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HOUSEHOLD FOOD WASTAGE IN TURKEY

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SUMMARY

Household Budget Surveys, Household Income and Expenditure Surveys and Food Balance Sheets provide useful data for epidemiological research and for developing National Food and Nutrition Policies. Findings from these sources need to be interpreted in the light of other data regarding food consumption and factors that may affect consumption, energy and nutrient intake need to be taken into account. For example, in the case of household food wastage, food waste occurs between acquisition (house-gate) and food preparation; between food preparation and food serving; and after food serving (plate waste). The purpose of this study was to estimate household food wastage using a sample of 500 households (1 736 individuals) in Ankara, Turkey, grouped according to socio-economic status. The study was carried out during the summer of 2005. Mean (± SEM) energy intake levels per consumption unit and per person were found to be 2 692.6± 58.96 and 2 207.9 ± 48.35 kcals/day, respectively. Mean daily energy loss from acquisition to plate waste was 481.7 kcal by the average household and 215.7 kcal/person, which amounts to 8.9% of daily per person dietary energy consumption (DEC). Wastage accounted on average for 9.8% of the daily energy intake per person. The average daily discards per household and per person were 816.4g and 318.8g respectively.

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Abbreviations and Acronyms

CU	Consumption Unit
DEC	Dietary Energy Consumption
FBS	Food Balance Sheet
g	gram
HBS	Household Budget Survey
HIES	Household Income and Expenditure Survey
kcal	kilocalorie
SD	standard deviation
SEM	standard error of mean
YTL	New Turkish Lira

HOUSEHOLD FOOD WASTAGE IN TURKEY

I. INTRODUCTION

1. Household Budget Surveys (HBS), Household Income and Expenditure Surveys (HIES) and Food Balance Sheets (FBS) provide useful data for epidemiological research and for developing National Food and Nutrition Policies. Findings from these sources need to be interpreted in the light of other data regarding food consumption and factors that may affect consumption, energy and nutrient intake need to be taken into account. For example, in the case of household food wastage, food waste occurs between acquisition (house-gate) and food preparation; between food preparation and food serving; and after food serving (plate waste). The purpose of this study was to estimate household food wastage using a sample of 500 households (1 736 individuals) in Ankara, Turkey, grouped according to socio-economic status. The study was carried out during the summer of 2005.[1]

2. The most relevant purposes for which food consumption data are collected are related to: (i) food and nutrition planning (adequacy of the food supply, food production, food distribution, food regulations, food fortification and nutrition education); (ii) nutritional studies (estimation of the adequacy of dietary intake of population groups, investigation of the relationship between diet and health and nutritional status, evaluation of nutrition education, nutrition intervention and food fortification programmes); and (iii) toxicological aspects of the food supply (estimation of food additives and contaminants and estimation of habitual high and low levels of consumption of foods containing fortification nutrients and food additives) (Cameron and van Staveren, 1988).

3. Not all dietary assessment tools are equal. The decision regarding which dietary assessment method to use for a single purpose needs to fit the goals of the assessment.

4. The food data used for international comparisons most often derive from: (i) FBS, providing information on food supply for human consumption at the national level; (ii) HBS/HIES, which collect data on food availability; and (iii) specifically designed Individual Nutrition Surveys which take place over a short time period. These data allow determining what information can be compared over time at national level. Household survey methods provide a quick way of estimating the food consumption and nutrient intake of countries, although these measure uptake and not actual intake. The method used by many countries to calculate food availability per capita per day is to divide product availability in the household by mean household size and the time period (DAFNE III, 2000).

Food Balance Sheets

5. The most common and widely used datasets in the field of food consumption statistics are obtained through FBSs. They provide estimates of quantities available for human consumption in a country during a specified period. The per caput supply of each food item available for human consumption is obtained and data on per caput food supplies are expressed in terms of quantity, caloric value, protein and fat content. It is important to note that the quantities of food available for human consumption, as estimated in the FBSs, relate simply to the quantities reaching the consumer in private households, as well as in the non-household sector, i.e., catering establishments, boarding schools, hospitals, prisons, armed forces' bases and other communities. The amount of food actually consumed may be lower than the quantity shown in the FBS. The difference reflects waste occurring between retail level and the kitchen, as losses of edible food and nutrients in households and institutions, e.g., during storage, in preparation and cooking (which has a greater effect on vitamins and minerals than on calories, protein and fat), as plate-waste, or as quantities fed to domestic animals and pets, or that thrown away (FAO, 2000).

[1] The authors are grateful to the students of Hacettepe University Department of Nutrition and Dietetics for their help in the collection of data. The authors would also like to acknowledge the support of the Statistics Division of the Food and Agriculture Organization of the United Nations (FAO); and the assistance of Mr Ricardo Sibrian, Senior Statistician and Ms Amanda Gordon, Statistician, of the Statistics Division, in finalising the report.

6. Information on food consumption or availability is also available from surveys of household consumption or expenditure (FAO, 2000). Due to differences in the concepts and definitions used and to measurement errors, the data from these two sources are not expected to be directly comparable.

Household Budget Surveys/Household Income and Expenditure Survey

7. The HBS or HIES collects data on food items as an integral part of its broader enquiry on household consumer expenditure and income and is undertaken on a more-or-less regular basis in many countries. These surveys attempt to measure household consumption through the expenditure approach, i.e., from the monetary value of the food (as well as other goods) acquired by households (FAO, 2000).

8. The food consumption data obtained from the household expenditure surveys generally reflect the food acquired by, or available to, the household during the reference period. Wastage or losses in the household, such as food fed to pets, leftovers, food thrown away, etc., are not normally accounted for. Information on food, whether purchased or otherwise acquired, is normally collected by interviewing household respondents (recall method) or by record-keeping.

9. Information on food eaten outside the household is usually collected in household expenditure surveys. However, the information collected refers to monetary values only. As such, the quantity data exclude the quantities of food eaten away from home. This omission has little effect on the national estimate of average per caput consumption figures for countries where eating outside the household is not a common practice. However, for countries where a significant proportion of food is eaten outside the home, consumption would be underestimated (FAO, 2000).

10. Recent research has expanded towards comparing patterns of food intake in a country or between countries. Food consumption surveys which are held at household and individual levels are used to estimate the adequacy of dietary intake, to investigate the relationship of diet to nutritional status or the development of disease, and to also obtain qualitative and/or quantitative information on the food actually eaten.

Household Food Consumption or Dietary Surveys

11. Household food consumption in a nutritional sense represents the food and beverages consumed by the household. This can be the sum of the food intake of the individual household members, or it can be the total amount of food consumed in the household, excluding that eaten away from home unless taken from home (Cameron ME, van Staveren WA, 1988).

12. The main objective of household food consumption or dietary surveys is to collect data on the quantities of food items consumed by a representative sample of households selected from the population. They provide detailed data on food consumed in the household as well as away from home, i.e., any food and beverages, meals and snacks eaten outside the home by members of the household.

13. Information on household food consumption is obtained by recording or recalling. Amounts of foods may be weighed or weights can be estimated by the household's measures, food models, and/or photographs. Energy and nutrient contents are calculated from food composition tables (Cameron ME, van Staveren WA, 1988).

14. Information on food consumed away from home is obtained by interviewing each member of the household. The food consumption data obtained from this type of survey represent an estimate of the quantities actually eaten. The enumerations normally are carried out for a period of 24-hours or three to seven consecutive days. This type of survey calls for very careful supervision by the interviewer and close cooperation by the respondents. In general, these surveys are rather complicated and costly to undertake and therefore are not always carried out frequently, or even at regular intervals (FAO, Cameron ME, van Staveren WA, 1988, Thomson FE, Byers T, 1994).

II. PURPOSE

15. The purpose of this study is to estimate the food wastage occurring between acquisition and food preparation; between food preparation and food serving to household members; and after food serving (plate waste) in the household.

III. METHODS AND MATERIALS

Sampling Design

16. The study was designed as a cross-sectional study and was held during 19-29 July 2005, in Ankara, which is the capital city of Turkey and the country's second largest city after İstanbul. The total number of households is 1 018 371 and the total household population is 3 887 844, giving an average household size of 3.82 (www.die.gov.tr).

17. A total of 500 households (1 736 persons) in different districts of Ankara agreed to participate in the study. They were recruited to be representative of the main socio-economic groups; namely high (126 households, 25.2%), middle (203 households, 40.6%) or low (171 households, 34.2%). Socio-economic status (SES) was classified according to the districts where the households were situated.

General Characteristics of Households

18. The age and sex of each member of the household was recorded, beginning with the household head, followed by the spouse and children. Household members were interviewed to acquire information on socio-demographic status, family size, educational and occupational status and income level. The income of the household members and household head was determined after the questionnaire was completed (Appendix 1).

Food Consumption

19. At household level food consumption data was collected by the 24-hour recall survey technique. The person responsible for meal preparation and cooking at home was interviewed for data referring to the previous day. All the data were collected by 50 third grade students of the Department of Nutrition and Dietetics at Hacettepe University, who have been educated in, and have experience on, nutritional assessment techniques. The students visited the households participating in the study under the supervision of the instructors (authors of this report), and were also trained on the questionnaire.

20. There are many studies showing that the foods are not distributed equally within family members. Adult men often receive more than the other family members. The adequacy of diet of particular age/sex groups within families may not be equal to the average for the family as a whole. This problem can be overcome by using factors to predict how nutrients are distributed within the household. Intake according to age and sex is expressed in relation to that of the adult male, whose intake is taken as standard. Values for other age and sex groups are calculated based on the Recommended Dietary Allowances (RDA) for an adult man (Cameron ME, van Staveren WA, 1988).

21. Turkey has been using Consumption Unit (CU) reference values for many years. The tables in Appendix 2 list daily CUs by age and gender and also by age, gender and meals. Average energy, nutrient and food intake are given per CU and per person.

Food Frequency

22. The food frequency approach asks respondents to report their usual frequency of consumption of each food from a list of foods for a specific period (Thomson, Byers, 1994). The food frequency questionnaire is used for the estimation of the consumption frequency of food items and also for food wastage. A guide form was developed in order to calculate the food losses in mixed dishes. This helped in accurately performing calculations and also aided the memory of the respondent (Appendix 1). Members of the households who were absent for any

reason (e.g. army service, work etc.) were not included in the survey. Visitors' intake was included in the total household intake whereas food eaten by household members outside the home was excluded. If a member of a family did not have a meal at home, the identified meal was subtracted from the total daily CU. If visitors shared the meal in a household, their CU values were added to total household CU.

23. Three of the supervisors (Dr Köksal, Res Ass. Küçükerdönmez and Dr Özel) performed the food coding and the data input using *ad hoc* BEBİS software and SPSS 10 programme. Food waste was estimated as: (i) waste occurring between acquisition and food preparation; (ii) waste occurring between food preparation and food serving to household members; and (iii) waste occurring after food serving (plate waste) (Appendix 1). Energy and nutrient intakes were calculated per CU and per person. According to the age and sex distribution of the surveyed population, 82 CUs were found to be equivalent to 100 persons. Therefore a conversion factor of 0.82 is used to convert values per CU to values per person (average amounts of energy, nutrient and food intake per CU were multiplied by 0.82 to give amounts per person).

24. Data are presented in distribution tables according to SES groups. The statistics given are mean ($\bar{x}$), median, standard deviation (SD) and standard error of mean (SEM).

IV. RESULTS

A. General Characteristics of the Households

Socio-economic Status

25. The distribution of households according to SES is given in Table 1. The percentage of families belonging to high, middle and low SES are 25.2, 40.6 and 34.2, respectively.

Table 1. Distribution of households by SES

SES	No. of households	%
High	126	25.2
Middle	203	40.6
Low	171	34.2
Total	500	100.0

26. The total number of subjects in the families was 1 736 of which 36.1% were adult men and 39.6% were adult women; and the number of subjects living in high, middle and low SES was 424, 683 and 629, respectively (Table 2).

Table 2. Distribution of subjects by SES and sex

Subjects	High SES		Middle SES		Low SES		Total	
	No.	%	No.	%	No.	%	No.	%
Adult men	170	40.1	246	36.0	211	33.5	627	36.1
Adult women	170	40.1	292	42.8	225	35.8	687	39.6
Pregnant women	1	0.2	3	0.4	4	0.6	8	0.4
Lactating women	2	0.5	3	0.4	4	0.6	9	0.5
Young males (6-18 yrs)	39	9.2	56	8.2	76	12.1	171	9.9
Young females (6-18 yrs)	25	5.9	54	7.9	70	11.1	149	8.6
Boys (0-5 yrs)	8	1.9	13	1.9	21	3.4	42	2.4
Girls (0-5 yrs)	9	2.1	16	2.4	18	2.9	43	2.5
Total	424	100.0	683	100.0	629	100.0	1 736	100.0

Income

27. A total of 474 out of the 500 households reported their incomes. The mean monthly income of the households was YTL 3 855.0, YTL 1 687.3 and YTL 831.67 (1.35 YTL = 1 US$) for high, middle and low SES households, respectively (Table 3). The average income of the household head is given in Table 4.

Table 3. Total household monthly income

SES status	Mean	Median	SD	SEM
	YTL/month*			
High	3 855.0	3 400.0	1 770.32	161.60
Middle	1 687.3	1 560.0	609.71	44.35
Low	831.67	800.0	511.99	39.86
Total**	1 938.2	1 500.0	1 552.91	71.33

**1US $ = 1.35 YTL*

*** Income was not indicated by 26 households.*

Table 4. Household head monthly income

SES status	Mean	Median	SD	SEM
	YTL/month*			
High	2 844.4	2 500.0	1 830.44	167.09
Middle	1 227.3	1 000.0	648.34	47.16
Low	689.4	700.0	252.10	20.06
Total**	1 518.7	1 000.0	1 595.89	73.85

**1US $ = 1.35 YTL*

*** Income was not indicated by 26 households.*

Education and Occupation

28. The percentage of adult men and women with primary school as maximum education level attained was 10.7% and 21.2%, respectively (Table 5). The highest percentage of people with a maximum education level of primary school was in the low SES group. As expected, the percentage of individuals with university education was high (45.7%) in the high SES group (Table 6).

Table 5: Distribution of subjects by education

Education	Male		Female		Young male (6-18 yrs)		Young female (6-18 yrs)	
	No.	%	No.	%	No.	%	No.	%
Illiterate	2	0.3	25	3.6	-	-	-	-
Literate	7	1.1	13	1.9	48	31.0	41	29.1
Primary	67	10.7	149	21.2	43	27.7	31	22.0
Secondary	59	9.4	52	7.4	52	33.5	46	32.6
High school	236	37.6	276	39.2	12	7.8	23	16.3
Üniversity	256	40.9	188	26.7	-	-	-	-
Total	627	100.0	704	100.0	155	100.0	141	100.0

Table 6. Distribution of subjects by SES and education

Education	High SES		Middle SES		Low SES		Total*	
	No.	%	No.	%	No.	%	No.	%
Illiterate	2	0.5	6	0.9	19	3.3	27	1.7
Literate	18	4.4	31	4.8	60	10.4	109	6.7
Primary	44	10.9	90	14.0	156	27.1	290	17.8
Secondary	44	10.9	70	10.8	95	16.5	209	12.8
High school	112	27.6	263	40.7	173	30.0	548	33.7
Üniversity	185	45.7	186	28.8	73	12.7	444	27. 3
Total	405	100.0	646	100.0	576	100.0	1 627	100.0

**109 children were excluded.*

29. The mean (±SEM) duration of education of household members was 10.4±0.11 years. The percentage of household heads who had primary, high school and university education was 15.0%, 31.4% and 41.6%, respectively. Household heads were mostly working in the public (25.0%) and private (27.6%) sectors. Only 3.0% of women were housewives (Table 7).

Table 7. Distribution of household head by education and occupation

Status	No. persons	%
Education		
Illiterate	5	1.0
Literate	6	1.2
Primary	75	15.0
Secondary	49	9.8
High school	157	31.4
University	208	41.6
Occupation		
Public sector	125	25.0
Qualified labour	52	10.4
Unqualified labour	29	5.8
Housewife	15	3.0
Private sector	138	27.6
Student	31	6.2
Retired	102	20.4
Unemployed	8	1.6

30. The mean (±SEM) duration of education of household heads was found to be 11.6±0.18 years. As indicated in Table 8, the percentage of subjects working as qualified or unqualified labourers was 13.4% in the low SES group and 26.7% of subjects in the high SES group were working in the private sector.

Table 8. Distribution of subjects by occupation

Occupation	High SES		Middle SES		Low SES		Total	
	No.	%	No.	%	No.	%	No.	%
Public sector	76	18.8	105	16.2	48	8.3	229	14.1
Qualified labourer	10	2.5	27	4.2	39	6.8	76	4.7
Unqualified labourer	4	1.0	18	2.8	38	6.6	60	3.7
Housewife	60	14.8	105	16.3	148	25.7	313	19.2
Private sector	108	26.7	93	14.4	50	8.7	251	15.4
Student	105	25.9	214	33.1	172	29.9	491	30.2
Retired	39	9.6	65	10.1	48	8.3	152	9.3
Unemployed	3	0.7	19	2.9	33	5.7	55	3.4
Total	405	100.0	646	100.0	576	100.0	1 627	100.0

Household Family Size

31. The average number of subjects in the households was 3.4, 3.4 and 3.7 in high, middle and low SES groups, respectively (Table 9).

Table 9. Average family size by SES and sex

Family	High SES			Middle SES			Low SES			Total		
size	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Mean	3.4	2.7	3.4	3.6	2.4	3.4	3.86	2.7	3.7	3.6	2.6	3.4
SD	0.93	0.82	0.93	1.14	0.64	1.15	1.38	1.68	1.49	1.19	1.14	1.24
SEM	0.08	0.33	0.08	0.09	0.10	0.08	0.11	0.32	0.11	0.06	0.13	0.05
Min	1	2	1	2	1	1	1	1	1	1	1	1
Max	6	4	6	8	4	8	10	9	10	10	9	10

B. DIETARY INTAKE

Food Intake of Subjects per Consumption Unit (CU) and per Person

32. The average daily consumption of foods per CU and per person is given in Table 10 and by SES group in Tables 11a-11c. Fresh fruit and vegetable intake was found to be high in all SES groups. In summertime fruits such as watermelon, melon, cherries and grapes, and vegetables such as green beans, eggplant, cabbage, lettuce and tomatoes are usually consumed in higher amounts. Cereals (111.3g) and bread (179.7g) were the main energy source (Table 10).

33. Statistically significant differences ($p<0.05$) between CUs in the SES groups were found in the consumed amounts of milk and yogurt (high: 214.4 g, low:132 g), red meat (high: 90.1g, middle: 62.2g, low: 40.2g), bread (high: 219.2g, middle: 241.5g, low: 280.5g), oils (high: 29.4g, middle: 21.9g) and alcohol (high: 8.2g, low: 0g) (Tables 11a-11c).

Table 10. Mean daily consumption of foods per CU and per person

Food and Beverages	g/CU/day				g/person/day			
	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Milk and yogurt	168.1	114.8	225.19	10.07	137.8	94.2	184.65	8.26
Cheese	57.7	47.4	55.92	2.50	47.3	38.8	45.86	2.05
Red meat	61.7	8.6	105.30	4.71	50.6	7.1	86.35	3.86
Poultry	45.4	0.0	137.25	6.14	37.3	0.0	112.55	5.03
Fish	7.2	0.0	55.32	2.47	5.9	0.0	45.36	2.03
Eggs	39.9	26.5	49.19	2.20	32.7	21.7	40.33	1.80
Legumes/seeds	46.7	17.4	85.75	3.83	38.3	14.3	70.32	3.14
Vegetables	567.2	492.5	608.34	27.21	465.1	403.9	498.84	22.31
Potato	50.0	0.0	117.44	5.25	41.0	0.0	96.30	4.31
Fruits	465.8	365.7	504.30	22.55	382.0	299.8	413.53	18.49
Cereals	124.2	92.8	135.13	6.04	101.9	76.1	110.81	5.00
Cakes	17.2	0.0	65.27	2.92	14.1	0.0	53.52	2.39
Bread	249.2	222.2	172.65	7.72	204.4	182.2	141.58	6.33
Sugar	31.5	10.9	79.24	3.54	25.8	8.9	64.97	2.91
Fats	9.2	0.0	19.74	0.88	7.6	0.0	16.19	0.72
Oils	25.4	19.4	28.32	1.27	20.8	15.9	23.22	1.04
Soft drinks	142.1	0.0	278.89	12.47	116.5	0.0	228.69	10.23
Alcohol	4.1	0.0	51.13	2.29	3.3	0.0	41.92	1.87

Table 11a. Mean daily consumption of foods in high SES group

High SES Food and Beverages	g/CU/day				g/person/day			
	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Milk and yogurt	214.4	149.7	308.45	27.48	175.8	122.8	252.93	22.53
Cheese	63.8	50.0	57.45	5.12	52.4	41.0	47.11	4.20
Red meat	90.1	37.5	138.43	12.33	73.8	30.7	113.52	10.11
Poultry	65.3	0.0	151.77	13.52	53.5	0.0	124.45	11.09
Fish	12.7	0.0	85.49	7.62	10.4	0.0	70.10	6.24
Eggs	39.0	16.0	46.79	4.17	32.0	13.1	38.37	3.42
Legumes/seeds	44.4	20.5	62.91	5.60	36.4	16.8	51.59	4.60
Vegetables	627.6	522.7	1032.49	91.98	514.6	428.6	846.64	75.42
Potato	61.2	0.0	137.86	12.28	50.2	0.0	113.05	10.07
Fruits	465.9	388.7	430.87	38.38	382.0	318.8	353.31	31.47
Cereals	135.8	116.1	128.48	11.45	111.3	95.2	105.35	9.38
Cakes	21.9	0.0	87.67	7.81	18.0	0.0	71.89	6.40
Bread	219.2	181.8	164.46	14.65	179.7	149.1	134.85	12.01
Sugar	35.9	10.0	121.41	10.82	29.5	8.2	99.55	8.86
Fats	7.5	0.0	16.84	1.50	6.1	0.0	13.81	1.23
Oils	29.4	21.6	36.67	3.27	24.1	17.7	30.07	2.68
Soft drinks	169.6	0.0	333.38	29.70	139.0	0.0	273.37	24.35
Alcohol	8.2	0.0	49.32	4.39	6.7	0.0	40.44	3.60

Table 11b . Mean daily consumption of foods in middle SES group

Middle SES	g/CU/day				g/person/day			
Food and Beverages	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Milk and yogurt	169.7	125.0	205.35	14.41	139.1	102.5	168.39	11.81
Cheese	58.9	50.0	56.69	3.98	48.3	41.0	46.49	3.26
Red meat	62.2	18.3	101.56	7.13	51.0	15.0	83.27	5.84
Poultry	36.5	0.0	95.45	6.70	29.9	0.0	78.27	5.50
Fish	9.1	0.0	53.76	3.77	7.4	0.0	44.08	3.09
Eggs	42.7	30.7	56.30	3.95	35.0	25.1	46.16	3.24
Legumes/seeds	40.1	15.2	69.95	4.91	32.9	12.5	57.36	4.02
Vegetables	519.2	455.0	353.20	24.79	425.7	373.1	289.63	20.33
Potato	43.6	0.0	105.38	7.40	35.8	0.0	86.41	6.06
Fruits	518.8	400. 0	620.10	43.52	425.4	328.0	508.48	35.69
Cereals	121.5	93.1	118.72	8.33	99.6	76.3	97.35	6.83
Cakes	14.4	0.0	52.82	3.71	11.8	0.0	43.31	3.04
Bread	241.5	220.0	162.76	11.42	198.0	180.4	133.46	9.37
Sugar	30.8	10.8	63.74	4.47	25.2	8.9	52.27	3.67
Fats	10.0	0.0	20.80	1.46	8.2	0.0	17.06	1.20
Oils	21.9	18.3	24.29	1.70	18.0	15.0	19.92	1.40
Soft drinks	147.4	0.0	273.65	19.21	120.8	0.0	224.40	15.75
Alcohol	4.9	0.0	70.19	4.93	4.0	0.0	57.55	4.04

Table 11c . Mean daily consumption of foods in low SES group

Low SES	g/CU/day				g/person/day			
Food and Beverages	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Milk and yogurt	132.0	91.1	160.86	12.30	108.2	74.7	131.90	10.08
Cheese	51.7	40.0	53.56	4.09	42.4	32.8	43.92	3.36
Red meat	40.2	0.0	71.71	5.48	33.0	0.0	58.80	4.50
Poultry	41.5	0.0	164.71	12.60	34.0	0.0	135.06	10.33
Fish	0.8	0.0	10.29	0.79	0.6	0.0	8.44	0.64
Eggs	37.1	25.9	41.32	3.16	30.4	21.2	33.88	2.52
Legumes/seeds	56.2	18.2	112.76	8.62	46.0	14.9	92.46	7.07
Vegetables	579.6	501.7	385.47	29.48	475.3	411.4	316.08	24.17
Potato	49.4	0.0	114.77	8.78	40.4	0.0	94.10	7.19
Fruits	402.9	314.8	381.80	29.20	330.4	258.1	313.08	23.94
Cereals	118.9	73.3	156.79	11.99	97.5	60.1	128.56	9.83
Cakes	16.9	0.0	59.27	4.53	13.8	0.0	48.60	3.71
Bread	280.5	250.0	185.51	14.19	230.0	205.0	152.11	11.63
Sugar	28.9	12.5	52.35	4.00	23.7	10.2	42.92	3.28
Fats	9.6	0.0	20.44	1.56	7.9	0.0	16.76	1.28
Oils	26.5	19.7	25.24	1.93	21.7	16.1	20.69	1.58
Soft drinks	115.6	0.0	237.28	18.15	94.8	0.0	194.57	14.88
Alcohol	-	-	-	-	-	-	-	-

Energy and Nutrient Intake per CU and per Person

34. Mean, median, SD and SEM values of daily energy and nutrient intake per CU and per person are given in Table 12 and by SES group in Tables 13a-13c.

35. Mean (±SEM) energy intake per CU was 2 692.6 ± 58.96 kcal/day, and per person was 2 207.9 ± 48.35 kcal/day (Table 12). Mean (±SEM) energy intake per CU was 2 819.3 ± 119.95 kcals/day and per person was 2 311.9 ± 98.36 kcals/day in the high SES group; 2 636.7 ± 82.21 kcals/day per CU and 2 162.1 ± 67.42 kcals/day per person in the middle SES group; and 2 665.6 ± 111.44 kcals/day per CU and 2 185.8 ± 91.38 kcals/day per person in the low SES group (Tables 13a-13c).

36. Statistically significant differences ($p<0.05$) were found in protein, fibre, niacin and folate intake by SES group. Important differences were found between high and low SES groups in the intake of protein, riboflavin, niacin and calcium; niacin intake between middle and low groups; and protein and niacin intakes between high and middle SES groups (Tables 13a-13c).

37. Differences in the intake of protein, vitamin B2, niacin and calcium per CU by SES group was also found to be statistically significant ($p<0.05$). Protein and niacin intake was different between high and low SES groups and also between high and middle SES groups; fibre and folate was different between middle and low SES groups (Tables 13a-13c).

Table 12 . Mean daily energy and nutrient intake per CU and per person

Energy and Nutrients (unit)	unit/CU/day				unit/person/day			
	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Energy (kcal)	2 692.6	2 410.2	1 318.58	58.96	2 207.9	1 976.4	1 081.24	48.35
Protein (g)	97.0	87.1	55.44	2.48	79.6	71.4	45.46	2.03
Fat (g)	95.8	82.6	63.89	2.86	78.5	67.8	52.40	2.34
Carbohydrate (g)	349.7	315.4	173.16	7.74	286.7	258.6	142.0	6.35
Fibre (g)	33.9	29.9	21.33	0.95	27.8	30.6	17.49	0.78
Vitamin A (mcg)	1 434.8	1172.4	1 118.10	50.00	1 176.5	961.3	916.85	41.00
Vitamin B1 (mg)	1.5	1.3	0.81	0.04	1.2	1.0	0.66	0.03
Vitamin B2 (mg)	1.9	1.8	0.91	0.04	1.6	1.4	0.75	0.03
Niacin (mg)	18.3	14.3	15.38	0.69	15.0	11.7	12.61	0.56
Folate (mcg)	521.4	476.5	305.73	13.67	427.5	390.7	250.70	11.21
Vitamin C (mg)	224.8	173.1	239.27	10.70	184.3	141.9	196.20	8.77
Calcium (mg)	851.2	766.6	483.86	21.64	698.0	628.6	396.77	17.74
Iron (mg)	17.7	15.6	9.42	0.42	14.5	12.8	7.73	0.35

Table 13a . Mean daily energy and nutrient intake in high SES group

Energy and Nutrients (unit)	unit/CU/day				unit/person/day			
	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Energy (kcal)	2819.3	2533.1	1346.42	119.95	2311.9	2077.1	1104.07	98.36
Protein (g)	109.2	93.3	54.93	4.89	89.6	76.5	45.05	4.01
Fat (g)	107.3	83.7	74.29	6.62	88.0	68.6	60.92	5.43
Carbohydrate (g)	340.6	315.4	159.18	14.18	279.3	258.7	130.53	11.63
Fibre (g)	33.9	30.2	21.79	1.94	27.8	24.8	17.87	1.59
Vitamin A (mcg)	1404.4	1126.6	933.48	83.16	1151.6	923.8	765.45	68.19
Vitamin B1 (mg)	1.6	1.3	0.82	0.07	1.3	1.1	0.67	0.06
Vitamin B2 (mg)	2.1	1.8	1.07	0.09	1.7	1.5	0.88	0.08
Niacin (mg)	21.8	15.8	16.04	1.43	17.9	13.0	13.15	1.17
Folate (mcg)	514.7	462.8	251.85	22.44	422.1	379.5	206.51	18.40
Vitamin C (mg)	221.9	164.3	176.43	15.72	182.0	134.8	144.67	12.89
Calcium (mg)	964.2	837.6	595.27	53.03	790.6	686.8	488.12	43.49
Iron (mg)	18.4	16.3	8.88	0.79	15.1	13.4	7.29	0.65

Table 13b . Mean daily energy and nutrient intake in middle SES group

Energy and Nutrients (unit)	unit/CU/day				unit/person/day			
	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Energy (kcal)	2636.7	2411.9	1171.36	82.21	2162.1	1977.8	960.52	67.42
Protein (g)	93.7	87.4	42.16	2.96	76.8	71.7	34.57	2.43
Fat (g)	95.1	85.3	58.54	4.11	77.9	69.9	48.00	3.37
Carbohydrate (g)	341.3	309.1	161.06	11.30	279.8	253.5	132.07	9.27
Fibre (g)	31.6	28.4	15.71	1.10	25.9	23.3	12.89	0.90
Vitamin A (mcg)	1425.9	1184.2	1003.25	70.41	1169.3	971.1	822.67	57.74
Vitamin B1 (mg)	1.42	1.28	0.69	0.05	1.2	1.1	0.57	0.04
Vitamin B2 (mg)	1.9	1.8	0.84	0.06	1.6	1.5	0.69	0.05
Niacin (mg)	17.7	14.7	10.68	0.75	14.5	12.1	8.76	0.61
Folate (mcg)	490.3	470.3	231.53	16.25	402.1	385.6	189.86	13.32
Vitamin C (mg)	207.1	176.7	199.62	14.01	169.8	144.9	163.69	11.49
Calcium (mg)	848.1	759.2	437.73	30.72	695.5	622.6	358.94	25.19
Iron (mg)	17.2	15.4	8.36	0.59	14.1	12.6	6.86	0.48

Table 13c. Mean daily energy and nutrient intake in low SES group

Energy and Nutrients (unit)	unit/CU/day				unit/person/day			
	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Energy (kcal)	2 665.6	2 402.1	1 457.31	111.44	2 185.8	1 969.7	1196.00	91.38
Protein (g)	91.9	79.2	67.39	5.15	75.4	64.9	55.26	4.23
Fat (g)	88.1	77.0	60.78	4.65	72.2	63.2	49.84	3.81
Carbohydrate (g)	366.3	324.8	195.29	14.93	300.4	266.3	160.14	12.25
Fibre (g)	36.7	31.4	26.04	1.99	30.1	25.8	21.35	1.63
Vitamin A (mcg)	1 467.7	1171.2	1 353.15	103.48	1 203.5	960.4	1 109.58	84.85
Vitamin B1 (mg)	1.4	1.3	0.92	0.07	1.2	1.0	0.76	0.06
Vitamin B2 (mg)	1.7	1.6	0.84	0.06	1.4	1.3	0.69	0.05
Niacin (mg)	16.4	13.0	18.87	1.44	13.5	10.7	15.48	1.18
Folate (mcg)	563.2	502.6	401.36	30.69	461.8	412.2	329.11	25.17
Vitamin C (mg)	247.9	174.6	311.28	23.80	203.3	143.2	255.25	19.52
Calcium (mg)	771.6	710.4	427.97	32.73	632.7	582.5	350.93	26.84
Iron (mg)	17.7	15.4	10.90	0.83	14.5	12.6	8.94	0.68

C. FOOD WASTE

38. Mean, median, SD and SEM of daily food waste occurring between acquisition and preparation, preparation and service, and plate waste per household, CU and person and by SES group are presented in Tables 14a-14e, Tables 15a-15d, Tables 16a-16d, Tables 17a-17d and Tables 18a-18d. The total average amount of food discarded is given in Table 19.

39. The energy content of all food wasted in the household was calculated using food composition tables (Tables 20a-20b).

40. Wastage of cereals, bread, fats and oils in the household was the most significant contribution in terms of energy loss.

41. The mean daily energy loss between acquisition through plate waste was 481.7 kcal/day per household and 215.7 kcal/day per person (Table 20b). Wastage accounted on average for 9.8% of the daily energy intake per person.

Household Food Waste by SES Group

Table14a. Food waste: Acquisition and preparation (g/household/day)

	Mean	Median	SD	SEM
High SES				
Milk, yogurt	34.6	0.0	88.24	18.01
Cheese	10.0	0.0	16.23	5.13
Meat and products, offal	0.6	0.0	3.14	0.28
Poultry	72.8	72.9	31.97	3.47
Fish	49.0	40.0	22.20	4.12
Eggs	17.7	15.0	12.34	1.23
Legumes/seeds	7.2	0.0	15.34	1.37
Vegetables	267.2	255.3	179.64	16.00
Fruits	377.6	153.7	475.67	43.79
Cereals	0.7	0.0	5.40	0.48
Bread	28.4	0.0	49.54	9.20
Sugar	0.05	0.0	0.51	0.05
Fats, oils	6.6	0.0	9.58	0.85
Middle SES				
Milk, yogurt	34.4	0.0	76.99	13.01
Cheese	9.9	0.0	21.95	4.91
Meat and products, offal	0.9	0.0	6.97	0.49
Poultry	63.5	48.6	34.99	2.92
Fish	33.2	40.0	14.37	2.82
Eggs	15.5	14.2	11.11	0.83
Legumes/seeds	6.0	0.0	13.44	0.94
Vegetables	252.1	225.9	147.78	10.37
Fruits	279.8	128.7	376.76	27.12
Cereals	1.2	0.0	6.93	0.49
Bread	39.7	17.9	52.82	7.40
Sugar	0.02	0.0	0.15	0.01
Fats, oils	6.7	0.0	12.64	0.89
Low SES				
Milk, yogurt	17.7	0.0	25.76	4.42
Cheese	6.1	0.0	9.92	2.22
Meat and products, offal	0.6	0.0	4.55	0.35
Poultry	64.2	46.5	38.95	3.48
Fish	54.3	40.0	39.47	7.89
Eggs	13.6	11.0	8.28	0.72
Legumes/seeds	8.0	0.0	15.31	1.17
Vegetables	256.1	224.6	176.69	13.51
Fruits	321.7	123.0	453.27	35.29
Cereals	1.4	0.0	12.85	0.98
Bread	28.0	0.0	54.71	7.98
Sugar	1.0	0.0	8.87	0.68
Fats, oils	7.8	0.0	10.62	0.81

Table 14b. Food waste: Preparation and service (g/household/day)

	Mean	Median	SD.	SEM
High SES				
Milk, yogurt	14.8	0.0	31.15	6.36
Cheese	4.9	0.0	13.43	4.25
Meat and products, offal	0.5	0.0	2.45	0.22
Poultry	4.0	0.0	10.94	1.19
Fish	1.1	0.0	4.28	0.79
Eggs	3.0	0.0	7.32	0.73
Legumes/seeds	-	-	-	-
Vegetables	45.9	0.0	109.11	9.72
Fruits	34.1	0.0	123.17	11.34
Cereals	1.2	0.0	6.85	0.61
Bread	2.6	0.0	7.89	1.47
Sugar	0.4	0.0	3.95	0.35
Fats, oils	0.9	0.0	3.09	0.28
Middle SES				
Milk, yogurt	17.5	0.0	44.60	7.54
Cheese	0.5	0.0	1.45	0.32
Meat and products, offal	0.3	0.0	1.97	0.14
Poultry	3.4	0.0	14.88	1.24
Fish	0.5	0.0	2.80	0.55
Eggs	1.5	0.0	6.61	0.50
Legumes/seeds	2.3	0.0	12.52	0.88
Vegetables	45.1	0.0	104.52	7.34
Fruits	43.5	0.0	121.46	8.74
Cereals	0.4	0.0	2.80	0.20
Bread	4.6	0.0	16.68	2.34
Sugar	0.2	0.0	2.02	0.14
Fats, oils	0.5	0.0	2.43	0.17
Low SES				
Milk, yogurt	10.6	0.0	24.71	4.24
Cheese	2.6	0.0	7.04	1.58
Meat and products, offal	0.8	0.0	5.82	0.44
Poultry	6.1	0.0	22.75	2.03
Fish	4.6	0.0	15.29	3.06
Eggs	3.2	0.0	6.93	0.60
Legumes/seeds	0.6	0.0	4.47	0.34
Vegetables	75.3	0.0	150.76	11.53
Fruits	40.6	0.0	116.05	9.03
Cereals	0.7	0.0	3.69	0.28
Bread	3.4	0.0	10.24	1.49
Sugar	-	-	-	-
Fats, oils	1.2	0.0	4.56	0.35

Table 14c. Food waste: Plate waste (g/household/day)

	Mean	Median	SD.	SEM
High SES				
Milk, yogurt	19.1	8.1	26.71	5.45
Cheese	4.4	1.1	5.92	1.87
Meat and products, offal	2.1	0.0	7.79	0.69
Poultry	2.7	0.0	9.50	1.03
Fish	4.1	0.0	13.66	2.54
Eggs	1.1	0.0	4.66	0.46
Legumes/seeds	1.0	0.0	5.03	0.45
Vegetables	18.3	0.0	41.68	3.71
Fruits	10.4	0.0	31.80	2.93
Cereals	6.2	0.0	15.76	1.40
Bread	28.8	7.2	45.08	8.37
Sugar	0.2	0.0	2.31	0.21
Fats, oils	1.3	0.0	3.96	0.35
Middle SES				
Milk, yogurt	16.7	0.0	35.16	5.94
Cheese	9.5	4.3	17.31	3.87
Meat and products, offal	0.3	0.0	1.89	0.13
Poultry	3.6	0.0	11.27	0.94
Fish	4.2	0.0	8.77	1.72
Eggs	1.1	0.0	4.38	0.33
Legumes/seeds	2.2	0.0	9.20	0.65
Vegetables	18.1	0.0	37.79	2.65
Fruits	15.3	0.0	63.52	4.57
Cereals	2.9	0.0	7.73	0.54
Bread	29.9	0.0	52.78	7.39
Sugar	0.05	0.0	0.54	0.04
Fats, oils	1.1	0.0	4.31	0.30
Low SES				
Milk, yogurt	13.2	1.4	22.85	3.92
Cheese	5.1	1.4	7.65	1.71
Meat and products, offal	0.6	0.0	2.78	0.21
Poultry	2.8	0.0	9.54	0.85
Fish	2.9	0.0	11.68	2.34
Eggs	0.9	0.0	3.28	0.29
Legumes/seeds	1.0	0.0	4.89	0.37
Vegetables	16.9	0.0	39.36	3.01
Fruits	8.9	0.0	26.80	2.09
Cereals	4.3	0.0	10.08	0.77
Bread	26.6	0.0	48.18	7.03
Sugar	0.33	0.0	2.34	0.18
Fats, oils	0.9	0.0	2.94	0.22

Table14d . Total food waste (g/household/day)

	Mean	Median	SD	SEM
High SES				
Milk, yogurt	68.5	60.1	83.75	17.10
Cheese	19.2	14.3	15.13	4.78
Meat and products, offal	3.2	0.0	9.57	0.85
Poultry	79.5	85.8	34.20	3.71
Fish	54.2	52.1	26.43	4.91
Eggs	21.9	18.9	15.66	1.56
Legumes/seeds	8.2	0.0	16.19	1.44
Vegetables	331.5	300.3	233.83	20.83
Fruits	422.1	171.6	498.39	45.88
Cereals	8.7	0.0	21.72	1.94
Bread	59.8	31.5	54.21	10.07
Sugar	0.6	0.0	4.58	0.41
Fats, oils	8.7	0.0	11.80	1.05
Middle SES				
Milk, yogurt	68.6	35.8	80.29	13.57
Cheese	19.9	6.4	23.81	5.32
Meat and products, offal	1.5	0.0	7.62	0.53
Poultry	71.2	64.4	41.66	3.47
Fish	38.0	40.0	19.04	3.73
Eggs	18.1	15.7	13.62	1.02
Legumes/seeds	10.5	0.0	23.55	1.65
Vegetables	315.3	275.3	196.03	13.76
Fruits	338.7	165.6	416.11	29.95
Cereals	4.9	0.0	13.06	0.92
Bread	74.3	50.0	53.40	7.48
Sugar	0.2	0.0	2.11	0.15
Fats, oils	8.3	0.0	14.85	1.04
Low SES				
Milk, yogurt	41.5	34.2	31.93	5.48
Cheese	13.8	14.3	9.21	2.06
Meat and products, offal	1.9	0.0	8.33	0.64
Poultry	73.1	64.4	51.12	4.57
Fish	61.7	50.1	50.25	10.05
Eggs	17.7	14.3	12.29	1.07
Legumes/seeds	9.6	0.0	18.35	1.40
Vegetables	348.2	292.2	262.53	20.08
Fruits	371.2	163.0	492.30	38.33
Cereals	6.4	0.0	18.86	1.44
Bread	58.0	31.5	60.08	8.76
Sugar	1.3	0.0	9.14	0.70
Fats, oils	9.9	2.1	13.18	1.01

Table14e. Total food waste by wastage category (g/household/day)

	Mean	Median	SD	SEM	Mean	Median	SD	SEM
	Acquisition/preparation				Preparation/service			
Milk and yogurt	28.3	0.0	66.64	6.91	14.3	0.0	34.72	3.60
Cheese	8.4	0.0	16.64	2.35	2.2	0.0	7.47	1.06
Red meat	0.7	0.0	5.40	0.24	0.5	0.0	3.83	0.17
Poultry	66.0	64.4	35.87	1.91	4.8	0.0	17.35	0.92
Fish	45.5	40.0	28.14	3.15	1.9	0.0	9.12	1.02
Eggs	15.4	11.8	10.71	0.53	2.4	0.0	6.92	0.34
Legumes/seeds	6.9	0.0	14.58	0.65	1.1	0.0	8.44	0.38
Vegetables	257.3	227.4	166.13	7.43	55.6	0.0	123.89	5.54
Fruits	318.6	128.7	430.72	19.74	40.2	0.0	119.85	5.49
Cereals	1.1	0.0	9.11	0.41	0.7	0.0	4.43	0.20
Bread	32.8	0.0	52.70	4.68	3.7	0.0	12.78	1.13
Sugar	0.3	0.0	5.21	0.23	0.2	0.0	2.36	0.11
Fats	7.1	0.0	11.24	0.50	0.8	0.0	3.46	0.15
	Plate waste				Total waste			
Milk and yogurt	16.0	0.0	28.78	2.98	58.7	35.7	68.36	7.09
Cheese	6.7	2.9	12.27	1.74	17.3	13.6	17.42	2.46
Red meat	0.8	0.0	4.45	0.20	2.1	0.0	8.40	0.38
Poultry	3.1	0.0	10.25	0.54	73.9	67.6	43.71	2.32
Fish	3.8	0.0	11.50	1.29	51.3	40.0	35.00	3.91
Eggs	1.0	0.0	4.13	0.20	18.9	15.7	13.82	0.68
Legumes/seeds	1.5	0.0	7.01	0.31	9.6	0.0	20.15	0.90
Vegetables	17.7	0.0	39.26	1.76	330.6	292.3	230.08	10.29
Fruits	11.9	0.0	46.22	2.12	370.6	165.2	464.67	21.29
Cereals	4.2	0.0	11.08	0.49	6.4	0.0	17.63	0.79
Bread	28.5	0.0	49.06	4.35	64.9	50.0	56.23	4.99
Sugar	0.2	0.0	1.83	0.08	0.7	0.0	5.98	0.27
Fats	1.1	0.0	3.79	0.17	8.9	0.0	13.56	0.61

Acquisition and preparation wastage per CU and per person by SES Group

Table 15a. Food waste: Acquisition and preparation in high SES group

High SES	g/CU/day				g/person/day			
	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Milk and yogurt	15.9	0.0	35.79	7.31	13.1	0.0	29.35	5.99
Cheese	4.9	0.0	8.73	2.76	4.0	0.0	7.16	2.26
Red meat	0.3	0.0	1.60	0.14	0.3	0.0	1.31	0.12
Poultry	45.4	39.0	32.69	3.54	37.2	31.9	26.80	2.91
Fish	27.3	23.1	17.91	3.33	22.4	18.9	14.69	2.73
Eggs	10.6	9.1	9.22	0.92	8.7	7.4	7.56	0.75
Legumes/seeds	4.5	0.0	11.21	0.99	3.7	0.0	9.19	0.82
Vegetables	167.5	118.5	182.46	16.25	137.4	97.2	149.61	13.33
Fruits	227.3	83.7	303.18	27.91	186.4	68.7	248.61	22.89
Cereals	0.4	0.0	2.76	0.25	0.3	0.0	2.27	0.20
Bread	15.3	0.0	26.21	4.87	12.5	0.0	21.49	3.99
Sugar	0.03	0.03	0.32	0.00	0.03	0.0	0.26	0.02
Fats, oils	3.9	0.0	6.19	0.55	3.2	0.0	5.08	0.45

Table 15b. Food waste: Acquisition and preparation in middle SES group

Middle SES	g/CU/day				g/person/day			
	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Milk and yogurt	15.6	0.0	32.76	5.54	12.8	0.0	26.86	4.54
Cheese	5.6	0.0	13.89	3.11	4.6	0.0	11.39	2.55
Red meat	0.7	0.0	5.39	0.38	0.5	0.0	4.42	0.31
Poultry	43.1	30.6	43.32	3.61	35.3	25.1	35.52	2.96
Fish	21.9	20.5	12.97	2.54	17.9	16.8	10.64	2.09
Eggs	10.8	7.1	14.14	1.06	8.8	5.8	11.59	0.87
Legumes/seeds	3.7	0.0	10.29	0.72	3.1	0.0	8.43	0.59
Vegetables	173.9	118.5	237.12	16.64	142.6	97.2	194.44	13.65
Fruits	174.8	67.7	283.20	20.38	143.3	55.5	232.22	16.72
Cereals	0.6	0.0	3.05	0.21	0.4	0.0	2.50	0.18
Bread	21.9	6.8	30.99	4.34	17.9	5.5	25.41	3.56
Sugar	0.01	0.0	0.11	0.007	0.01	0.0	0.09	0.006
Fats, oils	4.6	0.0	11.94	0.84	3.8	0.0	9.79	0.69

Table 15c. Food waste: Acquisition and preparation in low SES group

Low SES	g/CU/day				g/person/day			
	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Milk and yogurt	9.1	0.0	14.62	2.51	7.5	0.0	11.99	2.06
Cheese	2.8	0.0	4.96	1.11	2.3	0.0	4.07	0.91
Red meat	0.3	0.0	2.32	0.18	0.2	0.0	1.91	0.15
Poultry	35.3	25.2	33.58	3.00	28.9	20.7	27.54	2.46
Fish	29.5	27.0	22.61	4.52	24.2	22.2	18.54	3.71
Eggs	8.9	4.9	11.38	0.99	7.4	4.0	9.33	0.81
Legumes/seeds	5.4	1.0	0.00	13.34	4.4	0.0	10.94	0.84
Vegetables	149.2	102.2	146.96	11.24	122.4	83.8	120.51	9.22
Fruits	166.2	63.7	241.72	18.82	136.3	52.3	198.21	15.43
Cereals	0.4	0.0	3.15	0.24	0.3	0.0	2.59	0.19
Bread	16.1	5.2	0.00	35.84	13.2	0.0	29.39	4.29
Sugar	0.3	0.0	2.66	0.20	0.3	0.0	2.18	0.17
Fats, oils	4.5	0.0	7.99	0.61	3.7	0.0	6.56	0.50

Table 15d. Food waste: Acquisition and preparation in all SES groups

Foods and	g/CU/day				g/person/day			
Beverages	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Milk and yogurt	13.3	0.0	28.35	2.94	10.9	0.0	23.25	2.41
Cheese	4.4	0.0	10.01	1.42	3.6	0.0	8.21	1.16
Red meat	0.4	0.0	3.78	0.17	0.4	0.0	3.10	0.14
Poultry	40.9	29.6	37.80	2.01	33.5	24.3	30.99	1.65
Fish	26.3	22.2	18.23	2.04	21.5	18.2	14.95	1.67
Eggs	10.2	6.8	12.21	0.60	8.3	5.6	10.01	0.49
Legumes/seeds	4.5	0.0	11.64	0.52	3.7	0.0	9.54	0.43
Vegetables	163.9	115.4	196.41	8.78	134.4	94.6	161.05	7.20
Fruits	184.8	69.3	275.39	12.62	151.6	56.8	225.82	10.35
Cereals	0.5	0.0	3.01	0.13	0.4	0.0	2.47	0.11
Bread	18.2	0.0	31.81	2.82	15.0	0.0	26.08	2.31
Sugar	0.1	0.0	1.57	0.07	0.1	0.0	1.28	0.06
Fats, oils	4.4	0.0	9.45	0.42	3.6	0.0	7.75	0.35

Preparation and Service Wastage per CU and per Person by SES Group

Table 16a. Food waste: Preparation and service in high SES group

High SES	g/CU/day				g/person/day			
	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Milk and yogurt	8.7	0.0	17.71	3.62	7.1	0.0	14.52	2.96
Cheese	1.5	0.0	3.94	1.25	1.2	0.0	3.23	1.02
Red meat	0.2	0.0	1.23	0.11	0.2	0.0	1.01	0.08
Poultry	2.2	0.0	5.83	0.63	1.8	0.0	4.78	0.52
Fish	0.4	0.0	1.44	0.27	0.3	0.0	1.18	0.22
Eggs	2.4	0.0	8.44	0.84	2.0	0.0	6.92	0.69
Legumes/seeds	0.0	0.0	0.00	0.0	0.0	0.0	0.00	0.00
Vegetables	27.2	0.0	63.41	5.65	22.3	0.0	51.99	4.63
Fruits	17.2	0.0	64.53	5.94	14.1	0.0	52.92	4.87
Cereals	0.7	0.0	4.02	0.36	0.6	0.0	3.29	0.29
Bread	1.1	0.0	3.26	0.60	0.9	0.0	2.67	0.49
Sugar	0.2	0.0	2.63	0.23	0.2	0.0	2.16	0.19
Fats, oils	0.5	0.0	1.84	0.16	0.4	0.0	0.13	1.51

Table 16b. Food waste: Preparation and service in middle SES group

Middle SES	g/CU/day				g/person/day			
	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Milk and yogurt	12.8	0.0	38.22	6.46	10.5	0.0	31.34	5.30
Cheese	0.3	0.0	0.89	0.20	0.3	0.0	0.74	0.16
Red meat	0.1	0.0	0.75	0.05	0.1	0.0	0.61	0.04
Poultry	2.2	0.0	7.71	0.64	1.8	0.0	6.32	0.53
Fish	0.3	0.0	1.65	0.32	0.3	0.0	1.35	0.26
Eggs	0.8	0.0	3.59	0.27	0.7	0.0	2.94	0.22
Legumes/seeds	1.1	0.0	7.03	0.49	0.9	0.0	5.77	0.40
Vegetables	26.3	0.0	60.46	4.24	21.6	0.0	49.57	3.48
Fruits	32.2	0.0	124.00	8.93	26.4	0.0	101.68	7.32
Cereals	0.6	0.0	5.11	0.36	0.5	0.0	4.19	0.29
Bread	2.8	0.0	11.92	1.67	2.3	0.0	9.78	1.37
Sugar	0.07	0.0	0.91	0.06	0.05	0.0	0.75	0.05
Fats, oils	0.3	0.0	1.31	0.09	0.2	0.0	1.08	0.07

Table 16c. Food waste: Preparation and service in low SES group

Low SES	g/CU/day				g/person/day			
	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Milk and yogurt	4.7	0.0	10.13	1.74	3.8	0.0	8.31	1.42
Cheese	0.9	0.0	2.61	0.58	0.7	0.0	2.14	0.48
Red meat	0.4	0.0	2.39	0.18	0.3	0.0	1.96	0.15
Poultry	3.4	0.0	13.29	1.19	2.8	0.0	10.90	0.97
Fish	2.6	0.0	9.08	1.81	2.1	0.0	7.44	1.49
Eggs	1.9	0.0	6.15	0.54	1.6	0.0	5.05	0.44
Legumes/seeds	0.2	0.0	1.51	0.11	0.2	0.0	1.24	0.09
Vegetables	44.2	0.0	91.13	6.97	36.2	0.0	74.73	5.71
Fruits	18.8	0.0	47.55	3.70	15.5	0.0	38.99	3.03
Cereals	0.4	0.0	2.50	0.19	0.4	0.0	2.05	0.16
Bread	4.2	0.0	19.82	2.89	3.5	0.0	16.25	2.37
Sugar	0.0	0.0	0.00	0.00	0.0	0.0	0.00	0.00
Fats, oils	0.6	0.0	2.32	0.18	0.5	0.0	1.89	0.15

Table 16d. Food waste: Preparation and service in all SES groups

Foods and	g/CU/day				g/person/day			
Beverages	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Milk and yogurt	8.7	0.0	25.84	2.68	7.2	0.0	21.19	2.20
Cheese	0.8	0.0	2.45	0.35	0.6	0.0	2.01	0.28
Red meat	0.2	0.0	1.60	0.07	0.2	0.0	1.31	0.06
Poultry	2.6	0.0	9.72	0.52	2.1	0.0	7.97	0.42
Fish	1.1	0.0	5.27	0.59	0.9	0.0	4.32	0.48
Eggs	1.6	0.0	5.96	0.29	1.3	0.0	4.89	0.24
Legumes/seeds	0.5	0.0	4.59	0.21	0.4	0.0	3.76	0.17
Vegetables	32.6	0.0	73.38	3.28	26.8	0.0	60.17	2.69
Fruits	23.9	0.0	89.83	4.12	19.6	0.0	73.66	3.38
Cereals	0.6	0.0	4.10	0.18	0.5	0.0	3.36	0.15
Bread	2.9	0.0	14.27	1.27	2.4	0.0	11.70	1.04
Sugar	0.1	0.0	1.44	6.45	0.07	0.0	1.18	0.05
Fats, oils	0.4	0.0	1.84	8.24	0.3	0.0	1.51	0.07

Plate waste per CU and per person by SES Group

Table 17a. Plate waste in high SES group

High SES	g/CU/day				g/person/day			
	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Milk and yogurt	8.3	3.8	11.30	2.31	6.8	3.1	9.26	1.89
Cheese	2.5	0.4	3.81	1.20	2.0	0.4	3.12	0.99
Red meat	1.2	0.0	4.29	0.38	0.9	0.0	3.52	0.31
Poultry	1.5	0.0	6.61	0.72	1.2	0.0	5.42	0.59
Fish	1.8	0.0	5.45	1.01	1.5	0.0	4.47	0.83
Eggs	1.1	0.0	7.23	0.72	0.9	0.0	5.93	0.59
Legumes/seeds	0.5	0.0	2.99	0.27	0.4	0.0	2.45	0.22
Vegetables	10.2	0.0	22.09	1.97	8.4	0.0	18.12	1.61
Fruits	6.5	0.0	22.37	2.06	5.3	0.0	18.34	1.69
Cereals	3.6	0.0	10.76	0.96	2.9	0.0	8.82	0.78
Bread	16.7	3.9	28.45	5.28	13.7	3.3	23.33	4.33
Sugar	0.2	0.0	2.55	0.23	0.2	0.0	2.09	0.19
Fats, oils	0.8	0.0	3.01	0.27	0.6	0.0	2.46	0.22

Table 17b. Plate waste in middle SES group

Middle SES	g/CU/day				g/person/day			
	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Milk and yogurt	19.1	0.0	80.40	13.59	15.7	0.0	65.93	11.14
Cheese	8.3	1.9	15.83	3.54	6.8	1.5	12.98	2.90
Red meat	0.2	0.0	1.25	0.09	0.2	0.0	1.03	0.07
Poultry	2.4	0.0	8.67	0.72	2.0	0.0	7.11	0.59
Fish	2.4	0.0	4.85	0.95	1.9	0.0	3.98	0.78
Eggs	0.7	0.0	3.40	0.25	0.6	0.0	2.79	0.21
Legumes/seeds	1.3	0.0	5.69	0.40	1.1	0.0	4.67	0.33
Vegetables	15.5	0.0	43.26	3.04	12.7	0.0	35.47	2.49
Fruits	11.2	0.0	51.15	3.68	9.2	0.0	41.94	3.02
Cereals	2.3	0.0	7.81	0.55	1.9	0.0	6.40	0.45
Bread	24.5	0.0	62.77	8.79	20.1	0.0	51.47	7.21
Sugar	0.04	0.0	0.45	0.03	0.03	0.0	0.37	0.03
Fats, oils	0.6	0.0	2.58	0.18	0.5	0.0	2.12	0.15

Table 17c. Plate waste in low SES group

Low SES	g/CU/day				g/person/day			
	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Milk and yogurt	6.9	0.5	14.21	2.44	5.7	0.4	11.65	1.99
Cheese	2.3	0.5	3.20	0.72	1.8	0.4	2.62	0.59
Red meat	0.2	0.0	1.29	0.09	0.2	0.0	1.06	0.08
Poultry	1.7	0.0	5.87	0.53	1.4	0.0	4.81	0.43
Fish	1.2	0.0	4.39	0.88	0.9	0.0	3.60	0.72
Eggs	0.4	0.0	1.58	0.14	0.4	0.0	1.29	0.11
Legumes/seeds	0.6	0.0	3.92	0.30	0.5	0.0	3.21	0.25
Vegetables	10.9	0.0	29.04	2.22	9.0	0.0	23.81	1.82
Fruits	4.4	0.0	12.36	0.96	3.6	0.0	10.13	0.79
Cereals	1.9	0.0	5.38	0.41	1.6	0.0	4.41	0.34
Bread	11.4	0.0	21.75	3.17	9.4	0.0	17.83	2.60
Sugar	0.3	0.0	2.03	0.16	0.2	0.0	1.67	0.13
Fats, oils	0.6	0.0	2.20	0.17	0.5	0.0	1.81	0.14

Table 17d. Plate waste in all SES groups

Foods and	g/CU/day				g/person/day			
Beverages	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Milk and yogurt	11.9	0.0	50.26	5.21	3.9	1.1	8.70	1.23
Cheese	4.8	1.3	10.61	1.50	0.4	0.0	2.01	0.09
Red meat	0.5	0.0	2.45	0.11	1.6	0.0	5.97	0.32
Poultry	1.9	0.0	7.28	0.39	1.5	0.0	4.02	0.45
Fish	1.8	0.0	4.90	0.55	0.6	0.0	3.54	0.17
Eggs	0.7	0.0	4.31	0.21	0.7	0.0	3.73	0.17
Legumes/seeds	0.9	0.0	4.55	0.20	10.4	0.0	28.08	1.26
Vegetables	12.6	0.0	34.25	1.53	6.3	0.0	28.90	1.32
Fruits	7.7	0.0	35.25	1.62	2.0	0.0	6.56	0.29
Cereals	2.5	0.0	7.99	0.36	14.7	0.0	36.21	3.21
Bread	17.9	0.0	44.16	3.92	9.7	0.0	41.21	4.27
Sugar	0.2	0.0	1.77	0.08	0.1	0.0	1.45	0.06
Fats, oils	0.7	0.0	2.57	0.12	0.5	0.0	2.11	0.09

Total Food Waste per CU and per person by SES Group

Table 18a. Total food waste in high SES group

High SES	g/CU/day				g/person/day			
	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Milk and yogurt	32.9	23.4	34.61	7.06	27.1	19.2	28.38	5.79
Cheese	8.9	7.8	7.37	2.33	7.3	6.4	6.04	1.91
Red meat	1.7	0.0	5.10	0.45	1.4	0.0	4.18	0.37
Poultry	49.1	42.9	33.91	3.68	40.3	35.2	27.81	3.02
Fish	29.5	25.0	18.52	3.44	24.2	20.5	15.18	2.82
Eggs	14.1	10.7	20.24	2.01	11.6	8.8	16.60	1.65
Legumes/seeds	5.1	0.0	11.55	1.03	4.2	0.0	9.47	0.84
Vegetables	204.9	154.0	202.57	18.05	168.1	126.3	166.11	14.80
Fruits	251.0	103.7	314.21	28.93	205.9	85.1	257.65	23.72
Cereals	4.9	0.0	13.05	1.16	4.1	0.0	10.70	0.95
Bread	33.0	21.4	30.75	5.71	27.1	17.6	25.22	4.68
Sugar	0.5	0.0	3.66	0.33	0.4	0.0	3.00	0.27
Fats, oils	5.2	0.0	7.94	0.71	4.2	0.0	6.51	0.58

Table 18b. Total food waste in middle SES group

Middle SES	g/CU/day				g/person/day			
	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Milk and yogurt	47.5	21.4	86.86	14.68	38.9	17.6	71.23	12.03
Cheese	14.3	3.6	18.35	4.10	11.7	2.9	15.04	3.36
Red meat	0.9	0.0	5.58	0.39	0.8	0.0	4.58	0.32
Poultry	47.6	34.1	46.36	3.86	39.1	27.9	38.02	3.17
Fish	24.6	22.6	14.61	2.86	20.2	18.5	11.98	2.35
Eggs	12.3	7.9	15.12	1.13	10.1	6.5	12.40	0.93
Legumes/seeds	6.1	0.0	15.70	1.10	5.0	0.0	12.87	0.90
Vegetables	215.7	147.2	286.47	20.11	176.9	120.7	234.90	16.49
Fruits	218.2	88.9	330.05	23.76	178.9	72.9	270.64	19.48
Cereals	3.6	0.0	11.71	0.82	2.9	0.0	9.60	0.67
Bread	49.3	35.7	60.83	8.52	40.4	29.3	49.88	6.98
Sugar	0.1	0.0	1.05	0.07	0.09	0.0	0.86	0.06
Fats, oils	5.5	0.0	13.16	0.92	4.6	0.0	10.79	0.76

Table 18c. Total food waste in low SES group

Low SES	g/CU/day				g/person/day			
	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Milk and yogurt	20.6	15.5	18.43	3.16	16.9	12.7	15.11	2.59
Cheese	5.9	4.9	4.45	0.99	4.9	4.0	3.65	0.82
Red meat	0.9	0.0	3.82	0.29	0.7	0.0	3.13	0.24
Poultry	40.4	26.8	40.44	3.62	33.1	21.9	33.16	2.97
Fish	33.3	27.8	29.09	5.82	27.3	22.8	23.86	4.77
Eggs	11.4	6.4	13.91	1.21	9.3	5.3	11.41	0.99
Legumes/seeds	6.2	0.0	15.19	1.16	5.1	0.0	12.45	0.95
Vegetables	204.4	138.1	204.28	15.62	167.6	113.2	167.51	12.81
Fruits	189.5	82.8	255.33	19.88	155.4	67.9	209.37	16.30
Cereals	2.8	0.0	7.58	0.58	2.3	0.0	6.21	0.47
Bread	31.8	13.2	39.35	5.74	26.1	10.8	32.26	4.71
Sugar	0.6	0.0	3.32	0.25	0.5	0.0	2.72	0.21
Fats, oils	5.7	0.8	9.21	0.70	4.6	0.6	7.55	0.58

Table 18d. Total food waste in all SES groups

Foods and	g/CU/day				g/person/day			
Beverages	Mean	Median	SD	SEM	Mean	Median	SD	SEM
Milk and yogurt	33.9	20.4	57.84	5.99	27.8	16.7	47.43	4.92
Cheese	9.9	4.9	12.76	1.80	8.1	4.0	10.46	1.48
Red meat	1.1	0.0	4.92	0.22	0.9	0.0	4.04	0.18
Poultry	45.4	34.1	41.63	2.21	37.2	27.9	34.14	1.81
Fish	29.1	26.7	21.41	2.39	23.9	21.9	17.56	1.96
Eggs	12.5	8.1	16.17	0.80	10.2	6.7	13.26	0.65
Legumes/seeds	5.9	0.0	14.56	0.65	4.8	0.0	11.94	0.53
Vegetables	209.1	145.7	240.30	10.75	171.5	119.4	197.05	8.81
Fruits	216.4	88.7	302.34	13.86	177.5	72.8	247.92	11.36
Cereals	3.7	0.0	10.88	0.49	3.0	0.0	8.92	0.39
Bread	39.1	22.7	48.10	4.27	32.0	18.6	39.45	3.50
Sugar	0.4	0.0	2.76	0.12	0.3	0.0	2.26	0.10
Fats	5.5	0.0	10.72	0.48	4.5	0.0	8.79	0.39

42. An average of 318.8g of food was discarded per day. The average daily discard per household and per person was 816.4g and 318.8g, respectively. The average amount of food discarded between food preparation and service was found higher (121.5g/person) than that between acquisition and preparation (85.4g/person) and that at plate waste (111.8g/person).

Table 19: Average amounts of discarded food (g/day)

Food Waste	Household	CU	Per person
Acquisition/preparation	218.8	104.2	85.4
Preparation/service	311.2	148.2	121.5
Plate waste	286.4	136.4	111.8
Total waste	816.4	388.8	318.8

Energy Loss per Household, per CU and per Person

43. The mean daily energy loss between acquisition and plate waste was 481.7 kcal per household and 215.7 kcal per person. Wastage accounted on average for 9.8% of the daily energy intake per person (Tables 20a and 20b).

Table 20a. Mean energy loss from acquisition to plate waste (kcal/household/day)

SES group		Acquisition/preparation	Preparation/service	Plate waste	Total waste
High	Mean	349.8	59.9	66.8	476.6
	Median	269.1	0.0	3.4	398.7
	SD	279.01	117.15	117.46	357.70
	SEM	24.86	10.44	10.46	31.87
Middle	Mean	384.5	55.2	58.8	498.5
	Median	283.2	6.4	8.4	388.0
	SD	301.65	115.25	100.02	383.44
	SEM	21.17	8.09	7.02	26.91
Low	Mean	352.8	50.6	62.2	465.6
	Median	285.5	0.0	2.7	376.8
	SD	249.36	85.35	118.0	296.21
	SEM	19.07	6.53	9.02	22.65
Total	Mean	364.9	54.8	62.0	481.7
	Median	283.0	1.6	5.4	387.8
	SD	278.89	106.35	110.72	348.81
	SEM	12.47	4.76	4.95	15.60

Table 20b. Mean energy loss from acquisition to plate waste (kcal/day)

SES group		Acquisition/preparation		Preparation/service		Plate waste		Total waste	
		CU	Person	CU	Person	CU	Person	CU	Person
High	Mean	193.4	158.6	32.1	26.3	39.7	32.6	265.1	217.4
	Median	161.7	132.6	0.0	0.0	2.5	2.1	220.6	180.9
	SD	145.61	119.40	69.32	56.84	75.49	61.90	196.08	160.78
	SEM	12.97	10.64	6.18	5.06	6.73	5.51	17.47	14.32
Middle	Mean	219.9	180.4	31.2	25.6	38.1	31.3	289.3	237.2
	Median	154.3	126.5	3.5	2.8	3.7	3.0	201.0	164.8
	SD	198.34	162.64	72.57	59.51	77.70	63.71	279.97	229.57
	SEM	13.92	11.41	5.09	4.18	5.45	4.47	19.65	16.11
Low	Mean	174.5	143.1	25.4	20.8	30.6	25.1	230.5	189.0
	Median	151.0	123.8	0.0	0.0	0.8	0.7	189.6	155.5
	SD	128.44	105.32	45.45	37.27	58.59	48.04	156.53	128.36
	SEM	9.82	8.05	3.48	2.85	4.48	3.67	11.97	9.82
Total	Mean	197.7	162.1	29.4	24.1	36.0	29.5	263.1	215.7
	Median	154.5	126.7	0.6	0.5	2.8	2.3	206.0	168.9
	SD	165.06	135.35	63.63	52.17	71.10	58.31	224.39	184.00
	SEM	7.38	6.05	2.85	2.33	3.18	2.61	10.03	8.23

D. DISCUSSION

Household and Household Head Characteristics

44. In this study a total of 500 households (1 736 persons), living in different districts in Ankara, were recruited as representative of three SES groups - high (126 households, 25.2%), middle (203 households, 40.6%) and low (171, 34.2%). The percentage of household heads who had attained primary, high school and university education was 15.0%, 31.4% and 41.6%, respectively. Household heads were mostly working in public (25.0%) and private (27.6%) sectors. Many state institutions and ministries are located in Ankara as it is a capital city and usually people work in the public sector.

45. The average number of subjects in the households was 3.4 in the high and middle SES groups and 3.7 in the low SES group (Table 9). In Ankara, the average size of households is 3.82 according to the State Institute of Statistics (www.die.gov.tr), hence in line with the results found through this study.

Food Consumption

46. The mean daily consumption of foods per CU and per person by SES indicated that the consumption of fresh fruit and vegetables was high with an average of 382g of fruits per day and 465g of vegetables. This survey was conducted in the summer when fruits such as watermelon, melon, cherries and grapes, and vegetables such as green beans, eggplant, cabbage, lettuce and tomatoes are usually consumed in higher amounts. Turkey grows a lot of fruit and vegetables. According to the results of the Household Expenditure Survey held in 1994, the average daily consumption of fruit and vegetables was found to be 183g and 284g, respectively (Ungan et al, 1998).

47. Becker (2001), in his study compared the household and individual food consumption survey results. The sample size was 3 000 subjects aged 0-74 years. Each household was asked to record all the foods purchased over a four-week period, except for food eaten outside the home. For the selected subject, excluding children less than one year old, food intake was obtained using a simplified seven-day record. Food consumption from the two datasets was compared for the whole sample and for one-person households, respectively. A reasonable correspondence (+/-20%) was seen for many major foods including cereal products, milk, cheese, meat and meat products, fish and, after correction for the inedible part, fruit and vegetables. Purchases were lower for sweet bakery products, alcoholic beverages and potatoes, while the opposite was seen for oils and fats, cream and sugar. For one-person households the two datasets showed similar differences in consumption patterns between men and women. The gross differences observed can be explained by factors such as home baking, eating out and the recorded level of processing, e.g. as raw food including the inedible part or as a prepared dish. The results showed a reasonable correspondence between purchased and eaten amounts for aggregated food groups but marked differences were seen for some important individual items. It was concluded that household-based consumption data are useful for many purposes provided the limitations of the data are accounted for.

48. In an another study the aim was to compare HBS and Individual Nutrition Survey (INS) data in Poland. Estimates of food consumption and nutrient intake were compared between household food acquisition data collected over one month and a single 24-hour recall collected from every household member in a nationally representative sample of Polish households surveyed between September and November 2000. INS food consumption data excluded food eaten away from home and were modified using a computer program to estimate food “as purchased” (including disaggregation of recipe data) and to allow for wastage. Participants were 3 716 individuals in 1 215 households. A good correspondence was shown between median estimates of foods such as potatoes, vegetables (including processed), meat, meat products and poultry, and animal fats (excluding butter), but correspondence was poor for bread and rolls, fruit, vegetable fats and oils, eggs and six other food groups. Estimates of energy and nutrient intake were within +/-10% with the exception of polyunsaturated fats, potassium and vitamin C. Possible reasons for differences in findings between the two surveys include survey bias (e.g. social approval bias leading to over reporting of fruit), seasonal variations (e.g. high potato purchases between September and November) and aspects of the methodology (e.g. HBS data were based on records collected over one month, whereas 24-hour recall data were based on recalls collected from all household respondents on only one day and averaged for each household type). It was concluded that HBSs

provide useful data for epidemiological research, but findings need to be interpreted in the light of other data regarding consumption, and numerous factors that may affect consumption need to be taken into account (Sekula et al, 2005).

49. Estimates of nutrient intake based on food purchasing records modelled on the National Food Survey (NFS) were compared with nutrient intake calculated from food consumption records based on a semi-weighted method and a combination of weighing and household measurement techniques. Of 82 families in Cambridge who completed the study, 32 were volunteers and 50 were from a random sample in which the cooperation rate was 73%. The estimated energy and nutrient contents of the Cambridge food purchases were very similar to those reported by the NFS for families of similar composition and income. The energy intake obtained by the semi-weighted method was compared with results from 25 studies of energy intake based on quantitative measurements of food consumption: there was no evidence to suggest that the semi-weighted method consistently under- or over- estimated intake in the Cambridge subjects. Purchases adjusted to allow for waste and consumption of food by visitors contained significantly more energy, protein, carbohydrate, calcium, iron and dietary fibre than measured home food consumption. There was no significant difference in the nutrient content of purchases and consumption per 4.184MJ (1 000kcal), with the exception of Fe and ascorbic acid. Measured wastage of edible food in 31 families averaged 3.2% of purchases. Estimate of wastage in all 82 families was 3.8%, and consumption of food by visitors accounted for 3.0% of purchases. The excess of purchases over measured home food energy intake is probably accounted for by a net increase in larder stocks rather than wastage, consumption of food by visitors, or under-recording of intakes (Nelson 1985).

Energy Intake

50. Mean (±SEM) energy intake per CU was found to be 2 692.6± 58.96 kcal/day, and as 2 207.9 ± 48.35 kcal/day per person (Table 12). Nationwide or regional food consumption survey results of 1974, 1984 and 1997 report values of 2 291, 2 281and 2 083 kcals/day/person, respectively (Köksal, 1974; Tönük et al, 1984; Pekcan and Karaağaoğlu, 2000). According to the results of the Household Expenditure Survey held in 1994, the average energy intake was found to be 2 023 kcal/day/person (Urgan et al. 1998). As seen from the data, food consumption and household expenditure surveys had similar results.

Food Waste

51. Mean, median, SD and SEM values of food waste occurring between acquisition and food preparation, food preparation and food service and plate food waste per day were estimated and the energy content of all food wasted in the house was calculated using food composition tables.

52. In terms of energy, wastage of cereals (3g/day) and bread (32g/day), fats and oils (4.5g/day) had an important effect. Dairy products (27.8%) also significantly contribute to energy loss, due to their fat content (Table 18d).

53. An average of 318.8g of food was discarded per day. The average daily discard per household and per person was 816.4g and 318.8g, respectively. The average amount of food discarded between food preparation and service was found higher (121.5g/person) than between acquisition and preparation (85.4g/person) and plate waste (111.8g/person) (Table 19).

54. In a survey, the average weight of daily discard per household was calculated as 227g (1 587g food in a seven-day period) (Van Garde and Woodburn, 1987).

55. The mean daily energy loss from acquisition to plate waste was 481.7 kcal per household (215.7 kcal/person, which amounts to 8.9% of daily per person DEC) (Table 20a). The lowest energy loss was noted in the low SES group (189 kcal/person) (Table 20b). Wastage accounted on average for 9.8% of the daily energy intake per person. This percentage is higher than the data published in previous surveys. The reason for this could be the differences in the preparation of dishes, and also to the high consumption of fruits and vegetables.

56. Adelson et al (1961, 1963) in the United States, using seven-day discard records, found that caloric losses from household food averaged 7%.

57. A study held in the United Kingdom (Dowler, 1977), using a seven-day collection of discards that were analyzed in a bomb calorimeter, found an average of 4% (with a range of 0% to 12%) of the calories in a household was discarded.

58. Nelson et al (1985) found the average measured wastage as 3.8% of the food energy purchased in 82 families. The contribution of protein, fat and carbohydrate to the energy in the waste was 11.5%, 53.2% and 35.3% respectively. Waste is made up more of fat than of protein and carbohydrate.

59. Wenlock and Buss (1977) collected and analysed potentially edible food which was wasted in 52 well-motivated households in and around London. Wastage appeared to be related to household size with each person contributing about 95 kcal per day.

60. In another study, Wenlock et al (1980), in a representative sample of 100 British households, collected all the potentially edible food wasted in the homes during one week, and kept a record of the food. A total of 672 households cooperated fully, 338 in summer and 334 in winter. Each food sample received was weighed and its energy content was determined calorimetrically. Significantly more waste food was collected in summer than in winter, equivalent to 2 220 kcal/household per week and 1 700 kcal/household per week respectively. In terms of energy, cereals, fat and meat wastage predominated, while in terms of weight, milk was more important and fat less so. The energy content of all food wasted in the home averaged 2 790 kcal/household per week in summer and 2 410 kcal/households per week in winter, equivalent to 150 kcal and 130 kcal/person/day respectively. It was also found that food wastage was significantly influenced by the composition of the family, with adults wasting more in absolute terms than children, and larger households wasting less per person than smaller households. However, with few exceptions, neither income nor geographical region significantly affected the total amount of food wasted in the home. When assessed against the expected use of food in the home, wastage accounted on average for 6.5% of the energy intake in summer and 5.4% in winter. As a result of this study it was concluded that 6% (140 kcal/person/day) of the calories brought to the household was discarded.

61. All of the studies came out with a conclusion that fats contributed a major quantity and largely determined the amount of discard for each household.

62. In 1978, the average energy content of the household diet in England, based on the National Food Survey was estimated as 2 260 kcal/person/day. It was also calculated that 89% of the total food energy intake was obtained from the household diet, and food eaten away from home accounted for the remaining 11% (279 kcal/person/day). Energy from sweets, soft drinks, and alcoholic beverages provided an additional 335 kcal/person/day, yielding a total of 2 860 kcal/person/day. Consumption of food by visitors (4%) and waste (6%) would account for 285 kcal, leaving an estimated intake of 2 575 kcal/person/day. This value is 14% (325 kcal) in excess of the estimated energy requirement of the population – 2 270 kcal/person/day (Nelson et al, 1985).

63. Recent findings from the Garbage Project study, as reported in Van Garde and Woodburn (1987), show a mean of 107 g/household/day (10%) of solid food being discarded. It was estimated that 307g food was discarded by the average household (3.7 persons).

64. Food discard patterns and reasons were determined for a sample of 243 households in Oregon (Van Garde and Woodburn, 1987). Personal interviews were conducted, and seven-day records of discards were collected. Households discarded an average of 1 587g food in a seven-day period on the basis of the 79% completed usable records. Major reasons for the discard were poor quality for fruits and vegetables; storage time for meat, fish, and poultry; non-use of leftovers for combination dishes; and plate waste for cereals and dairy products. Twenty-nine percent of the discarded food was considered to be unsafe to eat by the householder. Discards increased with the number of members in the household and were influenced by the age of children. Household income was not linearly related to amount of discard.

V. CONCLUSION

65. FBSs measure the total quantity of food flowing into both the household and non-household sectors, without taking into account losses of edible food and nutrients in these sectors. The household surveys normally do not cover food consumption in the non-household sector. Among such surveys, only the specialized food consumption surveys take into account losses and wastage at the household level. Therefore, food data derived from food balance sheets may differ from household survey data.

66. Measurement deficiencies also contribute to conceptual discrepancies between FBSs and household surveys. The reliability of the data from FBSs depends on the available range and accuracy of basic statistics, such as production, trade, utilization and population data on which FBSs are based. The reliability of data from the household surveys depends on the magnitude of sampling and non-sampling errors.

67. Household food consumption is the amount of food available for consumption in a household, not counting food eaten away from home unless it was taken into consideration in the design. Food consumption per capita is calculated in terms of income level, family size, region, and other socio-economic characteristics. Estimates can be made of nutrient intake per capita by multiplying average food consumption data by nutrient values of foods from nutrient data tables.

68. Food may be wasted at three points: between coming into the house and preparation, between preparation and serving, and after serving (plate waste). Where it is not possible to measure waste directly, an estimate should be made so that a correction factor could be used. According to this survey, conducted during the summer, this correction factor for food wastage was estimated as an average of 9.8% of the daily energy intake per person and an average of 8.9% of energy consumption. This figure may be underestimated since food eaten away from home may be higher than that in households.

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APPENDIX 1

QUESTIONNAIRE FOR ESTIMATING HOUSEHOLD FOOD WASTAGE

No:

Name of the interviewer:

I. CHARACTERISTICS OF THE HOUSEHOLD

Address:

Socio-economical status: 1.H 2.M 3. L

Person	**Name and Surname of Family Members**	**Relation to household head (HH)** 1. HH 2. Wife of HH 3. Children 4.Bride, groom 5. Grandchildren 6. Relative of HH 7.Relative of wife HH 8. Guests 9. Others	**Gender** 1. Adult male 2. Adult women 3. Pregnant 4. Lactating 5. Young male (6-18 y) 6. Young female (6-18 y) 7. Boys (0-5 y) 8. Girls (0-5 y)	**Age** (…years 10/12 mos 29/365 days)	**Education** 1. Illiterate 2. Literate 3. Primary 4. Secondary 5. High 6. University	**Years of education?**	**Occupation** 1. Civil servant 2. Qual.labour 3. Unqual labour 3. Housewife 4. Private sector 5. Student 6. Retired 7. Others:	**Income** (YTL/mos) ***ATTN: Will be asked after finishing the question-naire***
1								
2								
3								
4								
5								
6								
7								
8								
9								

II. HOUSEHOLD FOOD CONSUMPTION AT HOME AND CONSUMTION UNITS (CU)

Person	Name and Surname	Gender	Age (years)	C.U.	Meal	Attendance		Total C.U / day
					Breakfast	Lunch	Dinner	
1								
2								
3								
4								
5								
6								
7								
8								
9								
							Total C.U/day	

III. 24-HOUR RECALL OF THE HOUSEHOLD MEMBERS **(Date / Day: …… / …….)**

Meals	Foods and drinks	Ingredients	Amount	
			Household measures	Net (g)
Breakfast				
Snack				
Lunch				
Snack				
Dinner				
Snack				

IV A. FOOD FREQUENCY QUESTIONNAIRE (WILL BE ASKED FOR THE LAST WEEK)

	Food Never	Freq. Times/ Day	Intake Times/ Week	Amount measure/ gram	 None	Waste Daily	 Weekly	House gate – Prep. measure/ gram	Prep.- Serving measure/ gram	Plate waste measure/ gram	TOTAL WASTE gram
Dairy Products											
Milk, yogurt											
Cheese											
Meat, eggs, legumes/ seeds											
Red meat											
Meat poducts											
Offal											
Poultry											
Fish											
Eggs											
Dry legumes											
Seeds											
Veetables & fruits											
Vegetables											
Fruits											
Potato											
Bread and cereals											
Bread											
Bulgur											
Rice											
Pasta,											
Biscuits, salty											
Flour											
Fats & oils											
Margarine, butter											
Oils											
Olives											
Sugar & sweets											
Sugar											
Jam, honey											
Pekmez (conc grape juice)											
Sweet biscuits, cakes											
Mayonnaise											

IV B. GUIDE FOR THE ESTIMATION OF FOOD WASTES (FOR THE LAST WEEK)

	Food preparation- Service measure/gram	**Plate waste measure/gram**
Milk and products		
Puddings		
Soup with yogurt		
Cheese		
Meat, eggs,pulses		
Minced meat		
Meat pieces		
Ball meats		
Kebaps		
Offal		
Poultry		
Fish		
Eggs, fats		
Beans with olive oil		
Seeds, in cakes		
Vegetables and fruits		
Veg. with meat		
Veg. with olive oil		
Green salad		
Sephard salad		
Potato		
Cereals and bread		
Bulgur pilaf		
Rice pilaf		
Rice soup		
Stuffed veg. with oil		
Pastry		
Börekler		
Oils		
Oil in dishes		
Oil in salad		
Fat in dishes		
Sugar		
Helva		
Desserts		
Fruit added desserts		

APPENDIX 2.

1. DAILY CONSUMPTION UNITS PER AGE and GENDER

(C.U/day/age/gender)

Age (y)	Males	Females
0-1	0.4	0.4
1-3	0.5	0.5
4-6	0.6	0.6
7-9	0.7	0.7
10-12	0.9	0.9
13-15	1.1	0.9
16-19	1.2	0.8
20-29	1.0	0.8
30-39	1.0	0.7
40-49	0.9	0.7
50-59	0.9	0.6
60-69	0.8	0.6
70+	0.7	0.5
Pregnant		+0.1
Lactating		+0.3

2. CONSUMPTION UNITS PER AGE, GENDER and MEALS

Age (years)	Breakfast		Lunch		Dinner	
	Males	Females	Males	Females	Males	Females
0-1	0.1	0.1	0.1	0.1	0.1	0.1
1-3	0.1	0.1	0.2	0.2	0.2	0.2
4-6	0.1	0.1	0.2	0.2	0.3	0.3
7-9	0.2	0.2	0.2	0.2	0.3	0.3
10-12	0.2	0.2	0.3	0.3	0.4	0.3
13-15	0.2	0.2	0.3	0.3	0.5	0.4
16-19	0.2	0.2	0.4	0.3	0.6	0.3
20-29	0.2	0.2	0.3	0.3	0.5	0.3
30-39	0.2	0.2	0.3	0.2	0.5	0.3
40-49	0.2	0.2	0.3	0.2	0.4	0.3
50-59	0.2	0.1	0.3	0.2	0.4	0.3
60-69	0.2	0.1	0.3	0.2	0.3	0.3
70+	0.2	0.1	0.2	0.2	0.3	0.2
Pregnant				+0.1		
Lactating				+0.2		+0.1