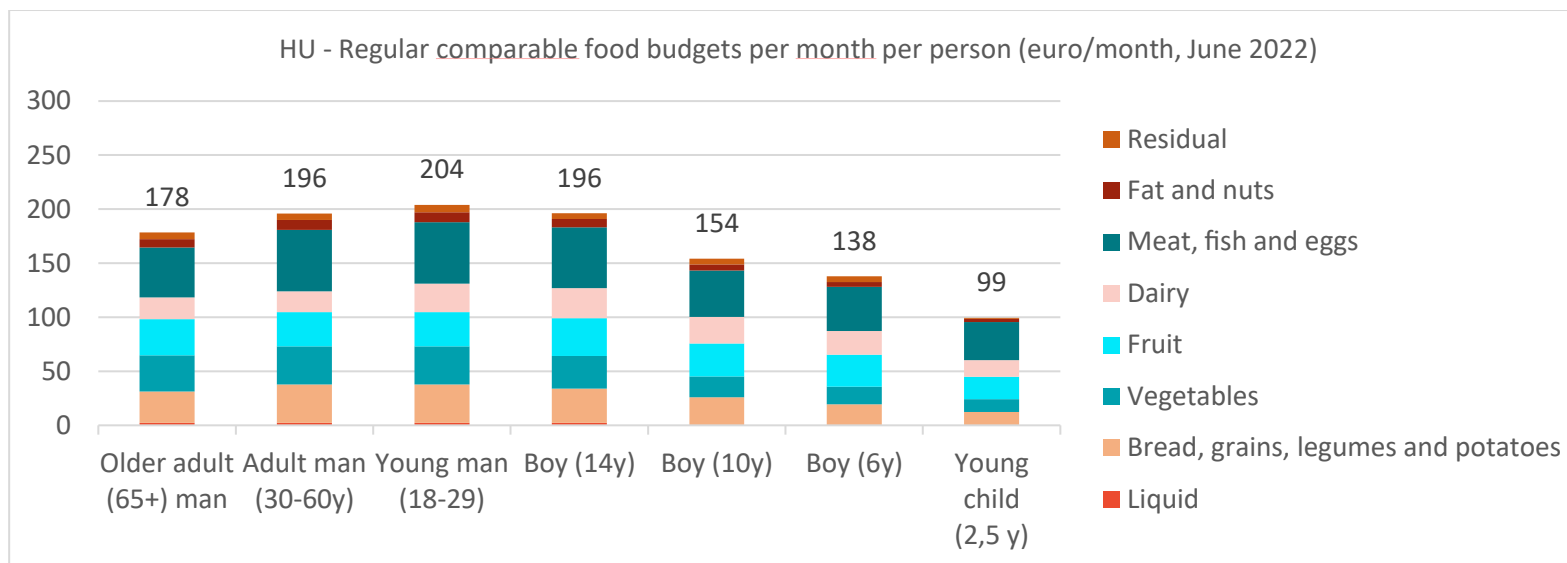


Figure 24 Overview of food budget per person, male profiles, excluding kitchen equipment, in Hungary (EUR/month, June 2022)

7.4 Overview over prices per kilo for the different sustainability criteria at the pricing level

Table 9. Unit prices in EUR/per kilo for the different sustainability criteria at the pricing level in Belgium, Finland, Spain and Hungary (June 2022)

Price/kilo	BE			FI			ES			HU		
	base	local	local, in bulk, in season	base	local	local, in bulk, in season	base	local	local, in bulk, in season	base	local	local, in bulk, in season
Potatoes	1,1	1,1	1,49	0,66	0,66	0,66	1,19	1,19	1,79	1,04	1,04	1,76
fresh fruit	2,14	3,64	5,49	2,52	22,44	2,79*	2,29	2,83	2,41	2,2	3,63	2,01
fresh vegetables	1,56	1,74	3,8	2,5	7,27	4,22*	2,1	2,17	1,79	2,2	3,02	2,58
charcuterie	11,97	18,14		12,38	12,22		15,37	15,37**		13,99	14,87	
fresh fish	19,93	36,61		16,63	20,1		7,89	8,26		13,12	8,07	
frozen fish	8,72	13,9		16,1	26,17		6,56	10,33		12,28	12,28**	
lean meat	9,07	9,07		11,87	11,87		6,87	8,06		8,82	8,67	
fatter meat	11,12	10,84		13,47	16,27		6,67	6,73		9,54	13,3	

Notes:

For charcuterie (lean), fresh fish, frozen fish, lean meat and fatter meat we only applied the 'local' criterion.

*There are no food items available meeting all three criteria of local, in bulk and in season. Therefore, the criterion of seasonality is left out.

**There are no food items available meeting the criterion 'local' so the 'base-price per kilo' is appli