Increasing fruit and vegetable consumption whilst incorporating consumer preferences

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Abstract:

All the main demographic groups (Female and Males aged 11 upwards) in the United Kingdom (UK) do not consume the government's recommended 5 a day target for fruit and vegetables. Understanding how a 50 percent increased consumption of fruit or vegetables would impact on the whole diet of these demographic groups requires the incorporation of price and income elasticities and a diet model similar to Irz et al (2015). This study used data from the UK National Diet and Nutrition Survey (NDNS) and price data from Kantar Worldpanel for the period 2008 to 2013. This study has estimated eight demand systems which represent the eight demographic groups of interest. This is a departure from the previous literature which has relied on household level demand systems to represent the different demographic groups. This study estimated similar diet models to Irz et al (2015) and found that increasing fruit consumption would have the most beneficial change in diet as measured by the Mean Adequacy Ratio (MAR). The demographic group of Males aged 11 to 15 resulted in an approximate increase in the MAR of 5 percent thus experienced the largest improvement in diets as a result of a 50 percent increase in fruit.

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JEL Codes: Q18, I12

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Key Words: Consumer preferences, nutrition, demand systems, diet models

JEL code: D12, Q18, I10

1. Introduction

Currently no demographic group in the UK meets the 5 a day fruit and vegetable recommendations (Food Standards Agency and Public Health England, 2016). Consumer preferences in the form of price elasticities have recently been included in diet models of Irz et al (2015) and Irz et al (2016). These microeconomic diet models offer an approach for modelling whole dietary change for the major demographic groups within the UK. Increasing fruit and vegetable consumption may have unintended consequences due to the substitution and complement relationships which could cause quantities of other beneficial food groups to reduce. Therefore, diets need to be modelled which account for these preferences (i.e. accounting for substitutions and complement relationships) and a whole dietary approach is required.

The aim of this paper is to estimate the effects on diets (for the eight demographic groups) of increased fruit and vegetable consumption whilst accounting for preferences in the form of Marshallian, Hicksian and Income elasticities. The resulting Mean Adequacy Ratio (MAR) and Mean Excess Ratio (MER) developed by Vieux et al (2013) of each diet will also be estimated in order to understand the overall effect of dietary change on nutrient consumption.

The structure of this paper is as follows: the background section presents the main issues associated with UK based food consumption in terms of nutrition and consumer preferences. This is then followed by the data and methods section which presents the data used along with the Irz et al (2015) method. The next section discusses the results with the final section offering a conclusion.

2. Background

One of the most concerning results of the recent National Diet and Nutrition Survey (NDNS) is that on average no demographic group (irrespective of age) in the UK managed to consume the five a day fruit and vegetable recommendation (Food Standards Agency and Public Health England, 2016). These NDNS results suggest that a 50 percent increase in fruit and vegetable consumption would be sufficient for the majority of demographic groups to satisfy their 5 a day. The exception would be the females aged 11 to 14 group but as the other groups would be sufficiently covered the target of a 50 percent is a reasonable policy to model. The Scottish Dietary Goals (SDG) translates this 5 a day into a minimum of 400 grams (Scottish Government, 2016). Clearly these two food groups require additional focus on dietary modelling.

Previous studies which have accounted for nutrition (and carbon emissions which this study will not focus on) such as Horgan et al (2016) found that only one person out of a sample of 1,491 UK adults recorded a diet which met all the major DRVs. This demonstrates the problem of diets in the UK not conforming to DRVs. However, the approach of Horgan et al (2016) to use linear programming lacks the ability to incorporate consumer preferences in sense of price elasticities.

The issue surrounding consumer preferences is important in order to produce a diet which would likely meet the different preferences of the demographic groups. Few studies have attempted to model this when estimating the contents of a sustainable diet. Green et al (2015), Irz et al (2015) and Irz et al (2016) have incorporated price elasticities into their diet models with the latter two studies using both own price, income elasticities and cross price elasticities whilst the former study used only own price elasticities. By incorporating price elasticities into diet models, underlying consumer preferences can be represented. However, an issue with both studies is the use of price elasticities which were estimated at household level and used to represent the individual demographic groups. This is assumes that household demand represents individuals from different demographic groups which seems unlikely given different preferences for food products can vary with age and gender.

The results from Irz et al (2015) suggest that the nutritional constraints have a mixed impact on consumption such as when the fibre nutritional constraint is increased by five percent resulting in increased consumption for total energy which is considered a negative effect (Irz et al., 2015). There were beneficial changes involved such as a five percent increase in the fruit and vegetable constraint resulting an approximate nine percent decrease in consumption of red meats.

An important result from Irz et al (2015) found that a five percent increase in the fruit and vegetables constraint resulted in decreased consumption of fibres by 16 percent (Irz et al 2015). This equates to the absolute quantity associated with an increase of five percent fruit and vegetable consumption of 19 grams per day (Irz et al 2015). This shows the unintended consequences of dietary policies.

3. Data

This section introduces the data required for the estimation of the demand systems, diet models, MAR and MER were: (1) dietary reference values (DRVs), (2) quantities of food and drink products consumed, (3) nutrients associated with food and drink consumption and (4) prices of these food and drink products.

The dietary reference values (1) (DRVs) are a combination of the Department of Health's Committee on Medical Aspects (1991) Scientific advisory committee on nutrition (2011) and the Scottish dietary goals (Scottish Government, 2016). Most of these DRVs are in the form of reference nutrient intakes (RNI), which are the quantity of nutrient which satisfy the requirement of at least 97 percent of a demographic group (Eastwood, 1997). Table 1 shows the DRVs for the demographic groups of interest to this study.

The quantities (2) of food products consumed and the associated nutrients (3) were obtained from the National Diet and Nutrition Survey (NDNS) years 1 to 6 (NatCen Social Research et al., 2017). Alcohol were excluded from the demographic groups below the ages of 19. Nutrient supplements were excluded from the dataset. Additional data for each respondent in the survey was: “Equivalised household income tertiles”, “Age” and “Survey year”. In terms of estimating the weekly data for the demand systems, the diaries were scaled up to seven days on the assumption that the same food and drinks consumed for the 3 or 4 days would also be consumed for the rest of the week. This assumption would be appear to be valid for those who partake in weekly shops. The NDNS products were assembled into 16 food groups based on NDNS food categories (these food groups are shown in table 2 of the results).

Median prices (4) were estimated from the Scottish section of Kantar Worldpanel and matched to the NDNS data. This was achieved through the use of Kantar designed sub groups which categorised all their collected goods into approximately 508 food groups (slightly varies by year). As the products are categorised into similar groups then a median price of these groups can be estimated for each year:

1. NDNS Year 1 – Kantar year 2008 data
2. NDNS Year 2 – Kantar year 2009 data
3. NDNS Year 3 – Kantar year 2010 data
4. NDNS Year 4 – Kantar year 2011 data
5. NDNS Year 5 – Kantar year 2012 data
6. NDNS Year 6 – Kantar year 2013 data

As theses Kantar prices were manually matched to the NDNS data then there are some cases where particular national brands or private labels could not be matched as the Scottish section of Kantar data did not have the subsequent product. Despite this limitation, this matched NDNS data is still considered to be the only source whereby a wide variety of nutrient data, food products and prices.

Table 1 Dietary reference values of the different demographic groups

	Female Ages11-14	Male Ages11-15	Female Ages 15-18	Male Ages 15-19	Female Ages 19-50	Male Ages 19-51	Female Ages 50 Plus	Male Ages 50 Plus
Energy (Kj)	9100.00	9850.00	10175.00	12575.00	8950.00	11225.00	8300.00	10250.00
Protein (g)	41.20	42.10	45.00	55.20	45.00	55.50	46.50	53.30
Sodium (mg)	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00
Calcium (mg)	800.00	1000.00	800.00	1000.00	700.00	700.00	700.00	700.00
Magnesium (mg)	280.00	280.00	300.00	300.00	270.00	300.00	270.00	300.00
Iron (mg)	14.80	11.30	14.80	11.30	14.80	8.70	8.70	8.70
Copper (mg)	0.80	0.80	1.00	1.00	1.20	1.20	1.20	1.20
Zinc (mg)	9.00	9.00	7.00	9.50	7.00	9.50	7.00	9.50
Vitamin A (µg)	600.00	700.00	600.00	700.00	600.00	700.00	600.00	700.00
Thiamin (mg)	0.70	1.10	0.80	1.10	0.80	1.00	0.80	0.90
Sugar (g)	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Fat (g)	67.39	73.13	61.16	90.61	59.13	87.92	54.66	81.06
Saturated Fat (g)	20.00	22.98	19.22	28.48	18.58	27.63	17.18	25.48
Fibre (g)	15.70	15.70	18.50	18.50	18.50	18.50	18.50	18.50

Sources: Based on Chalmers and Revoredo-Giha (2017)

4. Methods

This section starts by introducing the demand system for purposes of estimating price elasticities in order for consumer preferences to captured. Then the diet model of Irz et al (2015) is introduced which demonstrates how the elasticities are incorporated into a method which allows for the estimation of a whole diet approach when a constraint is changed. Finally, the Mean Adequacy Ratio (MAR) and Mean Excess Ratio (MER) are introduced in order to explain the metric behind the final estimated diet.

The Exact Affine Stone Index (EASI) demand systems were estimated in order to obtain the Marshallian price and Income elasticities for the eight demographic groups (to represent preferences). Conditional demand systems were estimated based on 16 food and drink groups. Equation 1 shows the "approximate" model of the linear approximate EASI demand which is based on the EASI introduced by Lewbel and Pendakur (2009) with the following parameters: *w* = budget shares, *b* = represents the Engel curve, $\tilde{y}$ = the stone price index, A = compensated price effects, p = log prices and the error term ε represented random utility parameter.

The instrumental variables for estimation were taken from the NDNS data and comprised of equivalised household income tertiles, Age and Survey year. The eight systems were estimated with no interactions between price, implicit utility and demographic variables.

$$w = \sum_{r=0}^{r} b_r \tilde{y}_r + Cz + Dz\tilde{y} + \sum_{l=0}^{L} z_l A_l p + Bp\tilde{y} + \tilde{\varepsilon} \qquad 1$$

The resulting own price Marshallian and Income elasticities were estimated and calibrated in order to estimate cross price Marshallian and Hicksian price elasticities which met curvature restrictions and for the purposes of Irz et al (2015) diet model allow for welfare measures to be estimated.

Irz et al (2015) and Irz et al (2016) used optimisation in order to assess the impact of nutritional constraints on the whole diet instead of previous studies in economics which often assess the effect of prices on diets ex post. They do this through extending the theory of consumer under rationing of Jackson (1991). The work of Jackson (1991) explained how rationing can be incorporated into underlying consumer preferences and emphasised that consumers are often not just constrained by the budget constraint. Jackson (1991) supports Deaton (1981) with regards to defining preferences in a rationed version for estimation of virtual prices. The work of Jackson (1991) is theoretical rather than applied to a particular problem of rationed goods or services.

The objective function used of Irz et al (2015) takes the form of equation 2 whereby the rationed cost function ($\tilde{C}$) is minimised subject to price (p), utility (U), A (matrix of nutritional coefficients) and r (vector of maximum nutrients allowed). A represents the DRVs shown in table1 of the data section.

$$\underset{p}{Min} \qquad (p, U, A, r) \qquad s.t \tag{2}$$

This nutritional constraint (r_n) represents the fruit or vegetable constraints. The left-hand side of equation 3 allows for the estimation of the impact of nutrient recommendations on nutrient consumption (Irz, Leroy et al. 2015). This constraint can be related to the unconstrained and constrained problems in rationing theory which allow for the demand functions to be identified (Irz et al 2015).

$$\sum_{i=1}^{H} a_i^{\,n} x_i \leq r_n, \forall n = 1,..., N \tag{3}$$

Equation 4 shows how the substitution effects arising from the nutritional constraints impact upon demand for other products which forms the basis of the model used by Irz et al (2015) and Irz et al (2016). The left-hand side of equation 4 signifies how consumer behaviour can be observed through the partial derivative of Hicksian demand parameters ($\tilde{h}$) with respect to the dietary constraints (r_1) signify how the nutrient constraint affect underlying consumer behaviour (Irz et al 2015). Essentially the partial derivative of the Hicksian demand parameters allows the price elasticities of an unconstrained individual to be incorporated into this equation, which allows for an understanding of how dietary constraints (r_1) would change the dietary choice of the individual. Equation 4 shows how a change in diet constraints (a_i^1) will induce changes on the whole diet through the Slutsky terms (s_{ki}) (Irz et al 2015).

$$\frac{\partial \tilde{h}}{\partial r_1} = \frac{\sum_{i=1}^{H} sk_i a_i^1}{\sum_{i=1}^{H} \sum_{j=1}^{H} s_{ij} a_i^1 a_j^1}, k = 1,..., H \tag{4}$$

The fruit and vegetables constraints (Δr_1) can be increased while maintaining the existing nutrient constraints as seen in equation 5. This is an iterative process whereby the resulting change on the Hicksian quantities are used to estimate the compensation variation (CV) and then the change resulting in Marshallian demands. If these Marshallian demands meet the initial constraints then a solution has been found. Otherwise if a solution cannot be found, the initial constraints are adjusted until a solution can be found (Irz et al., 2015).

$$\frac{\partial CV}{\partial r_1} = -p_1 \frac{\partial \widetilde{h_1}}{\partial r_1} - p_2 \frac{\partial \widetilde{h_2}}{\partial r_2} = CV^* \qquad 5$$

The MAR estimates the percentage of mean daily intake of beneficial nutrients with 100 percent representing a diet which conforms to the selected nutritional requirements (Vieux et al., 2013). Whilst the MER estimates the percentage mean daily maximum recommended intake of saturated fats, sugars and sodium with percentage greater than 100 showing excess consumption of one or more of these nutrients (Vieux et al., 2013).

5. Results and Discussions

The results for all the demographic groups suggest that a 50 percent increase to the existing quantities of fruit or vegetables consumed could result in improvements in terms of the MAR. Due to space constraints the Marshallian, Hicksian, income elasticities and shadow prices for each of the eight groups could not be shown. For all the groups the fruit group (Fruit, fruit products and fruit and vegetable juices) was relatively more price elastic than the vegetable group (Vegetables and vegetable products) though this was more apparent in the younger age groups (irrespective of gender). In addition to this the Marshallian and Hicksian price elasticities showed that many unhealthy food groups (in terms of the nutrients provided) acted as complements to the fruit and vegetable groups. By using the diet model the changes imposed by the 50 percent increase of fruit and vegetable constraint for the whole diet can be assessed. This also helps to explain why the exact quantities of the DRVs in table 1 do not match with the resulting nutrient intakes shown in tables 3 and 5.

With regards to the results of a 50 percent increase in vegetable consumption which is shown in Table 2, it can be seen that the main changes from the baseline data (shown in Table 6 of the appendix) are obviously for the vegetables group (though very small changes can be observed for other food groups). The MAR increases for all the demographic groups which should be expected given the beneficial nutrients such as Magnesium contained within vegetables. The largest increase in MAR is for females aged 11 to 14 which would increase the MAR by approximately 4.6 percent.

However, the vegetable group as constructed by the NDNS data contains products such as vegetarian based ready meals (such as curries) thus the high sodium and energy levels. This also has the effect of increasing the MER. This MER is explained by the observation that food groups such as "Sugar and confectionary and prepared desserts group" (which is relatively high in NMES) experience a small increase in consumption of approximately 2 percent for Females Aged 15 to 18.

With regards to the fruit constraint (results shown in Table 4), a 50 percent increase in consumption will result in slightly larger improvements to the MAR than for vegetables as shown in Table 5. The male and female aged 11 to 14 groups would experience nearly a 5 percent increase in the MAR which takes the MAR to 81 and 88. The MER does not increase to the same extent as for the case of the vegetables. This is because the NDNS fruit group does not contain processed meals as in the case of vegetables. The Male aged 11 to 14 group also benefits from approximately a 22 percent reduction in consumption of the "Sugar and confectionary and prepared desserts group". Whilst the table 5 shows that this demographic group exceeds the DRV of NMES of 30 grams it does show marginal changes in the diet can occur.

The background section covered the issue that a 50 percent increase in either fruit or vegetables (relative to the baseline quantities) would be sufficient for most of the demographic groups to meet their 400 grams target of fruit and vegetable. The most effective approach would entail focussing on increased fruit consumption in order to improve diet.

Table 2 Results of 50 percent increase in Vegetables on consumption of food groups

Food Groups (grams)	Demographic Group							
	Female 50 Plus	Male 50 Plus	Female 19 to 50	Male 19 to 50	Female 15 to 18	Male 15 to 18	Female 11 to 14	Male 11 to 14
Vegetables and vegetable products	254	258	224	225	147	163	125	135
Fruit, fruit products and fruit and vegetable juices	183	187	152	177	168	175	160	185
Grains and grain-based products	132	172	163	213	170	221	169	205
Starchy roots, tubers, legumes, nuts and oilseeds	94	120	88	108	93	116	83	89
Beef, veal and lamb	50	67	50	66	47	59	45	42
Pork	28	38	27	39	25	37	25	29
Poultry, eggs, other fresh meat	55	70	68	88	64	81	61	63
Processed and other cooked meats	38	62	43	71	48	72	43	59
Fish and other seafood	47	58	42	52	40	44	31	33
Milk, dairy products and milk product imitates	193	206	153	183	130	229	157	223
Cheese	20	25	22	25	18	21	16	18
Sugar and confectionary and prepared desserts	84	78	65	70	58	65	67	82
Soft drinks	219	271	353	477	475	587	415	516
Tea, coffee, cocoa, and drinking water	1257	1114	1068	1075	576	589	407	408
Snacks and other foods	41	49	38	48	43	53	50	49
Residual category	150	454	196	464	62	58	49	50

Source: Own elaboration based on NDNS data

Table 3 Results of 50 percent increase in Vegetables on consumption of nutrients

Nutrients (units in brackets)	Demographic Group							
	Female 50 Plus	Male 50 Plus	Female 19 to 50	Male 19 to 50	Female 15 to 18	Male 15 to 18	Female 11 to 14	Male 11 to 14
Energy (Kj)	10838.4	13785.1	10673.5	13926.6	8037.69	10690.7	8305.9	9460.2
Protein (g)	80.4	100.0	78.4	100.0	63.41	87.0	64.6	73.6
Sodium (mg)	2194.0	3061.5	2179.7	3037.9	1441.05	1961.5	1466.6	1651.4
Calcium (mg)	852.9	970.2	779.5	936.2	599.84	823.8	627.2	756.3
Magnesium (mg)	348.3	399.3	328.6	397.5	241.42	310.9	237.8	269.3
Iron (mg)	11.2	13.9	10.7	13.6	8.05	10.9	8.4	9.5
Copper (mg)	1.1	1.4	1.1	1.4	0.81	1.1	0.9	1.0
Zinc (mg)	9.7	12.1	9.4	12.0	7.54	10.5	7.8	8.9
Vitamin A (µg)	350.1	424.1	322.3	412.3	287.43	378.0	296.1	357.2
Thiamin (mg)	1.5	1.8	1.5	1.8	1.19	1.6	1.2	1.4
Sugar (g)	44.7	53.7	49.6	64.9	55.01	68.6	55.2	64.3
Fat (g)	72.8	97.3	74.5	101.1	64.05	86.1	65.8	76.2
Saturated Fat (g)	24.2	31.6	24.2	32.4	20.98	28.7	21.8	25.6
Fibre (g)	14.3	16.1	13.3	15.5	10.62	13.8	11.2	12.5
Mean Adequacy Ratio (MAR)	92.1	94.2	66.5	93.6	77.4	86.6	81.0	87.0
Mean Excess Ratio (MER)	142.4	164.8	144.0	174.5	130.8	147.0	131.0	143.0

Source: Own elaboration based on NDNS data

Table 4 Results of 50 percent increase in Fruits on consumption of food groups

Food Groups (grams)	Demographic Group							
	Female 50 Plus	Male 50 Plus	Female 19 to 50	Male 19 to 50	Female 15 to 18	Male 15 to 18	Female 11 to 14	Male 11 to 14
Vegetables and vegetable products	169	172	150	150	98	109	83	90
Fruit, fruit products and fruit and vegetable juices	275	280	228	265	253	263	240	278
Grains and grain-based products	132	173	163	213	167	221	169	258
Starchy roots, tubers, legumes, nuts and oilseeds	94	120	88	108	92	116	83	65
Beef, veal and lamb	50	66	50	66	46	59	45	42
Pork	28	38	27	38	24	37	24	29
Poultry, eggs, other fresh meat	55	69	68	86	62	81	61	94
Processed and other cooked meats	38	62	43	70	46	72	43	59
Fish and other seafood	47	58	42	52	39	44	31	38
Milk, dairy products and milk product imitates	193	206	153	183	130	229	157	285
Cheese	20	25	22	25	17	21	16	18
Sugar and confectionary and prepared desserts	84	78	65	69	56	65	67	64
Soft drinks	219	271	352	472	454	581	408	415
Tea, coffee, cocoa, and drinking water	1260	1098	1066	1056	568	587	405	311
Snacks and other foods	41	49	37	47	42	52	50	44
Residual category	150	454	196	464	62	58	49	43

Source: Own elaboration based on NDNS data

Table 5 Results of 50 percent increase in Fruits on consumption of nutrients

Nutrients (units in brackets)				Demographic Group				
Nutrients	Female 50 Plus	Male 50 Plus	Female 19 to 50	Male 19 to 50	Female 15 to 18	Male 15 to 18	Female 11 to 14	Male 11 to 14
Energy (Kj)	10125.7	13030.5	10015.7	13248.2	8294.5	10296.4	8044.4	9595.6
Protein (g)	76.1	95.3	74.4	95.7	65.3	84.7	63.2	79.7
Sodium (mg)	1985.5	2841.3	1991.5	2838.0	1462.1	1830.5	1369.1	1603.5
Calcium (mg)	834.6	948.1	760.6	917.4	628.1	820.4	629.2	810.6
Magnesium (mg)	338.0	387.0	318.1	386.9	256.1	308.5	238.4	282.5
Iron (mg)	10.5	13.1	10.0	13.0	8.7	10.6	8.4	9.9
Copper (mg)	1.0	1.3	1.0	1.3	0.9	1.1	0.8	1.0
Zinc (mg)	9.2	11.6	8.9	11.6	7.9	10.3	7.7	9.6
Vitamin A (µg)	392.4	465.9	357.0	451.1	325.7	417.6	332.6	437.5
Thiamin (mg)	1.4	1.7	1.4	1.8	1.3	1.6	1.2	1.6
Sugar (g)	44.7	53.7	49.5	64.4	54.6	68.1	54.6	52.1
Fat (g)	71.6	95.8	73.3	99.6	65.4	85.6	65.7	84.9
Saturated Fat (g)	23.9	31.1	23.9	31.8	21.2	28.5	21.7	27.8
Fibre (g)	14.0	15.8	13.0	15.3	12.2	14.2	11.7	13.5
Mean Adequacy Ratio (MAR)	91.9	94.6	66.1	94.2	81.1	86.6	81.0	88.0
Mean Excess Ratio (MER)	137.4	159.6	139.4	169.0	130.8	147.0	130.0	140.0

Source: Own elaboration based on NDNS data

6. Conclusion

This study found that a 50 percent increase in fruit and vegetables whilst incorporating consumer preferences through calibrated price and income elasticities results in diets which are likely acceptable to consumers as only marginal changes in consumption of other food groups would be required. The increase in the vegetable constraint results in an increase of nutrients considered to have a negative impact on health such as sodium which is likely because of the vegetable based meals incorporated within this group. Therefore, a 50 percent increase in fruit consumption is likely to have better nutrition outcomes in terms of MAR and MER for all the demographic groups.

This study has improved diet modelling through estimating the eight demand systems in order to represent consumer preferences rather than use household level demand systems as representation. The overall diet results would allow consumers to make small changes to their diet without eradicating or substantially reducing any of their consumed food groups. This is an important point as many of the diet models being based on linear programming or quadratic programming result in radical changes from currently consumed food products as they fail to capture consumer preferences to the same extent as this study.

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Appendix

Table 6 Baseline quantities consumed

Food Group (grams)	Demographic Group							
	Female 50 Plus	Male 50 Plus	Female 19 to 50	Male 19 to 50	Female 15 to 18	Male 15 to 18	Female 11 to 14	Male 11 to 14
Vegetables and vegetable products	169	172	150	150	98	109	83	90
Fruit, fruit products and fruit and vegetable juices	183	187	152	177	168	175	160	185
Grains and grain-based products	132	173	163	213	167	221	169	205
Starchy roots, tubers, legumes, nuts and oilseeds	94	120	88	108	92	116	83	89
Beef, veal and lamb	50	67	50	66	46	59	45	42
Pork	28	38	27	39	24	37	25	29
Poultry, eggs, other fresh meat	56	69	68	87	62	81	61	62
Processed and other cooked meats	38	62	43	71	47	72	43	59
Fish and other seafood	48	58	42	52	39	44	31	33
Milk, dairy products and milk product imitates	193	206	153	183	130	229	157	223
Cheese	20	25	22	25	17	21	16	18
Sugar and confectionary and prepared desserts	85	78	65	69	56	65	67	82
Soft drinks	219	271	353	473	459	585	412	503
Tea, coffee ,cocoa, and drinking water	1271	1106	1071	1062	568	588	406	407
Snacks and other foods	41	49	38	48	42	53	50	48
Residual category	150	454	196	464	62	58	49	50

Source: Own elaboration based on NDNS data

Table 7 Baseline nutrients consumed

Nutrients (units in brackets)	Demographic Group							
	Female 50 Plus	Male 50 Plus	Female 19 to 50	Male 19 to 50	Female 15 to 18	Male 15 to 18	Female 11 to 14	Male 11 to 14
Energy (Kj)	9843.8	12731.2	9779.6	12974.9	8037.7	10023.0	7787.7	8876.3
Protein (g)	74.0	93.1	72.6	93.6	63.4	82.7	61.3	69.9
Sodium (mg)	1962.4	2816.4	1972.6	2816.5	1441.1	1807.4	1346.8	1519.6
Calcium (mg)	804.5	916.7	735.5	887.9	599.8	790.6	601.5	727.3
Magnesium (mg)	322.6	370.9	305.1	371.8	241.4	293.2	224.1	254.1
Iron (mg)	9.8	12.4	9.4	12.3	8.1	9.9	7.7	8.7
Copper (mg)	1.0	1.2	0.9	1.2	0.8	1.0	0.8	0.9
Zinc (mg)	8.8	11.2	8.6	11.2	7.5	9.9	7.4	8.5
Vitamin A (µg)	350.7	423.4	322.6	411.0	287.4	377.8	295.8	356.3
Thiamin (mg)	1.4	1.6	1.3	1.7	1.2	1.5	1.2	1.4
Sugar (g)	44.9	53.7	49.7	64.5	55.0	68.4	54.9	63.2
Fat (g)	70.0	94.2	72.0	98.2	64.1	84.2	64.3	74.4
Saturated Fat (g)	23.6	30.9	23.7	31.6	21.0	28.2	21.4	25.1
Fibre (g)	12.3	14.0	11.5	13.7	10.6	12.5	10.2	11.4
Mean Adequacy Ratio (MAR)	89.5	92.9	65.2	92.5	77.4	86.6	77.5	84.0
Mean Excess Ratio (MER)	136.6	158.7	138.8	168.5	130.8	147.0	130.0	140.0

Source: Own elaboration based on NDNS data