 doi:10.20944/preprints202210.0445.v1

Article

Tell Me What You Waste and I'll Tell You Who You Are. An Eight-Country Comparison of Consumers Food Waste Related Habits

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Abstract: Starting from an original survey conducted in eight countries in 2021 (Canada, China, Germany, Italy, Russia, Spain, UK, and USA), this research explores the relationship between household food waste and dietary habits in a cross-country comparative perspective. 8,000 questionnaires were recorded from samples representative of adult population of each country through an online survey conducted between the 13th and the 24th of August. The questionnaires were built on the work of Waste Watcher International Observatory on Food and Sustainability, an international observatory of social, behavioral and lifestyles dynamics behind household food waste. Relationship between per capita self-reported amount of food waste (expressed in kilocalories) and self-declared dietary habits (Traditional, Healthy and Sustainable, Vegetarian, Smart, Confused) was estimated using multiple linear regression models. Results show that Smart diets are associated with higher values of food waste in Canada, Spain, UK and USA. Vegetarian diets are associated to lower food waste values in China, Germany, UK and USA but not in Italy, Russia and Spain. Since the share of population adopting a Smart diet is on average 2.7% of the sample, interventions for food waste reduction should focus on this specific type of consumers, often associated to larger amounts of food waste.

Keywords: household food waste; diets; food choices; dietary patterns

1. Introduction

Food waste is recognized as one of the most important global manifestations of inefficiencies of food systems. The UN Food System Summit 2021 has emphasized the multiple impacts of food waste in terms of environmental and economic impacts. Its call for action has been further spotlighted by the UN Framework Convention on Climate Change's 26th Conference of the Parties (COP26) that emphasized how climate change responses require to couple public interventions with individual actions. Also, EUROSTAT estimates that in 2020 around 127 kg of food waste per inhabitant were generated in the EU, for a total of almost 57 million tons in for the whole area[1].

A large part of literature allocates to consumers the responsibility for the higher portion of food waste both in industrialized [1] and non-industrialized countries [2]. As a result, a growing attention has been dedicated to the consumption stage which has been recognized as an essential behavioral issue where multiple, interrelated and competing drivers play an influential role [3].

[1] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Food_waste_and_food_waste_prevention_-_estimates

 doi:10.20944/preprints202210.0445.v1

Overall food waste behavioral drivers include - at least - preferences like taste and cultural issues [4], habits as the frequency of shopping [5], attitudes related to thoughts and feelings [6], social norms [7] as well as knowledge and skills. Food can be wasted due to poor understanding of date labels or of food storing practices to maximize shelf life [8]. Similarly, food waste can be related to the lack of ability in food preparation and portioning [9,10]. Some attention has been given to consumers individual concerns for food waste implications and therefore to their understanding of food waste environmental [11], economic and social impacts [12,13]. Along with individual capacity and concerns, several authors suggested considering opportunities such as local shopping options [14] and the availability of high-tech kitchen appliances [15]. Demographics also play a role in the generation of food waste. Those factors include household size [16,17], household composition as age, presence of children or the relationship structure in the house [16], employment status [18], income [19] and education level [15].

However, dietary patterns have been rarely studied as possible drivers of household food waste. Recent research has focused on the link between diets in terms of nutrients intake and sustainability both at aggregate [20] and consumer level [21] addressing indirectly the connection with food waste [22]. Also, Reynolds et al (2019) show that effective strategies for reducing food waste at consumer level include changes in sizes and type of plates and interventions aimed to increase the consumption of vegetables. This might indicate that the shift toward healthy diets can be part of food waste reduction strategies [23]. From this early research some promising insights seem to suggest that the research gap between dietary patterns and food waste is worth enquired about as it should be considered when developing waste reduction strategies.

Starting from an original survey conducted in eight countries in 2021 (Canada, China, Germany, Italy, Russia, Spain, UK, and USA) by Waste Watcher International, this work aims at exploring the relationship between food waste at household level and dietary habits and their related food choices in a cross-country comparative perspective.

The paper is structured as follows: Section 2 outlines the survey and the methodology applied in the study; in Section 3 and 4 results are shown and analyzed in the frame of existing literature. Finally, Section 5 discusses conclusions and implications for research and policy.

2. Materials and Methods

2.1. Subsection

This study builds on the work of the Waste Watcher International Observatory[2] on Food and Sustainability that provides knowledge and tools for investigating social, behavioral and lifestyles dynamics behind the household's food waste by focusing on its economic, social and environmental impacts. Among its activities, the Waste Watcher International Observatory in 2021 carried out a survey in 8 countries, U.S., Spain, Germany, Great Britain, Russia, China, Canada, and Italy, to enquiry food waste and consumption habits in a cross-country comparative perspective. A professional market research organization, IPSOS[3], was contracted for the recruitment and data collection of the survey for all countries.

A structured questionnaire was given to a selected sample from each country, with twenty items that investigated food purchasing behaviors, food diets, an approximate measure of waste of products for the main food typologies. For each country, the sample included 1,000 interviews for a total of 8,000. The sample was selected for each country to be representative of the adult population (18+ years old) with representative quotas for gender, age, and regions. The survey was conducted online between the 13th and the 24th of August 2021 with CAWI methodology, for a total of 15 minutes for each interview. All

[2] https://www.sprecozero.it/waste-watcher/

[3] https://www.ipsos.com/en

 doi:10.20944/preprints202210.0445.v1

respondents gave informed consent before filling out the survey which was compliant with the General Data Protection Regulation (GDPR).

2.2. Defining diets and a measure for household food waste

The estimation of food waste generated by the households included in the survey was based on self-reported data from respondents, who were asked to declare the quantity of food wasted during week prior to the survey, according to 41 typologies of food. To minimize biases, respondents were asked to report indicative quantities of food wasted per typology (e.g., a cup of vegetables, the number of pieces of fruit). The amount of wasted food was then estimated considering an average value of the weights associated to the indicative measures. Six out of 41 categories were excluded, because of their marginal contribution to the overall level of declared food waste (e.g., alcoholic and non-alcoholic beverages, fats for cooking and sauces for seasoning). Then the 35 left categories of food indicated in the questionnaire were merged into 8 macro-groups namely (i) fresh fruit, vegetables, and legumes (FVL), (ii) egg and dairy products, (iii) fresh seafood, (iv) frozen products, (v) fresh meat including cured, (vi) processed and ready food, (vii) starchy products excluding potatoes and (viii) sweet products. The total perceived quantity of food waste was calculated at household level for each macro-group and divided by the size of the household.

To provide an estimation of the nutritional value of food wasted instead of its value in terms of weight or costs, the quantity of Kilocalories (Kcal) wasted in respondents' households was computed. Adopting the Kilocalories as scale to estimate the quantities of wasted food is a method widely adopted in the literature on food waste ([24–27] among others) as it allows to overcome the problem of aggregation of diverse types of wasted food, by assessing their impact on total waste in terms of energy instead of weight, providing more generalizable results.

This approach on food waste measurement, focusing on the caloric value of wasted food, may overrepresent the influence of calorie-dense foods, in comparison to nutrient-dense foods such as vegetables, fruits, seafood, and dairy products that are wasted at high rates in terms of volume. However, the impact of those products on overall sustainability of the food system is disproportionately high, due to the large amount of resources needed to produce them [28–30]. This makes their possible overrepresentation consistent with the aim of assessing the overall impact of household food waste.

As first step, the average quantity of Kcal per 100g was calculated for each macro category of food. Then, these values were multiplied by the corresponding declared quantities of food waste. The estimation of the average kilocalories values was conducted using the nutritional values of foods included in a dataset elaborated by the Italian Council for Research in Agriculture and the Analysis of Agricultural Economics[4] (CREA). The dataset includes an extended set of validated data on nutritional characteristics of a large variety of food. The average values of kilocalories per 100 grams of food related to the 8 macro categories considered in this study is reported in Table 1.

Table 1. quantity of Kcal per 100gr of food.

Category of food	Kcal (100g)
Meat	201.4
Fish	72.3
Fruit, Vegetables and Legumes, incl. potatoes (FVL)	57.3
Egg and Dairy	228.6
Starchy foods (excl. potatoes)	340.9
Sweets	247.3

[4] https://www.alimentinutrizione.it/sezioni/tabelle-nutrizionali

 doi:10.20944/preprints202210.0445.v1

Ready-to-eat meals[1]	145.1
Frozen[2]	116.4

Source: authors elaboration on CREA data

Note: [1]: average of the values of Kcal/100g of starchy foods, FLV, Pizza Napoletana Margherita STG (253 Kcal/100g, provided by CREA), Fast Food Hamburger (251 Kcal/100g, provided by CREA), French Fries (192 Kcal/100g, provided by CREA); [2]: average of the values of Kcal/100g of Meat, Fish, FVL

In the questionnaire, the type of diet followed by respondents was explored through a set of 10 statements. Respondents had to select the sentence that more accurately described their prominent dietary pattern. These statements were developed to identify not only well-defined diets like vegan and vegetarian, but also to capture the heterogeneity behind omnivorous eating regimes. From this question and its statements, five categories of diets have been defined: (i) Vegetarian, (ii) Healthy & Sustainable, (iii) Traditional, (iv) Smart and (v) Confused. Group (i) includes individuals that self-declare to be vegetarian so that exclude meat and fish products; group (ii) consist of individuals that declared to be careful with fat intakes and to prefer biological and/or local products; group (iii) encompass respondents following a Mediterranean diet or other country-specific traditional cousins; group (iv) includes individuals that eat mainly pre-packaged, ready-made and convenience meals; group (v) refers to respondents that do not identify with any particular dietary pattern and self-declare to have an irregular and confused eating regime.

Finally, 84 observations have been excluded from the sample as individuals that defined themselves "vegan" were declaring a non-trivial meat consumption. A reason for this is that "vegan" can refer also to a lifestyle that is influenced by current trends and does not always correspond to a solid food choice. Those observations were distributed independently according to age, gender and country. The total sample was composed of 7916 observations.

2.3. Data analysis

An exploratory analysis with descriptive statistics was performed. The relation between household per capita food waste amount (expressed in Kcal) and type of diet was estimated using multiple linear regression to test for correlations, with food waste as the dependent variable and factor variables for each type of diet as independent variables. Interactions between country factor variables and diets factor variables were included in the model to account for heterogeneous cross-country effects of diets. Several socio-demographic variables were also integrated as controls including age, gender, education level, living arrangement (e.g., living on their own, living in couples), and a factor variable for the presence of children in the household. An alternative specification was also tested in which different regressions were adopted to estimate the differences in household food waste for each type of diet compared to all the others. Results are coherent with the main specification and are presented in Appendix A.

3. Results

3.1. Descriptive statistics

The sample composition in terms of demographics is illustrated in Table 2. The European countries plus UK and Canada are similar in terms of mean age that vary between 47.8 and 49.9 years old. China and Russia present quite lower mean age (39.7 and 44.6 respectively) while the USA present a mean age quite close the sample average.

The proportion of males is similar across countries with a quite balanced proportion with females. On the other hand, the proportion of households with children living in it (both underage and of age) is highly different across countries: it goes from the 63% of China down to the 22% in the USA. Germany, Canada, and UK also present a percentage

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of families with children in the house below the 30% while Italy, Spain and Russia are above 40%. This clearly reflects distinct cultural habits in terms of living standards and traditions. It is worth noting that countries also differ regarding living arrangements: in China nearly 78% of the respondents live in couple while only the 22% lives on their own or in other living conditions. Other countries with higher shares of people living in couple are Italy, Spain, and Russia. On the opposite side, in Germany only the 53% of the sample declared to live in couple while the 33.1% decaled to live on their own and the 13.5% have other living arrangements.

Regarding education, most of the sample is split between medium and high education with a residual share of respondents that reached only a low level of education. Across countries, these shares vary considerably. The highest proportion of people with a high education level is in China (78%) because these types of surveys tend to overrepresent the urban population in this country, thus supporting the comparability of populations across the selected countries.

Table 2. Demographic composition of the sample.

	Italy	**Germany**	**China**	**USA**	**Spain**	**Canada**	**UK**	**Russia**	**Total**
Mean age	49.9	49.5	39.7	46.5	47.9	47.8	48.1	44.6	**46.7**
Share (%) of Males in the sample	0.48	0.50	0.51	0.48	0.49	0.47	0.49	0.45	**0.48**
Children in HH	0.44	0.28	0.63	0.22	0.47	0.26	0.26	0.52	**0.39**
Education: Low (% share of sample)	1.90	0.40	0.00	0.10	3.20	5.90	0.40	0.60	**1.56**
Education: Medium (% share of sample)	64.00	76.10	22.00	52.60	40.00	32.50	62.00	39.20	**48.55**
Education: High (% share of sample)	34.10	23.50	78.00	47.30	56.80	61.60	37.60	60.20	**49.89**
Living on their own	15.30	33.10	11.60	30.20	14.40	30.20	26.20	14.20	**21.90**
Living in a couple (w/o children)	66.40	53.40	77.90	45.70	66.30	50.30	54.80	66.20	**60.12**
Other (e.g., single parents, friends, roommates)	18.30	13.50	10.50	14.10	19.30	19.50	19.00	19.60	**17.97**

Regarding diet habits across countries (reported in Figure 1), more than half of the population in Italy (55.2%) and Russia (54.4%) follow a Traditional type of diet, with Spain (46.1%) and China (47.1%) just below. China also presents the biggest share of respondents declaring to follow a Healthy and Sustainable diet (39.5%), with Spain (30.7%), Germany (16.0%), and Italy (28.0%) close following. Respondents self-declaring to be Vegetarians are more frequent in UK (5.5%), Germany (5.0%) and Canada (4.8%). USA (5.4%), UK (4.1%), Canada (3.3%) and Germany (3.0%) present higher shares of respondents that declare to follow a Smart Diet. Similarly, Germany (42.7%), USA (38.7%), Canada (38.4%) and UK (29.5%) have higher shares of Confused diets.

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Figure 1. Answer to the question "How would you define your diet?" - Percentages by country.

Analyzing food waste measured in Kcal per person (Figure 2) it is possible to notice that people who are following a Smart diet profile are those who declare the highest value of calories wasted (4428.6). Quite below but still above the sample average, there are those who declare to follow a Vegetarian type of diet (2647.7). On the opposite side people declaring to be following a Traditional type of diet (1588.3). Around the sample average individuals who follow Healthy & Sustainable (1952.7) and Confused (1782.3) types of diet.

Age seems to be negatively associated with the number of Kcal wasted as older the cohort, smaller appears to be the mean (from 2886.8 to 1123.6). Of course, this might be connected to the fact that elderly usually need less calories per day [31]. According to previous results among literature, men waste more food than women (2018.0 vs 1711.7) as well as people with a lower education level (2624.2) compared to medium (1823.9) and high (1871.4) levels of education [32,33]. A strong difference can be observed also between people that do not live with their children (2216.2) that waste quite more than those who have sons/daughters in the house (1385.8 - with no significant difference regarding the age of children). According to the relationship status and/or the living arrangement it is worth noting that people that live on their own significantly waste more (3475.6) that people living in couple (1412.3) or in other living/relationship arrangements like single parents or living with friends and roommates (1389.7). Finally, across countries, USA presents the highest level of food waste (2854.9) while Russia presents the lowest (1114.6). In between the other countries with Canada (2213.0), China (2181.4) and Germany (2048.8) above the sample average (1860.1) and UK (1771.6), Spain (1421.0) and Italy (1275.4) below.

When analyzing the distribution of food waste (measured in calories) with respect of diets and food categories (see Figure 3), it is worth noting that across all diet profiles, the type of food most wasted in terms of calories is starch. Regarding meat, vegetarian respondents declare a certain number of wasted calories from meat even though the median is set to zero. As stated before, while the question on diet is directly addressing the interviewed, the amount of food waste is measured at the household level where people with different types of diets can live together. Also, regarding meat, the group that presents a distribution more prone to higher values is the one that follows a “Smart” type of diet. The same also happens for the other food categories, in particular for Egg & Dairy, Ready and Sweet products which seem to be wasted more for this type of diet. On the opposite

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side, for people following a traditional type of diet, distribution presents lower maximum values for almost all the food categories. Fish and Frozen products are the types of food that seem to generate less waste across all diets. Regarding FVL, when measured in weight, waste for this food category is higher for vegetarians and Healthy & Sustainable types of diet, it is worth noting that this food is poor in calories, it turns out to contribute very little to global waste.

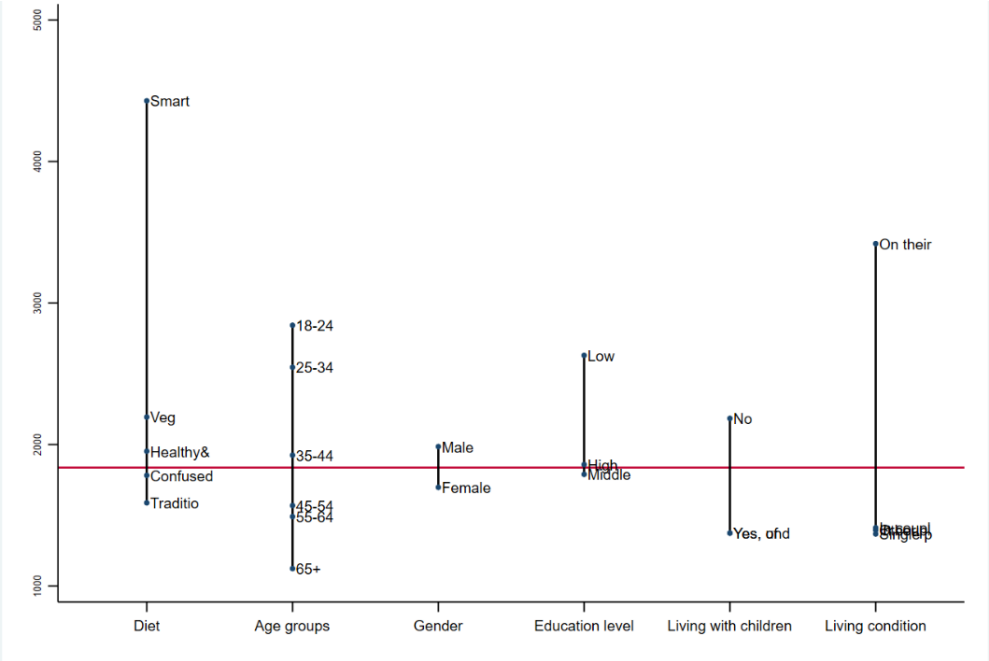

Figure 2. Mean of Food waste per person per week measured in Kcal – values for all countries.

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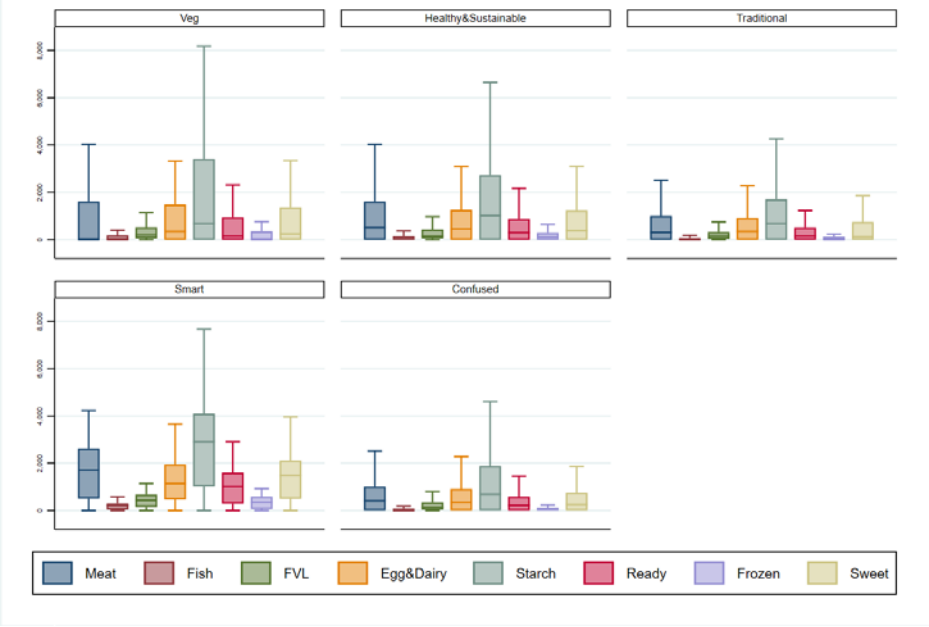

Figure 3. Mean of Food waste per person per week measured in Kcal – values for all countries.

The adoption of food waste-reducing behaviors by respondents is ferly frequent among respondents from all countries, where above half of the respondents declare to observe them always or often. However, some differences can be identified related to the typologies of self-declared dietary habits, as reported in Table 3.

Table 3. Adoption of food waste reduction behavior per typology of diet (% of respondents declaring always and often).

	Use of a shopping list	Proper storage and use of leftovers	Food stock awareness	Use of food products even shortly after expiration date
Vegetarian and Vegan	69.1%	78.4%	69.9%	73.7%
Healthy and sustainable	70.7%	76.2%	79.4%	74.0%
Traditional	67.7%	75.7%	78.4%	73.9%
Smart	58.7%	60.1%	70.7%	70.7%
Confused	66.5%	74.9%	68.6%	78.0%

Among food waste reduction behavior, the use of food products after the expiry date is the most frequent among respondents of all countries, followed by the awareness of food stock content and organization. The use of a shopping list, while quite widely adopted, is the less frequently adopted behavior.

Respondents declaring to adopt a Smart diet are the less likely to not use a shopping list (58.7%), to have a proper knowledge of the content and the organization of their food stock (60.1%) and to use edible food products even after the expiration date if they are still safe (70.7%).

On the other side, respondents declaring to adopt Traditional and Healthy and Sustainable diets adopt more frequently behaviors with a positive impact on food waste reduction. In particular they present the highest levels of awareness about the content and organization of their food stock (78.4% and 70.7%), of proper use and storage of leftovers (75.7% and 76.2%), and of the use of food products after expiration date if they are still edible (73.9% and 75%).

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3.2. Regression results

The last step of data analysis was the estimation of multiple regression models, to investigate the relationship of dietary patterns on the quantity of household food waste produced by different consumers typologies, controlling for several socio-demographic. In particular, the regression model includes factors as country (reference value: Italy), typology of diet (reference value: Traditional), age in completed years, gender (reference value: Male), living arrangement (reference value: on their own), education level (reference value: Low), and the presence of children (reference value: Yes, of age). Coefficients of the regression model are illustrated in Figure 4, with the red line indicating coefficients set on zero for the reference values. Also, Confidence intervals at 95% are presented.

Considering differences across countries regarding the traditional type of diet ("Country" group of coefficients in Figure 4), it is worth noting that with respect to Italy, only Russians respondents declared to have wasted less calories than Italian consumers. Considering the traditional type of diet in other countries, consumers from USA declared the highest quantities of wasted kilocalories compared to Italy, followed by Germany, China, and Canada. In Spain and UK, the average difference with Italy between individuals that follow a traditional type of diet is minimal but still significative.

When comparing types of diet in Italy ("Diet" group of coefficients in Figure 4), all coefficients associated to the five types of diet are averagely higher than the coefficient representing traditional type of consumers, with the highest difference for vegetarians.

When considering the interaction coefficients between country and dietary habits, this represents the average difference of any type of diet in a given country to its traditional one, compared to the same difference from the traditional Italian diet.

Consumers declaring to follow a Smart diet tend to waste considerably more calories than consumers following other types of dietary patterns across all countries. In particular, the largest positive difference in quantity of wasted calories is declared by Canadian respondents, followed by consumers in USA, Spain and UK adopting the same dietary habits.

On the other hand, across countries the biggest negative difference of wasted Kilocalories is declared by consumers following a Vegetarian diet. In particular, Vegetarians from Germany declare the biggest negative difference in the amount of food wasted among all the sample, followed by Vegetarians from China and from UK. Among other dietary patterns, consumers for USA declaring a Confused dietary pattern register an amount of wasted Kcal per capita per week lower than the reference value of Italians following a Traditional diet.

Controls presents coefficients coherent with literature, as consumers with lower education levels tend to waste more food. Consumers with secondary or higher education levels education tend to waste less Kilocalories per capita per week than the reference level of respondents with primary education or lower. Finally, the composition of the household has a statistically significant impact on household food waste level as households with children tend to waste more kilocalories per capita per week compared to the reference value of household with children older than 18 years old. Households with no children, on the other hand declare higher values of wasted kilocalories compared to the other typologies of households.

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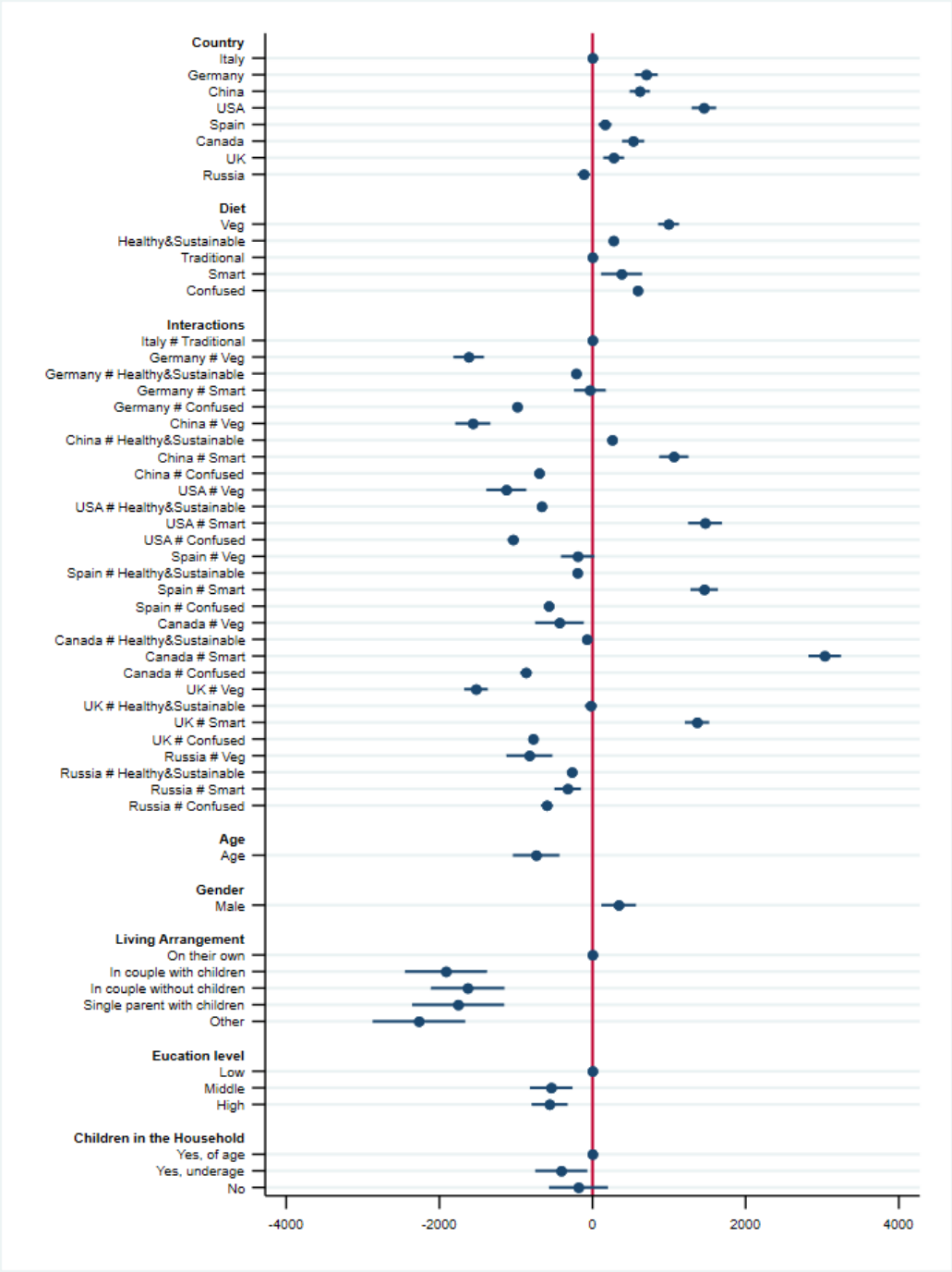

Independent variables: Country (Base Level: Italy), Diet (Base Level: Traditional), Age (in completed years), Gender (Base Level: Women), Living arrangement (Base Level: On their own), Education level (Base Level: Low), Children in the Household (Base Level: Yes, of age). Each coefficient can be interpreted as the average difference with respect to the base level. Confidence intervals at 95%.

Figure 4. Regression coefficients for food waste (expressed in kilocalories).

4. Discussion

Results from the survey conducted in the 8 countries highlighted significant differences among the relations between the declared dietary patterns adopted by respondents and the self-reported amounts of food waste generated within their households.

Across countries, Russian respondents who declared to follow a Traditional diet are associated with to have produced the lowest level of food waste. Italian and Spanish households of respondents adopting Traditional Diets follow closely. The most expensive

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Traditional Diets in terms of wasted calories are the American and the German, closely followed by Chinese, Canadian and British Traditional dietary patterns.

In Italy individuals adopting a traditional type of diet belong to households that on average waste less food closely followed by those who adopt a Healthy & Sustainable diet. On the opposite side Italian respondents declaring to follow a Vegetarian and Smart and Confused diet present the highest values of self-reported household food waste.

In Germany respondents declaring to adopt a Vegetarian or Confused dietary pattern belong to households that, on average, waste less food compared to those that follow a Traditional or a Healthy and Sustainable diet. On average, more food waste is generated in households of respondents declaring to adopt a Smart Diet. In China, like Germany, individuals that follow a Vegetarian diet belong to households that on average waste less food in comparison to those who follow a traditional diet. On average more food waste is generated in the Household of Smart diet respondents. In USA Spain and Canada, in comparison with those who follow a traditional type of diet, Healthy and Sustainable and Confused diet followers waste little less. On the opposite, households of Smart diet followers waste significantly more compared to respondents who declare different dietary habits.

When considering Vegetarians, in UK, respondents following this type of diet are the group that declared to have wasted less calories, closely followed by Chinese and German Vegetarians. Only Vegetarians in Canada and USA reported higher amounts of food waste than Italian respondents. It is worth noting that the share of people following this type of diet is the lowest in all countries.

Regarding Smart Diets, in Canada and USA respondents following this type of diet belong to the group that declared the highest values of wasted calories. In UK, Spain, Germany, and China, the self-reported level of food waste is considerably higher if compared with the previous two countries. In Italy and Russia, the difference in terms of wasted calories between Smart and Traditional diets is barely significant. It is worth noting that the share of people following a Smart dietary pattern is the second lowest in almost all countries

Considering Vegetarian diets, across countries UK is the country associated with less food waste, closely followed by Chinese and German vegetarians. Also, for these countries, on average more food waste is generated in the households of Smart Diet respondents. Consumers following a Smart diet tend to waste considerably more calories than consumers following other types of dietary patterns across all countries. In particular, the largest positive difference in quantity of wasted calories is declared by Canadian respondents, followed by consumers in USA, Spain and UK adopting the same dietary habits. On the other hand, across countries, the biggest negative difference of wasted Kcal is declared by consumers following a Vegetarian diet. In particular, Vegetarians from Germany declare the biggest negative difference in the amount of food wasted among all the sample, followed by Vegetarians from China and from UK. Among other dietary patterns, USA respondents declaring a Confused dietary pattern are associated to an amount of wasted Kcal per capita per week lower than the reference value of Italians following a Traditional diet.

In general, being a vegetarian in Germany China and UK and USA means to significantly waste less that being a vegetarian in Italy. This is might since traditionally in Italy the consumption of fresh fruit and vegetable is higher than other countries, where preserved vegetables are consumed more often. The more frequent consumption of fresh fruit and vegetables could thus generate an increase in the volume of wasted calories due to the more perishability of this type of product, that lead to a more frequent discard.

In Italy Traditional and Healthy & Sustainable type of diets are associated to the lowest self-declared amount of food waste while, Vegetarian and Smart and Confused diets are associated to more food waste per capita in terms of kilocalories. Across countries, also Russian and Spanish Traditional Diets are associated to households reporting low levels of food waste. The most expensive Traditional Diets in terms of wasted calories are

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the American and the German, closely followed by the Chinese, the Canadian and the British ones.

Given these differences and patterns, it is worth noting that consumers following diets associated to lower levels of declared food waste consume more raw products and less prepared/processed food than consumers following diets connected with higher levels of food waste. Also, the use of leftovers and overbuying are among food-related behaviors that differ the most between dietary patterns. Among the habits that are considered more important to avoid food waste according to consumers following diets correlated to lower levels of food waste there are the use of shopping lists, the proper use of leftovers (e.g., freezing, use before gone bad), the stock knowledge, and the use of food beyond expiration date if they are still good.

Finally, results of the study highlight that food preparation and management skills and, in particular, the availability of time to be dedicated to food have a stronger link to low levels of food waste declared by the households, when compared to the impact of motivations and attitudes. This is consistent with the most recent literature on household food waste drivers, that evidences a prominent role of time availability as driver for the reduction of food waste at the household level [33–36].

4.1. Limitations

This study relies on a consumer survey in which they self-reported on their behavior, motivation and amounts of food wasted. This methodology potentially suffers from cognitive biases, such as social comparison and social desirability bias that is correlated to the country. Indeed 9% of the whole sample declared to have not produced food waste in the week before the interview and the distribution is not independent across countries and across age categories (chi2 test). While this weakness has been well recognized and discussed in literature While these weaknesses in surveys have been well recognized and discussed in literature, the survey through CAWI method remains a solid method to explore food waste and its related behaviors [37].

A second limitation is related to the definition of dietary patterns, which in some cases could present some overlapping (e.g., Mediterranean and Traditional diets are similar for southern-European countries), due to the variety of contexts considered in this study. However, these cases were limited and did not affect the overall consistency of the results.

A final limitation derives from the fact that questions related to dietary habits were meant for an individual response while self-reported measures of food waste referred to the whole household. Although, since the questionnaire was compiled by individuals who were responsible or at least in part responsible for the management of the food in the household, it is possible to affirm that their dietary pattern could be a proxy for the main dietary pattern of the household.

5. Conclusions

Dietary patterns have been rarely studied as possible drivers of household food waste although they could represent a valuable part of food waste reduction strategies. Starting from an original cross-country survey conducted in in 2021 by Waste Watcher International, this work aims at exploring the relationship between food waste at household level and dietary habits and their related food choices in a cross-country comparative perspective.

From this work, several conclusions can be drawn. First, culinary traditions have a role in shaping consumption decisions and, consequently, also an impact on perceived food waste production. However traditional types of diets are not uniquely associated with lower or higher levels of food waste, meaning that new and emerging dietary habits are not necessarily connected to higher levels of food waste. More in detail, results show that Smart diets are frequently associated with highest values of food waste This is valid

 doi:10.20944/preprints202210.0445.v1

for all countries, and especially for Canada and Spain, UK and USA. Vegetarian diets are associated to lower values of food waste, being them based on foods with low density of calories, in particular if compared to Traditional diets for China, Germany, UK and USA. This is not true for Italy, where Traditional type of diet, which is in most of the cases the Mediterranean, is associated to lower self-declared amounts of food waste. Other Traditional diets associated with less values of food waste are Russian and Spanish.

Second, lower levels of food waste are associated with types of diets that usually require more raw products, more time to be dedicated to food preparation and higher kitchen skills. Indeed, a strong difference is present between diets about the possible use of leftovers. On the opposite, higher levels of food waste are associated with types of diets that rely on more processed and ready-to-eat food. These types of foods are generally high in fats, sugars, and are sold in portions that might be too big for consumers and generally are difficult to reuse as leftovers. Indeed, it appears that being engaged with food consumption concerned with locally and seasonally of products or being used to convenience, high-processed, ready-to-eat foods could be connected with different self-reported levels of food waste. This reinforce the idea that food waste prevention strategies have more to do with skills, time and management of food, especially leftovers, that motivations and attitudes.

Third, the proportion of individuals following different types of diets is fairly uneven. Countries with higher respondents for traditional diets are coherent with the places that have stronger food cultural traditions while Confused diets are more prominent in countries with less peculiar culinary traditions. It is worth noting that the share of population declaring to follow a Smart Diet is on average 2.7% of the whole sample. Since consumers following this type of dietary patterns seems to be the most responsible for the larger share of perceived food waste generation it would be worth to elaborate food waste prevention interventions that target specific dietary patterns and their associated food choices.

These types of interventions could also generate positive spillover supporting the transition towards diets that make less use of pre-packaged, ready-to-eat- meals. The improvement of diet quality could indeed simultaneously reduce the environmental impact of food waste and unhealthy and unsustainable food choices.

Author Contributions: "Conceptualization, E.I. and M.M; methodology, E.I.; validation, E.R., A.S; formal analysis, E.I, M.M.; data curation, E.R., L.F; visualization, E.I., M.M.; writing—original draft preparation, E.I., M.M, and M.V.; writing—review and editing, L.F., E.R, A.S.; supervision, M.V., A.S. All authors have read and agreed to the published version of the manuscript."

Data Availability Statement: Data can be provided by Authors on request

Conflicts of Interest: "The authors declare no conflict of interest."

 doi:10.20944/preprints202210.0445.v1

Appendix A Regression results

Table 1Main model specification in which food waste is regressed against all diets (both for total food waste and for each food waste category)

	MAIN MODEL		Meat		Fish		FVL		Egg&Dairy		Starch	
Italy	0	(.)	0	(.)	0	(.)	0	(.)	0	(.)	0	(.)
Germany	754.6***	(21.67)	146.5***	(20.69)	3.725***	(5.72)	41.79***	(26.67)	134.9***	(27.98)	258.9***	(25.11)
China	642.8***	(16.64)	144.3***	(18.09)	16.11***	(27.26)	27.30***	(13.91)	68.24***	(10.59)	184.1***	(16.20)
USA	1499.5***	(40.71)	277.8***	(44.34)	22.89***	(33.62)	59.43***	(34.69)	216.1***	(34.52)	467.4***	(44.02)
Spain	199.1***	(17.07)	46.88***	(14.28)	5.990***	(22.30)	9.116***	(12.63)	18.41***	(14.63)	50.37***	(12.64)
Canada	568.7***	(21.34)	89.84***	(21.53)	8.887***	(14.91)	32.54***	(23.28)	76.19***	(16.46)	195.0***	(25.83)
UK	323.0***	(14.67)	66.84***	(17.96)	0.218	(0.47)	26.51***	(26.96)	51.57***	(14.67)	113.4***	(17.73)
Russia	-77.89*	(-3.48)	-16.68*	(-3.26)	-5.704***	(-13.62)	2.184	(2.06)	-8.038*	(-2.79)	-11.63	(-1.63)
Traditional	0	(.)	0	(.)	0	(.)	0	(.)	0	(.)	0	(.)
Veg	1244.7***	(20.07)	32.01*	(3.38)	36.35***	(21.70)	78.04***	(29.17)	217.4***	(21.04)	497.8***	(28.68)
Healthy&Sustainable	168.8***	(11.31)	24.75***	(9.85)	0.316	(1.13)	5.427***	(6.91)	29.00***	(9.81)	42.31***	(8.73)
Smart	147.9	(1.84)	142.2***	(10.26)	13.12***	(8.65)	7.942	(2.02)	-62.46**	(-4.91)	-48.30	(-1.98)
Confused	398.1***	(12.13)	55.03***	(9.18)	6.182***	(8.72)	13.29***	(9.76)	53.17***	(10.79)	112.1***	(11.05)
Germany # Veg	-1877.3***	(-27.20)	-291.3***	(-24.04)	-45.67***	(-27.08)	-96.36***	(-37.41)	-269.5***	(-27.41)	-665.7***	(-32.36)
Germany # Healthy&Sustainable	-113.3***	(-6.15)	-42.47***	(-13.93)	6.485***	(20.98)	4.926**	(5.36)	1.899	(0.59)	-51.30***	(-9.26)
Germany # Smart	198.0**	(3.71)	-85.42***	(-8.19)	7.684***	(5.97)	-10.66**	(-4.41)	15.82	(2.05)	8.493	(0.52)
Germany # Confused	-788.9***	(-28.81)	-155.6***	(-28.64)	-9.692***	(-14.58)	-30.54***	(-32.07)	-100.5***	(-23.67)	-272.7***	(-33.29)
China # Veg	-1824.2***	(-19.17)	-146.6***	(-9.44)	-47.33***	(-19.30)	-110.3***	(-30.18)	-321.4***	(-22.39)	-637.9***	(-23.37)
China # Healthy&Sustainable	360.6***	(29.07)	72.05***	(28.12)	9.935***	(28.92)	13.87***	(25.98)	46.70***	(32.28)	127.3***	(32.80)
China # Smart	1285.5***	(26.85)	90.58***	(10.96)	21.28***	(23.22)	57.56***	(22.82)	287.5***	(39.08)	447.6***	(31.26)
China # Confused	-514.4***	(-51.61)	-66.15***	(-29.88)	-3.720***	(-15.13)	-14.68***	(-30.41)	-100.7***	(-87.06)	-165.6***	(-49.68)
USA # Veg	-1381.8***	(-23.52)	-126.5***	(-12.19)	-32.17***	(-21.26)	-17.49***	(-7.26)	-174.5***	(-22.42)	-567.9***	(-30.49)
USA # Healthy&Sustainable	-558.7***	(-46.86)	-76.39***	(-39.87)	1.448**	(5.26)	-19.83***	(-31.51)	-66.81***	(-29.83)	-199.4***	(-49.10)
USA # Smart	1709.8***	(55.54)	168.1***	(25.92)	67.66***	(75.90)	66.98***	(41.31)	258.9***	(49.52)	681.6***	(83.67)

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USA # Confused	-848.0***	(-21.90)	-142.4***	(-19.33)	-15.16***	(-19.66)	-25.55***	(-17.32)	-108.4***	(-17.48)	-274.4***	(-23.53)
Spain # Veg	-456.2***	(-8.53)	71.44***	(7.23)	-28.36***	(-18.44)	-63.57***	(-30.81)	-142.9***	(-20.00)	-168.6***	(-10.38)
Spain # Healthy&Sustainable	-91.56**	(-4.56)	-24.35***	(-6.44)	1.909**	(4.15)	6.602***	(9.12)	-8.774*	(-2.68)	-11.88	(-1.92)
Spain # Smart	1681.4***	(76.09)	111.1***	(29.82)	40.77***	(94.47)	112.1***	(85.30)	341.1***	(84.88)	588.5***	(86.76)
Spain # Confused	-382.2***	(-28.81)	-60.53***	(-22.60)	-5.040***	(-21.17)	-2.112**	(-4.19)	-60.63***	(-23.88)	-88.29***	(-23.31)
Canada # Veg	-674.9***	(-8.37)	46.08*	(3.03)	-22.16***	(-11.65)	-17.05***	(-6.10)	-122.0***	(-10.84)	-369.9***	(-14.99)
Canada # Healthy&Sustainable	37.93	(1.78)	25.51***	(6.06)	7.745***	(15.24)	7.125***	(7.76)	18.18**	(5.34)	-12.32	(-1.83)
Canada # Smart	3263.4***	(143.10)	531.1***	(106.65)	68.29***	(92.72)	126.2***	(103.46)	465.8***	(122.62)	1044.9***	(163.95)
Canada # Confused	-674.4***	(-17.71)	-108.2***	(-15.63)	-14.80***	(-17.43)	-30.24***	(-19.25)	-92.13***	(-16.58)	-181.2***	(-15.46)
UK # Veg	-1779.4***	(-27.75)	-184.1***	(-17.63)	-53.50***	(-30.78)	-82.86***	(-32.04)	-290.8***	(-28.70)	-658.8***	(-36.83)
UK # Healthy&Sustainable	74.38**	(4.61)	20.39***	(6.44)	7.273***	(17.95)	10.38***	(20.57)	28.33***	(11.69)	18.22**	(3.69)
UK # Smart	1589.6***	(66.96)	226.3***	(51.35)	32.21***	(45.55)	59.27***	(46.37)	288.4***	(70.54)	542.6***	(76.50)
UK # Confused	-583.9***	(-44.40)	-104.0***	(-38.01)	-11.37***	(-36.34)	-16.28***	(-38.64)	-67.31***	(-33.29)	-158.2***	(-40.28)
Russia # Veg	-1062.8***	(-13.55)	65.98**	(4.21)	-22.74***	(-12.54)	-94.65***	(-31.99)	-153.4***	(-14.70)	-569.1***	(-23.74)
Russia # Healthy&Sustainable	-163.0***	(-10.88)	-3.947	(-1.06)	0.145	(0.52)	-11.85***	(-15.37)	-42.82***	(-29.28)	-46.50***	(-9.59)
Russia # Smart	-97.33	(-2.34)	-97.89***	(-11.30)	1.826	(1.99)	-41.03***	(-27.16)	48.43***	(7.74)	66.49**	(5.26)
Russia # Confused	-413.6***	(-20.37)	-73.59***	(-19.91)	-5.640***	(-13.81)	-14.09***	(-15.33)	-63.83***	(-20.87)	-83.70***	(-12.69)
Age	-772.3***	(-6.59)	-136.1***	(-6.53)	-16.86***	(-6.98)	-28.83***	(-5.67)	-114.4***	(-6.16)	-238.1***	(-6.41)
Male	343.7**	(3.80)	62.12**	(3.53)	9.256**	(4.24)	10.25*	(2.95)	43.95*	(2.94)	105.7**	(4.07)
In couple with children	-1852.1***	(-8.47)	-316.9***	(-7.27)	-34.87***	(-8.55)	-106.5***	(-9.60)	-288.5***	(-7.74)	-570.1***	(-9.02)
In couple without children	-1562.9***	(-7.98)	-271.8***	(-7.28)	-29.91***	(-6.56)	-87.15***	(-9.79)	-241.6***	(-8.15)	-484.4***	(-8.84)
Single parent with children	-1691.0***	(-6.94)	-287.7***	(-6.28)	-32.08***	(-8.11)	-96.57***	(-7.18)	-256.5***	(-5.90)	-529.1***	(-8.14)
Other	-2220.8***	(-9.14)	-388.3***	(-8.35)	-43.53***	(-8.41)	-118.9***	(-11.53)	-336.9***	(-9.05)	-697.2***	(-9.90)
Middle Education	-622.6**	(-4.42)	-123.8*	(-3.49)	-12.13**	(-4.95)	-17.09	(-2.32)	-68.13*	(-2.69)	-181.8**	(-4.05)
High Education	-642.1***	(-5.70)	-132.8**	(-4.69)	-13.35***	(-8.18)	-15.09*	(-2.43)	-65.64*	(-2.38)	-187.3**	(-5.27)
Children in HH under age	-437.4*	(-3.45)	-72.00**	(-3.81)	-10.14**	(-3.82)	-16.59*	(-2.61)	-69.23**	(-3.52)	-135.6*	(-3.41)
Children in HH No	-200.3	(-1.24)	-30.79	(-1.07)	-4.080	(-1.29)	-6.571	(-0.84)	-34.71	(-1.19)	-54.70	(-1.09)
Constant	5055.2***	(11.95)	894.4***	(12.13)	103.0***	(13.85)	236.6***	(11.60)	742.4***	(9.76)	1568.7***	(11.84)

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Observations	7916	7916	7916	7916	7916	7916
R-squared	0.199	0.177	0.145	0.186	0.180	0.170
t statistics in parentheses	* p<0.05,** p<0.01, *** p<0.001					

Table 2 Alternative model specification in which food waste is regressed considering each diet against all the others

	Vegetarian		Healthy & Sustainable		Traditional		Smart		Confused	
Italy	0	(.)	0	(.)	0	(.)	0	(.)	0	(.)
Germany	491.2***	(13.49)	377.8***	(9.60)	222.7***	(7.48)	433.8***	(14.24)	639.9***	(17.55)
China	752.7***	(18.46)	526.8***	(13.36)	748.8***	(18.37)	692.4***	(17.27)	794.5***	(20.62)
USA	1208.9***	(34.72)	1265.7***	(36.49)	955.1***	(32.71)	1078.9***	(40.65)	1390.0***	(29.23)
Spain	145.7***	(13.87)	146.7***	(12.08)	36.42*	(2.59)	112.1***	(9.63)	192.3***	(14.78)
Canada	516.1***	(16.09)	483.6***	(13.72)	388.0***	(10.86)	408.1***	(13.78)	776.1***	(21.88)
UK	290.1***	(10.13)	181.7***	(7.55)	94.80**	(3.60)	166.6***	(7.40)	365.5***	(12.94)
Russia	-190.4***	(-9.52)	-201.6***	(-8.79)	-373.5***	(-14.70)	-210.6***	(-10.09)	-164.6***	(-8.58)
diet==1	1132.1***	(17.78)	49.95**	(5.00)	-286.7***	(-13.32)	23.61	(0.34)	303.3***	(10.48)
Germany # diet==1	-1614.7***	(-22.81)	258.4***	(13.03)	522.4***	(37.96)	507.0***	(9.16)	-680.3***	(-21.25)
China # diet==1	-1943.5***	(-20.21)	451.6***	(38.99)	-128.6***	(-13.89)	1212.8***	(24.76)	-681.3***	(-55.91)
USA # diet==1	-1118.1***	(-18.28)	-341.7***	(-24.00)	532.5***	(35.13)	2114.6***	(51.77)	-738.7***	(-15.55)
Spain # diet==1	-415.7***	(-7.06)	-42.99	(-1.89)	159.9***	(12.69)	1760.9***	(95.50)	-372.2***	(-30.16)
Canada # diet==1	-658.1***	(-7.45)	109.4***	(6.27)	171.7***	(9.21)	3408.7***	(156.52)	-884.4***	(-22.91)
UK # diet==1	-1738.2***	(-24.60)	201.0***	(13.40)	224.7***	(26.27)	1734.9***	(85.58)	-629.2***	(-27.26)
Russia # diet==1	-966.7***	(-13.61)	-46.26**	(-3.75)	290.8***	(14.96)	22.77	(0.67)	-332.3***	(-18.96)
Age	-811.2***	(-6.74)	-810.3***	(-6.73)	-806.5***	(-6.56)	-779.5***	(-6.76)	-807.5***	(-6.89)
Male	357.5**	(3.89)	360.6**	(3.89)	357.8**	(3.88)	345.1**	(3.76)	353.0**	(3.72)
Living arrangements:										
On their own	0	(.)	0	(.)	0	(.)	0	(.)	0	(.)
In couple with children	-1917.0***	(-8.12)	-1931.1***	(-8.16)	-1919.2***	(-8.08)	-1857.9***	(-8.71)	-1923.2***	(-8.37)
In couple without children	-1634.1***	(-7.66)	-1640.5***	(-7.71)	-1640.0***	(-7.60)	-1581.8***	(-8.39)	-1637.7***	(-8.05)
Single parent with children	-1802.5***	(-7.30)	-1807.7***	(-7.28)	-1818.4***	(-7.39)	-1727.3***	(-7.64)	-1794.0***	(-7.34)
Other	-2321.5***	(-8.51)	-2328.3***	(-8.52)	-2329.7***	(-8.68)	-2261.1***	(-9.15)	-2312.1***	(-9.01)
Education level:										
Low	0	(.)	0	(.)	0	(.)	0	(.)	0	(.)
Middle	-612.3**	(-4.21)	-593.8**	(-4.12)	-591.5**	(-4.14)	-603.6**	(-4.34)	-619.4**	(-4.26)
High	-619.9**	(-4.88)	-594.1**	(-4.88)	-597.8**	(-4.91)	-613.1***	(-5.50)	-637.6***	(-5.57)
Children in the HH:										
Yes, of age	0	(.)	0	(.)	0	(.)	0	(.)	0	(.)
Yes, underage	-477.4**	(-3.55)	-487.9**	(-3.66)	-488.5**	(-3.61)	-454.1**	(-3.68)	-479.3**	(-3.66)

 doi:10.20944/preprints202210.0445.v1

No	-245.6	(-1.57)	-245.1	(-1.54)	-247.3	(-1.58)	-219.5	(-1.42)	-236.4	(-1.50)
Constant	5323.8***	(12.63)	5322.8***	(12.46)	5484.7***	(13.14)	5207.5***	(12.92)	5311.2***	(12.89)
Observations	7916		7916		7916		7916		7916	
R-squared	0.181		0.181		0.181		0.193		0.182	

*t statistics in parentheses * p<0.05, ** p<0.01, *** p<0.001*

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7

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Appendix B Survey Questionnaire

YEAR/MONTH. Please indicate your date of birth.

- ☐ Year
- ☐ _1910 1910
- ☐ ...
- ☐ _2015 2015
- ☐ Month
- ☐ _1 Jan
- ☐ _2 Feb
- ☐ _3 Mar
- ☐ _4 Apr
- ☐ _5 May
- ☐ _6 Jun
- ☐ _7 Jul
- ☐ _8 Aug
- ☐ _9 Sep
- ☐ _10 Oct
- ☐ _11 Nov
- ☐ _12 Dec

RESP_AGE [Hidden]. Hidden Question - RESP_AGE "this is a dummy question that will hold age"

- ○ USE RESP_AGE [Hidden] response list

QUOTAGERANGE [Hidden]. Hidden Question - QUOTAGERANGE "this is a dummy question that will hold age breaks" for the quotas that should be defined by the PM; it CAN be edited and lines can be added to meet survey objectives.

- ○ _18_24 "18-24",
- ○ _25_34 "25-34",
- ○ _35_44 "35-44",
- ○ _45_54 "45-54",
- ○ _55_65 "55-64"
- ○ _65_more “65+”

RESP_GENDER. Are you. . .?

- ○ _1 Man
- ○ _2 Woman

QMktSize_IT. Residential address?

- ☐ Province:
- ☐ Municipality:
- ☐ ZIP code:

ITSTDREGION [Hidden]. Hidden recode ITSTDREGION from ITPROVINCE, ITMUNICIPALITY and ITZIPCODE:

- ○ _1 NORTH-WEST
- ○ _2 NORTH-EAST
- ○ _3 CENTER
- ○ _4 SOUTH
- ○ _5 ISLANDS

ITREGION1 [Hidden]. Hidden recode ITREGION1 from ITPROVINCE, ITMUNICIPALITY and ITZIPCODE:

- ○ _01 PIEMONTE
- ○ _02 VALLE D'AOSTA

- ○ _03 LOMBARDIA 53
- ○ _04 TRENTINO ALTO ADIGE 54
- ○ _05 VENETO 55
- ○ _06 FRIULI VENEZIA GIULIA 56
- ○ _07 LIGURIA 57
- ○ _08 EMILIA ROMAGNA 58
- ○ _09 TOSCANA 59
- ○ _10 UMBRIA 60
- ○ _11 MARCHE 61
- ○ _12 LAZIO 62
- ○ _13 ABRUZZO 63
- ○ _14 MOLISE 64
- ○ _15 CAMPANIA 65
- ○ _16 PUGLIA 66
- ○ _17 BASILICATA 67
- ○ _18 CALABRIA 68
- ○ _19 SICILIA 69
- ○ _20 SARDEGNA 70

ITREGION2 [Hidden]. Hidden recode ITREGION2 from ITPROVINCE, ITMUNICIPALITY and ITZIPCODE: 71

- ○ USE ITREGION2 [Hidden] response list 72

ITMKTSIZE [Hidden]. Hidden recode ITMKTSIZE from ITPROVINCE, ITMUNICIPALITY and ITZIPCODE: 73

- ○ _1 < 50 inhab/sqkm 74
- ○ _2 50 - 99 inhab/sqkm 75
- ○ _3 100 - 199 inhab/sqkm 76
- ○ _4 200 - 499 inhab/sqkm 77
- ○ _5 500 - 999 inhab/sqkm 78
- ○ _6 1000 - 1999 inhab/sqkm 79
- ○ _7 2000 - 4999 inhab/sqkm 80
- ○ _8 >= 5000 inhab/sqkm 81

ITMKTSIZE2 [Hidden]. Hidden recode ITMKTSIZE2 from ITPROVINCE, ITMUNICIPALITY and ITZIPCODE: 82

- ○ _1 0 - 5000 inhabitants 83
- ○ _2 5001 - 10000 inhabitants 84
- ○ _3 10001 - 30000 inhabitants 85
- ○ _4 30001 - 100000 inhabitants 86
- ○ _5 100001 - 250000 inhabitants 87
- ○ _5 250k+ inhabitants 88

ITDEGURBA [Hidden]. Hidden recode ITDEGURBA from ITPROVINCE, ITMUNICIPALITY and ITZIPCODE: 89

- ○ _1 Densely populated area 90
- ○ _2 Intermediate density area 91
- ○ _3 Thinly populated area 92

HHCMP10. How many people does your households consist of? (Include yourself and other people, adults or children, who have been living at your current address for at least two months) 93 94

- ☐ _1 1 95
- ☐ _2 2 96
- ☐ _3 3 97
- ☐ _4 4 98
- ☐ _5 5 99
- ☐ _6 6 100
- ☐ _7 7 101

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- ☐ _8 8
- ☐ _9 9
- ☐ _10 10
- ☐ _11 11
- ☐ _12 12+

IF HHCMP10<>1, ASK S1

S1 – SINGLE ANSWER

How is your household composed:

1. Lives alone 18-34 years old
2. Lives alone 35-54 years old
3. Lives alone +55 years old
4. 18-34 years old couple with children
5. 18-34 years old couple without children
6. 35-54 years old couple with children
7. 35-54 years old couple without children
8. over 54 years old couple with children
9. over 54 years old couple without children
10. single parent, with children
11. single, lives with other people (friends, relatives)
12. other/prefer not to answer

IF HHCMP10=1 AND RESPONDENT_AGE 18-34 → SET S1=1
IF HHCMP10=1 AND RESPONDENT_AGE 35-54 → SET S1=2
IF HHCMP10=1 AND RESPONDENT_AGE >54 → SET S1=3

IF S1= 4,6,8,10,12 ASK S2, OTHERWISE SET S2=3

S2 – SINGLE ANSWER

Do you have children living with you?

1. Yes over 18
2. Yes minors
3. no

FOOD WASRE AND HABITS

Q1NEW – GRID – SA PER ITEM

We would like to talk about your eating habits. Can you tell us, in your, typical week, what food do you consume?

ITEM

1. Cold cuts/salami/cured meat
2. Soft drinks (fruit juices, Coke, mineral water, etc.)
3. Alcoholic beverages (wine, beer, etc.)
4. Butter, margarine and oil
5. Cooked WHITE meat (excluding cured meat)
6. Raw WHITE meat (excluding cured meat)
7. Cooked RED meat (excluding cured meat)
8. Raw RED meat (excluding cured meat)
9. Prepared or precooked food (portions, roast chickens, pizzas etc.)
10. Onions, garlic and tubers (potatoes, carrots, etc.)
11. Sweets (cakes, ice-cream, etc.)
12. Chocolate, spreads, etc.
13. Cheese
14. Fresh fruit
15. Non-fresh fruit and vegetables (jarred, canned)
16. Salads
17. Milk and yogurt
18. Dairy products (mozzarella, cottage cheese…)
19. Legumes (lentils, beans. Chickpeas etc.)
20. Jams and marmalades
21. Mayonnaise and egg-based sauces (es. Tartar, Bernese…)

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22. Fresh bread
23. Packaged bread
24. Pasta and fresh pasta (raw)
25. Cooked pasta
26. Raw fish/crustaceans/shellfish
27. Cooked fish/crustaceans/shellfish
28. Breakfast products (cookies, cereals, rusks, etc.)
29. Frozen products (veggie soups, etc.)
30. Rice and other cooked grains
31. Rice and other uncooked grains
32. Sauces (e.g. Ketchup, tabasco…)
33. Sauces (es. tomato sauce, ready-made sauces, pesto…)
34. Eggs
35. Fresh vegetables
36. Pizza
37. Stuffed sandwiches
38. Frankfurters
39. French fries
40. Frozen or deep-frozen products
41. Prepared and precooked meals

ANSWERS

1. Everyday
2. 4-5 times a week
3. 2-3 times a week
4. 1 time a week
5. A few times in a month
6. rarely
7. never
8. I don't know

Q2NEW – SINGLE ANSWER – RANDOMIZE CODES 1-8
How would you define your diet

1. vegan
2. vegetarian
3. healthy and low-fat
4. Mediterranean style, with pasta and pizza
5. sustainability-aware with organic products
6. territory-aware with local products
7. traditional diet, typical of my country
8. smart, with pre-packaged meals
9. confused and irregular, with no particular preferences
10. don't know

Q3 – SINGLE ANSWER – REVERT 1-3/3-1
Please select which of the following statements you most identify with:

1. high quality food is very, important, and I am willing to spend to be assured of quality
2. I am very pragmatic about food: I buy considering the price I think is right
3. I have other priorities than food, I try to spend as little as possible
4. I don't know

Q4– SINGLE ANSWER
How often do you throw away cooked/prepared leftovers or food that you no longer consider good?

1. Almost every day
2. 3-4 times a week
3. 1-2 times a week
4. Less than once a week

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5. Almost never
6. I don't know

Q5 – MULTIPLE ANSWER – MAX 5 ANSWERS
What kind of food would you say that you throw away most often? (5 possible answers)

1. Cold cuts/salami/cured meat
2. Soft drinks (fruit juices, Coke, mineral water, etc.)
3. Alcoholic beverages (wine, beer, etc.)
4. Butter, margarine and oil
5. Cooked WHITE meat (excluding cured meat)
6. Raw WHITE meat (excluding cured meat)
7. Cooked RED meat (excluding cured meat)
8. Raw RED meat (excluding cured meat)
9. Prepared or precooked food (portions, roast chickens, pizzas etc.)
10. Onions, garlic and tubers (potatoes, carrots, etc.)
11. Sweets (cakes, ice-cream, etc.)
12. Chocolate, spreads, etc.
13. Cheese
14. Fresh fruit
15. Non-fresh fruit and vegetables (jarred, canned)
16. Salads
17. Milk and yogurt
18. Dairy products (mozzarella, cottage cheese…)
19. Legumes (lentils, beans. Chickpeas etc.)
20. Jams and marmalades
21. Mayonnaise and egg-based sauces (es. Tartar, Bernese…)
22. Fresh bread
23. Packaged bread
24. Pasta and fresh pasta (raw)
25. Cooked pasta
26. Raw fish/crustaceans/shellfish
27. Cooked fish/crustaceans/shellfish
28. Breakfast products (cookies, cereals, rusks, etc.)
29. Frozen products (veggie soups, etc.)
30. Rice and other cooked grains
31. Rice and other uncooked grains
32. Sauces (e.g. Ketchup, tabasco…)
33. Sauces (es. tomato sauce, ready-made sauces, pesto…)
34. Eggs
35. Fresh vegetables
36. Pizza
37. Stuffed sandwiches
38. Frankfurters
39. French fries
40. Frozen or deep-frozen products
41. Prepared and precooked meals
42. None of these EXCLUSIVE
43. I don't know EXCLUSIVE

Q6 – PROGRESSIVE GRID - SINGLE ANSWER PER ITEM
Think about the last SEVEN days, in your household, how much of the products you indicated did you throw away?

1. Cold cuts/salami/cured meat
2. Soft drinks (fruit juices, Coke, mineral water, etc.)
3. Alcoholic beverages (wine, beer, etc.)
4. Butter, margarine and oil
5. Cooked WHITE meat (excluding cured meat)
6. Raw WHITE meat (excluding cured meat)

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7. Cooked RED meat (excluding cured meat)
8. Raw RED meat (excluding cured meat)
9. Prepared or precooked food (portions, roast chickens, pizzas etc.)
10. Onions, garlic and tubers (potatoes, carrots, etc.)
11. Sweets (cakes, ice-cream, etc.)
12. Chocolate, spreads, etc.
13. Cheese
14. Fresh fruit
15. Non-fresh fruit and vegetables (jarred, canned)
16. Salads
17. Milk and yogurt
18. Dairy products (mozzarella, cottage cheese…)
19. Legumes (lentils, beans. Chickpeas etc.)
20. Jams and marmalades
21. Mayonnaise and egg-based sauces (es. Tartar, Bernese…)
22. Fresh bread
23. Packaged bread
24. Pasta and fresh pasta (raw)
25. Cooked pasta
26. Raw fish/crustaceans/shellfish
27. Cooked fish/crustaceans/shellfish
28. Breakfast products (cookies, cereals, rusks, etc.)
29. Frozen products (veggie soups, etc.)
30. Rice and other cooked grains
31. Rice and other uncooked grains
32. Sauces (e.g. Ketchup, tabasco…)
33. Sauces (es. tomato sauce, ready-made sauces, pesto…)
34. Eggs
35. Fresh vegetables
36. Pizza
37. Stuffed sandwiches
38. Frankfurters
39. French fries
40. Frozen or deep-frozen products
41. Prepared and precooked meals

ANSWERS

1. Less than 100 grams / less than one fruit / less than one glass
2. 100-200 grams / less than one fruit and a half / less than one glass and a half
3. 200-300 grams / less than two fruits / less than two glasses
4. More than 300 grams / more than two fruits / more than two glasses
5. Nothing / we don't consume it
6. I don't know

Q7 – PROGRESSIVE GRID – SINGLE ANSWER PER ITEM – RANDOMIZE ITEM – REVERT ANSWERS 1-5/5-1

You throw away food mainly because..

ITEM

1. I buy too much
2. Too much time passes between groceries and food deteriorates
3. I miscalculate the amount of food needed
4. I'm always afraid of not having enough food at home
5. Fruits and vegetables are often stored in refrigerators and when I bring them home they go bad
6. Sold food is already old
7. I don't know to preserve and store food
8. I buy too big portions and packages
9. I cook too much
10. I buy food that I don't not like

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11. There are too many discounts on food products
12. I forget about it and it expires/molds/rots/ the smell or taste deteriorates
13. I don't like leftovers

ANSWERS

1. Always
2. Often
3. Sometimes
4. Rarely
5. Never

Q8 – PROGRESSIVE GRID – SINGLE ANSWER PER ITEM – RANDOMIZE ITEM – REVERT ANSWERS 1-7/7-1

How much do you agree with each of the following statements about food waste?

ITEM

1. It is an ethical issue (it is immoral)
2. It has economic and social consequences
3. It has environmental consequences
4. It contributes to global warming
5. It causes a waste of money for families
6. It has negative economic consequences on my family
7. It reduces the production system efficiency
8. It causes an increase in pollution due to excess waste disposal
9. It causes an increase in inequalities between rich and poor countries
10. It has a negative educational impact on young people
11. It causes an increase in food prices
12. It causes failures in food distribution affecting those who cannot afford it
13. It generates waste of valuable resources such as water, energy and soil

ANSWER

1. I strongly agree
2. I agree
3. I slightly agree
4. Neither agree nor disagree
5. I slightly disagree
6. I disagree
7. I strongly disagree

Q9 – PROGRESSIVE GRID - SINGLE ANSWER PER ITEM – RANDOMIZE ITEMS – REVERT ANSWERS 1-4/4-1

To reduce food waste, those who take care of the household and grocery shopping can adopt several behaviors. Please indicate how often you…:

1. Make a shopping list
2. Make plans for what you need to cook each day of the week
3. Make sure that the food about to spoil is consumed first
4. Freeze food that cannot be eaten right away
5. Know exactly what you have in your shelfs, refrigerator and freezer
6. Keep your shelfs, refrigerator and freezer well organized
7. Weight ingredients during meal preparation
8. Calculate precisely the amount of food needed before cooking
9. Preserve leftovers from overcooking
10. Preserve leftovers from plates
11. Eat all food prepared including leftovers
12. Use recently expired food (1 day) after checking if it is still good
13. Take home uneaten food from restaurants and canteens

ANSWER

1. always
2. often
3. rarely
4. never
5. don't know

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Q10 – MULTIPLE ANSWER – RANDOMIZE CODES 1-13
In order to reduce your household's food waste, do you adopt any of the following purchasing strategies?

1. App/websites for purchasing unsold products to limit food waste
2. App/websites for purchasing unsold fresh fruit and vegetables for being damaged/unaesthetic
3. App/websites for trading expiring food with neighbors
4. App/websites offering recipes by entering the list of expiring products available in the house
5. App that track expiration dates and help preparing shopping lists
6. Shopping list based on weekly menu
7. Purchase of small portions
8. Frequent grocery shopping (day-by-day)
9. Purchase large quantities of fish, meat and vegetables, dividing them into small / single portions to be frozen
10. Prefer long-life products
11. Smart refrigerator or shelfs that monitors expiring products
12. None of these EXCLUSIVE

Q11 – PROGRESSIVE GRID – SINGLE ANSWER PER ITEM – RANDOMIZE ITEMS – REVERT ANSWERS 1-4/4-1
How much useful do you think each of the following measures is in reducing food waste?
ITEMS

1. Make citizen aware of negative environmental impacts
2. Make citizen aware of negative economic impacts
3. Rise taxation based on food waste
4. Charging more for food
5. Focus on education in schools
6. Make smaller portions
7. Make bigger portions
8. Improve food labeling

ANSWERS

1. Very Much useful
2. Quite useful
3. Little useful
4. Not at all useful
5. I don't' Know

Q12 – MULTIPLE ANSWER – MAX 4 ANSWERS – RANDOMIZE ANSWERS 1-15
In your opinion, [COUNTRY] families throw away food because… (max 4 answers)

1. They buy too much
2. Too much time passes between groceries and food deteriorates
3. They miscalculate the amount of food needed
4. They are afraid of not having enough food at home
5. Fruits and vegetables are often stored in refrigerators and when they bring them home they go bad
6. Sold food is already old
7. They don't know to preserve and store food
8. They buy too big portions and packages
9. They cook too much
10. They buy food that they don't not like
11. There are too many discounts on food products
12. they forget about it and it expires/molds/rots/ the smell or taste deteriorates
13. They don't like leftovers
14. I don'' know EXCLUSIVE

Q13 – SINGLE ANSWER – REVERT ANSWER 1-3 / 3-1
When grocery shopping, do you prefer to buy:

1. Family size packages to save money, even risking waste
2. Small portions to avoid food waste, even if packaging increases
3. Portions with daily consumption amounts clearly stated and recyclable packaging to reduce waste and environmental impacts, even

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Q14– MULTIPLE ANSWER – RANDOMIZE ANSWERS
What information do you think should be included in food nutrition labels??

1. Information on quality of single ingredients
2. Information on origins of ingredients
3. Information on environmental impacts of products
4. Information on nutritional characteristics of products
5. Precise information on each ingredient nutritional intake
6. Information on in ingredients that may cause allergies
7. Information on nutritional intakes that consider the average diet of individuals
8. None of these EXCLUSIVE

Q15 – SINGLE ANSWER – REVERT ANSWERS 1-4 / 4-1
To what extent do you think a better labeling mechanism with respect to nutritional values could influence consumer purchases?

1. Strongly agree
2. Agree
3. Disagree
4. Strongly disagree
5. Don't know

IT05EDU. What is you highest education title?

- ○ _1 No title
- ○ _2 Elementary school graduation
- ○ _3 Junior high school graduation
- ○ _4 High school diploma
- ○ _5 Bachelor degree
- ○ _6 Master degree
- ○ _7 Postgraduate title

EMP01. What is your current employment status?

- ○ _1 Full-time worker
- ○ _2 Part-time worker
- ○ _3 Freelancer/self-employed
- ○ _4 Unemployed/Looking for work
- ○ _5 Unemployed and not looking for work/Unable to work
- ○ _6 Housekeeper
- ○ _7 Retired
- ○ _8 Student

Q20 – SINGLE ANSWER – REVERT CODES 1-5/5-1
Your household income allows you to live...

1. Very comfortably
2. comfortably
3. whit some difficulties
4. with strong difficulties
5. I feel poor and never make ends meet
6. I prefer not to answer

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