DIETARY INTAKE PATTERNS

AND

MEDITERRANEAN DIET ADHERENCE AMONG TURKISH ADULTS

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ABSTRACT OF THE THESIS

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Thesis Director:

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Much has been written about the Mediterranean Diet (MD), its beneficial health effects, and its many variations. Turkey, located at the eastern end of the Mediterranean, has been described as having a MD, however there has been little to no previous research about its MD pattern.

This study examined dietary intake patterns, Mediterranean diet (MD) adherence and how MD adherence varied by city location in a geographically diverse sample of adults (aged 19 and older, n=3,001) living in urban centers in Turkey. The study was conducted as a secondary analysis of cross-sectional, nationally representative data collected in 2001-2002. Dietary intake was assessed by a 60 item semi-quantitative food frequency questionnaire. The MedDietScore and the Mediterranean-Style Dietary Pattern Score (MSDPS) were used to evaluate MD adherence. Variations in MD indices were examined using correlation, independent sample t-tests, ANOVA, ANCOVA and logistic regression. The dietary intake pattern

was examined using factor analysis. The Turkish adults in this study followed a unique dietary pattern which included some characteristics of the MD but also had differences from the MD pattern. The Turkish dietary pattern identified in this study primarily consisted of bread, fruits and vegetables, yogurt and yogurt-based foods, some red meat, and black tea. Participants reported low consumption of whole grains, legumes, potatoes, olive oil, wine and fish. Factor analysis identified five dietary patterns including Turkish western (ice cream, red meat, desserts, sweetened beverages, nuts and seeds) and Turkish (yogurt, fruits, vegetables; bulgur and red meats – secondary loading). The MD indices varied by city after adjusting for age, gender, education, energy intake, and body mass index. Both MD indices had significant and positive correlations with education levels which is consistent with previous research from other countries. This study makes a significant contribution to the understanding of the Turkish dietary intake patterns and provides evidence that the Turkish dietary pattern is unique. Future research should further examine associations between the Turkish dietary intake patterns and factors such as individual and area level socioeconomic status, urban versus rural differences, and local food environment as well as related health outcomes.

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CHAPTER 1: INTRODUCTION

Much has been written about the Mediterranean Diet (MD) and its beneficial health effects to help prevent or reduce cardiovascular disease (CVD), cancer, diabetes, hypercholesterolemia, hypertension, metabolic syndrome, obesity and overall mortality. [1,2,3-8] The MD however, is not a single diet pattern but has many variations based on local customs, traditions, food practices and food availability.

The Turkish diet has been called a MD [9] and has been ranked as 5th out of 41 European and Mediterranean countries for MD adherence. [10] However, this ranking was based on the Food and Agriculture Organization of the United Nations (FAO) food balance sheets, and there are some limitations associated with the use of food balance sheets to evaluate a dietary intake pattern.[11] In addition, no recent studies have used dietary intake data to evaluate the Turkish diet. As a result, it is unknown if the Turkish diet really follows the MD pattern, and if not, what is the Turkish dietary pattern? This study looked at the Turkish diet and how closely it adheres to the MD pattern.

Once the diet has been accurately characterized, future research may be able to evaluate associations between socioeconomic factors, the Turkish dietary pattern and various health outcomes. Since there is a high rate of obesity and mortality from cardiovascular disease in Turkey [12] this future research may help explain potential associations between the Turkish dietary pattern and certain chronic diseases common among the Turkish people. It could also lead to development of nutrition education programs to help increase adherence to the MD patterns among Turkish adults where warranted.

A three step process was used for this research. Dietary intake data was assessed using two established MD indices, the MedDietScore[13] and the Mediterranean-Style Dietary Pattern Score MSDPS[14] to evaluate adherence to a pre-defined MD pattern. In addition and consistent with previous nutrition research, [15,16] factor analysis (FA) was used to characterize the dietary intake patterns that may be specific to this national sample from Turkey and to create hypotheses about dietary patterns in Turkey. Finally, the index scores were evaluated using a logistic regression model controlling for demographic, socioeconomic and anthropometric factors.

CHAPTER 2: LITERATURE REVIEW

This chapter will provide an overview of the MD, and how it varies in different parts of the Mediterranean region. Methods used to study the MD, including both a priori and a posteriori approaches, as well as an introduction to Turkey will be discussed. This chapter also includes a review of previous research completed on the Turkish dietary intake patterns and provides information about the prevalence of obesity and obesity-related chronic conditions in the Turkish population. Search terms used with the PubMed and Google Scholar databases included Mediterranean Diet, Turkish diet, Turkish nutrition, Turkish health, Mediterranean Diet index and indices, Turkish obesity, and Turkish Mediterranean diet.

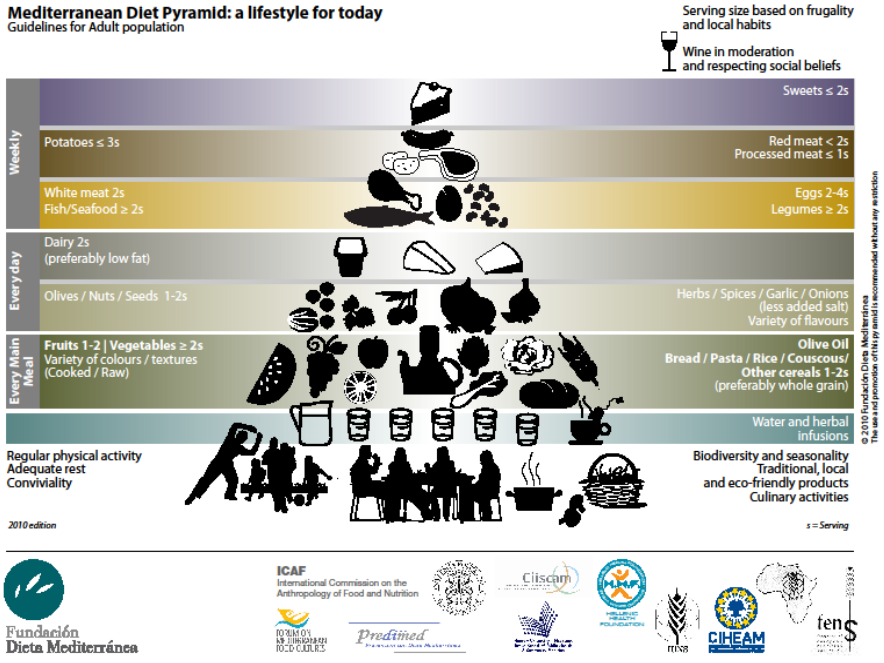
2.1 Mediterranean Diet

The first formal study of the MD is generally attributed to Ancel Keys et al.[17] who found significant health benefits associated with the MD dietary pattern in the ground-breaking Seven Countries study from 1958-1974. This study established the dietary pattern followed in Crete and Greece in the early 1960s as the "reference" MD pattern.[18] The MD pyramid, introduced in 1993 and aimed at consumers, was based on the original MD described in the Seven Countries study.[17] With minor adjustments over the years, this is still considered the "standard" MD pattern and remains in use today.

The recommended MD pattern described in the MD pyramid emphasizes eating mostly grains (including wheat, oats, rice, rye, barley and corn), vegetables and fruits (especially seasonal, fresh, and minimally processed) and olive oil, which is

recommended as the main source of added fat.[19] Dairy, preferably low fat, and often as yogurt or cheese, should be eaten twice a day, with eggs eaten 2-4 times/week. Olives/nuts/seeds are eaten once or twice/day, for example as snacks, and there is less emphasis on animal protein.[18,19] The general recommendation is to eat white meat (poultry), fish/seafood, and legumes 2 times/week, red meat less than 2 times/week, and processed meats less than 1 time/week. Sweets are eaten infrequently; fruit is the preferred dessert for most meals. The MD includes drinking a modest amount of wine (one 5-ounce glass/day for women and two 5-ounce glasses/day for men), especially with meals, unless prohibited by religious or cultural beliefs (Figure 1).[18,20]

Figure 1. The Mediterranean Diet Pyramid[19]



In 2010, a MD pyramid update was released which encourages moderate portion sizes and regular physical activity (30 minutes/day), emphasizes camaraderie from sharing meals and cooking, and recommends adequate rest as important features of the MD lifestyle.[19] Foods included in the updated MD pyramid are consistent with the earlier version.

2.2 Variations of the Mediterranean Diet

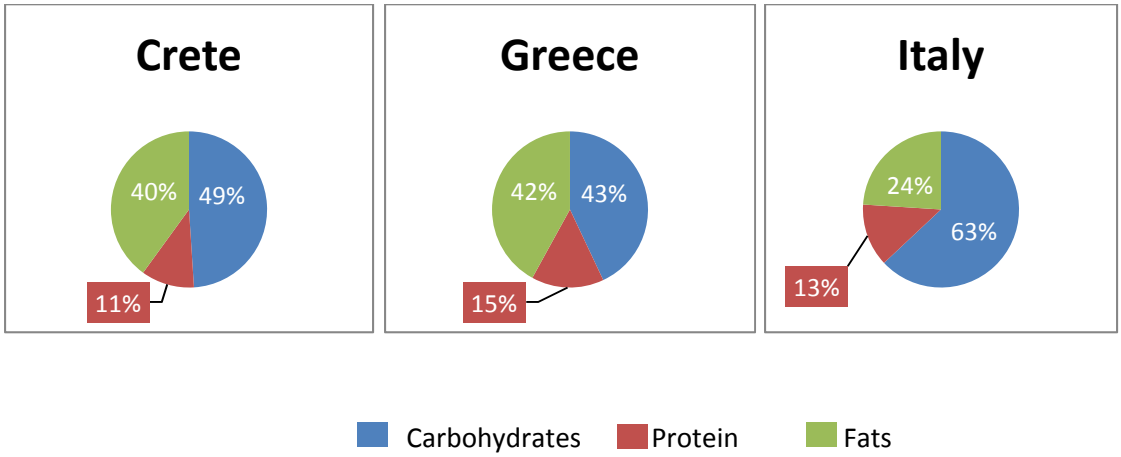
The MD pattern is not a single dietary pattern. Just as there is great diversity among the 21 countries which surround the Mediterranean Sea, there is also great diversity in the MD pattern both among and within the countries of the region.[18,21] For example, there is considerable variation in the MD found in Greece and Crete compared to that found in Italy, Spain or France. [18] Most of the previous MD research has focused on these countries, while much less has been written about the MD pattern in other countries such as Turkey.

The "reference" MD, which was the diet found in Crete during the 1960s, was high in total dietary fat (40% of energy intake), and low in saturated fat (SFA) (8% of energy intake) and protein (11% of energy intake).[17] The Greek MD was similar to this Cretan diet, and included a large amount of vegetables, fruits, nuts, legumes, and olive oil, and small amounts of dairy and sweets [22] (Figure 2).

Compared to the diet in Crete or Greece, the Italian MD from the 1960s was lower in fat (24% of total energy intake), slightly higher in protein (13% of total energy intake) and higher in carbohydrate (63% of total energy intake).[23] All three diets are considered to be examples of the original MD, thus supporting the idea that the MD is not

a single dietary pattern but takes on characteristics related to geographic location or cultural differences (Figure 2).

Figure 2. Macronutrient composition (% of energy intake) of diets followed in Crete[17], Greece[24] and Italy[23] during the 1960s.

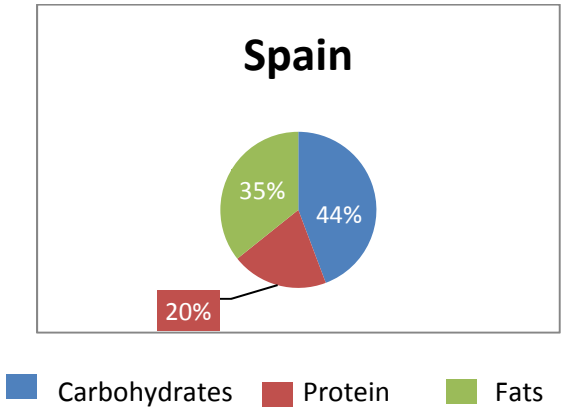


Diets also change over time, and not all MD diets reflect the reference MD diets described by Keys et al.[17] For example, although Portugal does not have a Mediterranean coast, the Portuguese diet of the 1980s has been described as "the most Mediterranean" compared to the diets of Spain, France, Greece and Italy.[25] In the Portuguese MD at that time, fats provided 33% of energy (of which 34% was from animal sources), proteins supplied 12% of energy, and carbohydrates supplied 55% of total energy.[25] In Crete, a study among mothers and daughters in 2008-2009 found that total fat intake level (as a percentage of total energy intake) was similar to the diet of the 1960s, but SFA and protein were slightly higher (SFA was 13.8% and 12.8%; protein was 14.6% and 13.9% for mothers and daughters, respectively).[26]

Data gathered during the late 1990s and early 2000s in Spain showed two eating patterns – a "Western" dietary pattern, which featured high consumption of fast-food,

French fries, high-fat dairy, processed and red meats, and a "Spanish-MD," which emphasized consumption of fish, vegetables, fruits, poultry, low-fat dairy, olive oil and legumes.[27,28] In the highest quintile of the Spanish-MD, fats contributed 35.2% (15.4% from Monounsaturated Fatty Acids (MUFAs) and 11.1% from SFA), protein contributed 19.7%, and carbohydrates contributed 43.6% of total energy intake [28] (Figure 3). This pattern falls somewhere between the higher fat Greek and lower fat Italian MD of the 1960s.

Figure 3. Macronutrient composition (% of energy intake) of MD in Spain[28] during the early 2000s.



There are also regional variations of the MD found within a single country. For example, pulses, olive oil, wine and milk were reported to be more common in the Basque region than in the rest of Spain.[25] Alberti-Fidanza reported that butter was used in northwestern France due to the influence of Belgium and Germany, while oil was used in southeastern France due to the influence of Italy.[25] The local nature of the food supply may also be a factor. An ethno-botanical review of research from across the Mediterranean region including parts of southern Europe, north Africa, the Levant and several islands, reported that of the 2,300 different plants and fungi which were gathered

and eaten in the region, over 1,000 grow and were consumed primarily within a single zone or climatic region.[29]

2.3 Methods of Studying the Mediterranean Diet

There are two main approaches that have been used to study the MD pattern. The a priori approach uses a MD index to compare dietary patterns to a reference MD pattern, and the a posteriori approach uses factor analysis or similar methods to identify dietary patterns which can be characterized as a MD pattern. Much of the previous MD research has relied on the a priori approach. The Mediterranean Diet Score (MDS), and the MedDietScore which is based on the MDS, are two common indices used to study MD adherence. Other indices have also been created, but many of these address a specific research question or a specific population such as patients with type 2 diabetes (Table 1). The a posteriori approach uses techniques such as factor analysis, principal components analysis (PCA), or cluster analysis to identify sample-specific dietary intake patterns that can be characterized as MD type .[15,30] The next section of this paper discusses the major MD indices and explains how the indices used for this research were selected.

Table 1. Comparison of MD indices

Name	Dietary Assessment Method, Food Items and Scoring	Strengths and Limitations
Mediterranean Diet Score (MDS)[31,32]	FFQ*; 8 items adjusted to grams/day and energy intake. Grains, vegetables, fruits/nuts, legumes, or MUFA/SFA* ratio > median=1 point. Dairy & milk, meat/meat products < median, and moderate alcohol intake = 1 point. Uses sample and sex-specific medians. Score range from 0 to 8. Higher score represents greater adherence to the MD.	Group median may not equal a healthy level of consumption; thus, results may not be generalizable to a broader population. Small list of food items. Index doesn't capture consumption extremes or full range of amounts of foods typically consumed in the population. If intake of an item is below median for most subjects, item may not contribute to the explanatory power of the index. [33]
Mediterranean Diet Pattern Adherence Index (MDP Adherence Index) [34]	FFQ; 9 items, energy-adjusted value for daily consumption of legumes, cereals/bread/potatoes, fruit, vegetables, meat/meat products, milk/dairy. Adjusted intake, MUFA/SFA and trans-fat standardized as a z value. Alcohol scored for "moderate" consumption and standardized. Total score for MDP weighted favorably for intake of legumes, cereals/bread/potatoes, fruit, vegetables, moderate alcohol, MUFA/SFA ratio, and unfavorably for intake of meat/meat products and milk/dairy. Score for MDP converted to relative % of adherence compared to range of values from sample.	Uses mean intake of study population, thus, cannot be used to compare to other populations.[35]

Mediterranean Diet Quality Index (Med-DQI)[36]	FFQ; 7 items scored as 0, 1 and 2. Low intake of SFA (% of energy), cholesterol, meats; high intake of olive oil, fish, cereals, vegetables, fruits = 0 points. Moderate intake of all food items = 1 point. Low intake of olive oil, fish, cereals, vegetables & fruits; high intake of SFA, cholesterol, meats = 2 points. Alcohol not included and is analyzed as a separate variable. Items categorized based on recommended intake or by tertiles if no recommendation is available. Scores range from 0 to 14; lower score represents a better quality diet.	The low, intermediate and high boundary may allow total score to better represent the degree to which individuals meet the recommended intake levels.[33]
MedDietScore [3,13](subsequently modified)[37]	FFQ; 11 food groups, each scored 0 to 5. Daily intake of whole grain cereals, fruits, vegetables, legumes, fish, olive oil = 5 points. No intake of whole grain cereals, fruits, vegetables, legumes, fish, olive oil; daily consumption of full fat dairy, poultry, red meat and products = 0 points. No consumption of full fat dairy, poultry, red meat and products = 5 points. Potatoes, 3-4 servings/week = 5 points, daily intake = 4 points, no intake = 0 points. Moderate intake of alcohol = 5 points, no intake or high intake = 0 points. Scores range from 0 to 55. Modified version's scores range from 0 to 130. For modified version, food eaten daily weighted by 3 (non-refined cereals, fruits, vegetables, legumes, olive oil, alcohol), foods eaten weekly weighted by 2 (potatoes, fish, full fat dairy), foods eaten monthly weighted by 1 (poultry, red meat). Higher score represents greater adherence to MD pattern.	Based on MDS, expanded list of food items, greater ability to capture the "extremes and inherent characteristics" of a diet pattern. [13]

Mediterranean-Style Dietary Pattern Score (MSDPS)[14]	FFQ; 13 food groups each scored 0 to 10 as a continuous variable based on MD pyramid recommendations (except olive oil). Items include whole grains, fruits, vegetables, dairy, wine, fish/seafood, poultry, olives/legumes/nuts, potatoes and other starchy roots, eggs, sweets, meat. Exclusive olive oil use =10 points; no use = 0 points; mix use of olive oil and other fats = 5 points. If exceed MD pyramid recommendations = subtract 1 point proportionally for amount of overconsumption. Scores are standardized (calculated score/ theoretical score of 130 X 100). Standardized score is weighted by proportion of energy intake from MD pyramid foods (e.g. if 60% of energy from MD pyramid foods, weighting factor is 0.6).	Uses 13 food groups as a continuous variable based on recommended number of servings. Adjusts for overconsumption of MD foods and for intake of non-MD foods.[14]
Relative Mediterranean Diet (rMED)[38]	Usual food intake; 9 food groups, scored 0, 1 or 2. Higher intake of fruit/nuts/seeds (excluding juice), vegetables (excluding potatoes), legumes, cereals, fresh fish/seafood, olive oil = 2 points. Low intake of meat/processed meats, dairy = 2 points; Moderate alcohol = 2 points, high or low intake of alcohol = 0 points. Score based on tertiles of intake; score range from 0 to 18. Higher score represents greater adherence to the MD pattern.	Based on energy-adjusted tertiles of intake for each component – discriminates better between variations of intakes within the study population.[38]

Mediterranean Adequacy Index (MAI),[39-41]	Diet history and weighed record method; 16 items. Median values of food groups combined into 4 groups. Group 1 = carbohydrates (breads, cereals, legumes raw-dry, potatoes); Group 2 = "protective" foods (vegetables, legumes raw-fresh, fruit, fish, alcohol such as red wine, vegetable oils); Group 3 = land animal foods (milk, cheese, meat, eggs, animal fats and margarines); Group 4 = sweets (sweet beverages, cakes, pies and cookies, sugar). MAI = sum of % of total daily energy intake from Groups 1 and 2 divided by sum of the % of total energy from Groups 3 and 4. Later version used g/day to calculate MAI without any modification to take total energy intake into account.[41] Scores range from 0 to over 100 (when calculated using g/day in the later version).	Calculated as a ratio (instead of a sum) of "typical" to "non-typical" Mediterranean foods; adds additional food items which helps overcome some limitations of small-scale diet scores.[41]
Mediterranean Diet Adherence Screener (MEDAS)[42-44]	Short screening questionnaire to assess MD adherence; 14 questions (12 on food consumption frequency including olive oil intake, sweet/carbonated beverages, nuts and white meats; 2 on food habits characteristic of the Spanish MD including one dedicated to dishes with sauce of tomato, garlic, onions and leeks - *sofrito*), scored as 0 and 1. Intake of olive oil, fruits, vegetables/salad, legumes, fish, wine, whole grain bread > cutoff = 1 point. Intake of meat, white bread, rice < cutoff = 1 point. Cut-offs based on adherence to MD pattern. Scores range from 0 to 14. Higher scores represent greater adherence to a cardio protective MD pattern	Focus on Spanish dietary pattern. Easy to use, short list of food items; dichotomized cut-off.[42]

Mediterranean Diet Pattern Score (associated with peripheral artery disease in patients with Type 2 diabetes)[45]	FFQ; 18 items scored as 0 or 1. High intake of raw vegetables, carrots, fruit, fish = 1 point. Low intake of cooked vegetables, eggs, meat, processed meat, cheese = 1 point. High intake of olive oil = 1 point. Low to medium vegetable oil intake = 1 point. No use of butter, cream, margarine = 1 point. Moderate alcohol use (wine, beer, spirits) = 1 point. Food items considered neutral and excluded from scoring = pasta, bread (white or brown), milk. Items categorized based on food groups suggested by Davidson and Passmore.[45] Score range from 0 to 18. Higher score represents better quality diet.	Milk and cereal considered neutral. Index used for population with diabetes.[45]

*FFQ: Food Frequency Questionnaire; MUFA: Monounsaturated Fatty Acid; SFA: Saturated Fatty Acid

2.3.1 The Mediterranean Diet Score (MDS) Group of Indices

The Mediterranean Diet Score (MDS): The MDS, still used today, was initially developed to analyze MD adherence among elderly Greek adults.[31] It assigns points based on whether consumption of a food item is greater or less than the median consumption of the item by the study population. The MDS has been used in numerous studies. Disadvantages of this index include that the group median may not represent a healthy level of consumption, results may not be generalizable to a broader population, there is a small list of food items (grains, vegetables, fruits and nuts, legumes, dairy and milk, meat and meat products, alcohol, and MUFA/SFA ratio), no distinction is made between whole and refined grains or regular and reduced/low fat dairy, and nuts are grouped with fruits.[46] Due to the use of the median as the cut-off point, this index does not capture consumption extremes or the full range of amounts of foods typically eaten. Therefore, it may not accurately reflect the true dietary intake pattern of the population.[13,41,47] Furthermore, if intake of a particular item is below the median for most subjects in the group, the item may not contribute to the explanatory power of the index.[46]

The Mediterranean Diet Quality Index (Med-DQI): The Med-DQI is based on the MDS but eliminates some of its components (legumes, nuts and dairy), adds cholesterol and olive oil, substitutes SFA as percentage of total energy intake for the MUFA/SFA ratio, and expands the scoring system from two levels used in the MDS (above or below median) to three levels, based on recommended intake levels of a given food item (or tertiles if no recommendation is available).[36] Since legumes, nuts and dairy

are an important part of the Turkish dietary pattern, [48,49] this index was not selected for this study.

The Mediterranean Adequacy Index (MAI): The MAI is another version of an expanded MDS, but it is calculated as a ratio (instead of a sum) of "typical" to "non-typical" Mediterranean foods.[39,40] The first version of the MAI excluded nuts, eggs and the MUFA/SFA ratio; a later version added eggs to the denominator, updated alcohol to include only wine, and calculated values based on grams per day of food intake.[41] Since nuts are a part of the Turkish dietary pattern, [49] this index was not selected for this study.

The MedDietScore: The MedDietScore significantly expands the MDS index, and therefore may be better at predicting associations between MD adherence and various disease states.[13,46] The index substitutes olive oil use for the MUFA/SFA ratio. This index, with the exception of alcohol intake, assigns a higher score for greater intake of foods thought to be beneficial.[13] The scoring for alcohol consumption is based on previous research indicating a flattened j-shaped curve since moderate alcohol intake, especially wine, has been linked to better cardiovascular health, and too much or too little are considered to be detrimental.[50,51]

A modified version of the MedDietScore adds a weighting factor to overcome the "potentially false" assumption that all foods make an equal contribution to health.[52] Both the original and modified versions of the MedDietScore have been validated with respect to various plasma fatty acid concentrations, although the modified version showed more "prominent" results than the original version. [52] The original MedDietScore has been shown to have an inverse relationship with serum lipids, blood pressure, inflammation and coagulation markers related to CVD.[13,53]

The Mediterranean-style Dietary Pattern Score (MSDPS): The Mediterranean-style Dietary Pattern Score (MSDPS) builds on the MedDietScore, but goes even further in addressing some known limitations of existing MD indices. For example, the MSDPS uses continuous variables to measure adherence to recommended intake levels from the MD pyramid (with the exception of olive oil) in a somewhat similar manner to the modified MedDietScore.[14,54] The MSDPS takes the weighting for the recommended food pattern further, and because it also accounts for overconsumption of foods, points are taken away when foods are eaten in excess of the MD pyramid recommendations. The MSDPS also weights the proportion of energy intake from MD pattern foods compared to non-MD foods.[14] For example, if a person eats 35% of energy from non-MD foods, the calculated weighting factor for MD adherence would be 0.65.[14] One drawback of the MSDPS for this particular study is that it was developed for the Framingham offspring cohort in the United States and has not been used in Mediterranean populations.[14] It has not been tested for direct associations with CVD, although it has been tested with biomarkers of Metabolic Syndrome.[14,136]

Other Versions of the MDS: Several versions of the MDS have been developed to address a specific research question or specific population. For example, the updated Mediterranean score (MED) uses the MDS structure but splits grains into whole and refined and adds a sweetened beverage component .[55] Many variations of the MDS have been reviewed by Hoffman and Gerber. [21] Examples of these variations include addition of polyunsaturated fats (PUFA) to examine the MUFA+ PUFA/SFA ratio, elimination of potatoes, treating fruits and nuts as separate categories, and different methods for handling the alcohol variable. [21] For example, the Healthy Ageing: a Longitudinal study

in Europe (HALE) (n=2,339) eliminated alcohol from the modified version of the MDS but then added it back into the overall "lifestyle" score which was calculated by adding the alcohol score to the modified MDS score, a physical activity score and a smoking status score. [56] In the HALE study, the low-risk group for alcohol consumption was participants who had daily alcohol intake greater than 0 g. [56]Several indices also include location-specific food items for use within a specific country.[21] For example, the Italian Mediterranean Index includes positive scores for high intake of pasta, common Italian Mediterranean vegetables (raw tomatoes, leafy vegetables, onion, garlic, salad, "fruiting" vegetables such as peppers), legumes, olive oil and fish, or low intake of soft drinks, butter, red meat and potatoes.[57] The relative MD score which is used to assess the relationship between MD adherence and risk of coronary heart disease (CHD) in the Spanish cohort of the European Prospective Investigation into Cancer and Nutrition (EPIC) study includes 9 food groups (compared to 8 items in the MDS) and assigns points based on tertiles of intake.[38] Since the sample of this study is the general Turkish population and these variations have not been used in Turkish populations previously, these indices were not selected for this study.

2.3.2 Non-MDS-Based MD Indices

Some indices are not based on the MDS and take a somewhat different approach. These include the a priori MD Score, the MD Adherence Screener and the MD Score pattern.

The a priori Mediterranean Pattern Score (a priori MDP score): The a priori MDP score focuses on how adherence to a "cardio-protective" MD pattern is related to the odds ratio of developing a myocardial infarction.[58] The food components list is

limited (e.g., dairy is excluded), but foods with a high glycemic index (white bread, rice and pasta) are included as a separate component in the higher risk group of items.[58] The use of energy-adjusted quintiles to calculate MD adherence expands the number of response categories and therefore may help improve its accuracy in predicting myocardial infarction.[46,58] Since this study is not specific to the relationship between the MD pattern and cardiovascular risk, this index was not selected.

The Mediterranean Diet Adherence Screener (MEDAS): The MEDAS uses cut-off points based on dose-response relationships identified in previous research about the cardio-protective effects of the MD pattern in Spain.[43,44] As a result, many food components are specific to the Spanish diet.[44] Intake variables are dichotomized by the cut-off values, and the number of food components is limited (13 questions address food consumption frequency, dairy is excluded, and one entire question asks about the use of *sofrito*, which is used in Spanish cooking).[42,43] Since this index is specific to the Spanish dietary pattern, it was not used for this study.

The Mediterranean Diet Score Pattern:

The Mediterranean Diet Score Pattern, introduced in 2003, expands the list of foods but completely removes grains (pasta, white and brown bread) and dairy due to the study's focus on type 2 diabetes.[45] The researchers state that cereals are neutral and are excluded from scoring because of their "strong relation to metabolic control" and that "limitation of their use is already strongly advised in type 2 diabetes patients."[45] Milk is also neutral in this index and is excluded from scoring although cheese is included.[45] Since the MD pattern typically includes a significant amount of grain and cereal products, cheeses and

yogurt, this index has a limited use for assessing MD adherence in a general population.[18,59]

2.3.3 MD Index Considerations

There are a number of choices to make when selecting (or constructing) a MD index including which components to include, how to assign foods to each component, how components are weighted, what cut-off values to use and how they are used, and whether to adjust the index for energy intake. Many of these choices have been described as being somewhat arbitrary.[30,33] For example, there is disagreement among researchers about the type of fat to include in the MD indices, the role of dairy, the importance of different types of meats, whether refined cereals are protective or detrimental, how to handle alcohol, and the proper role of nuts and fish as components.[32] Also, if no adjustment for energy intake is made, there is a concern that participants may satisfy recommended intake of various foods simply by eating more food.[33]

Indices are inherently limited by available knowledge at the time they are created and may not be adequately (or not at all) weighted to reflect the impact of different foods on health outcomes.[13,60] Indices can also completely miss foods that largely determine the dietary pattern of the population of interest. In this case, a posteriori methods such as FA or PCA may be needed to help characterize the dietary patterns of the target population.[30]

2.3.4 Factor Analysis

In order to identify dietary patterns specific to the study sample, a posteriori approaches such as FA and PCA can be used to group food intake into sample-specific factors or components.[15,16,61] FA and PCA are generally considered to be similar for the

purpose of exploratory dietary pattern analysis. [62,63] Exploratory FA is used early in the research process to reduce the number of variables and generate hypotheses about underlying constructs or patterns, while confirmatory FA is used to test and confirm the validity of hypotheses.[64]

FA and PCA have been used infrequently to identify MD patterns, although they are commonly used in other nutrition epidemiology research.[16] In Spain, when FA was used with a cohort of 16,008 middle-aged university graduates recruited between 1999 and 2009, three dietary patterns were identified including a Mediterranean pattern which featured factor loadings for vegetables, fish and seafood, fruits and olive oil. [65] Factor analysis which was used to analyze data from 2001-2002 in the ATTICA study in Greece (n=3,042) identified 6 food patterns including a "healthful" pattern with fish, vegetable, legumes, cereals and fruits, which is similar to the MD pattern. [66] When factor analysis was used to analyze data from the Greek cohort of the EPIC study (n=28,034), four patterns were identified including a "Mediterranean-like" pattern which featured factor loading for vegetables, legumes, fruit, fish and olive oil. [67] Factor analysis has also been used to study the Italian cohorts of the original Seven Counties data and identified three main factors including a bread, cereals vegetables, fish, potatoes, oils component ("similar to a typical MD"). [68] Other studies have also used this technique with similar findings.[30,69,70]

Advantages of FA and PCA include that they make natural use of the potentially strong correlations between various types of foods, dietary patterns are based on usual food consumption, and classification of foods does not rely on any previously determined diet pattern.[71,72] However, there is some subjectivity involved in the methodology such as

selection of the number of factors to be extracted (Eigenvalues >1.0 are often used as a criteria along with the scree plot), whether to use rotation and the type of rotation to use (orthogonal or oblique), and how the retained factors are named.[30,63] Since FA and PCA do not rely on previously determined food patterns, it can be difficult to use these techniques to examine diet-disease relationships because dietary patterns generated may not represent "optimal" patterns of eating, and patterns are specific to the time that data was collected.[15,61] As a result, while FA and PCA may identify a dietary pattern in a specific sample at a specific time, results often are not generalizable to other populations.

2.4 Introduction to Turkey

Turkey, with a population of nearly 76 million (2012) and land mass slightly larger than the state of Texas, is located at the northeast corner of the Mediterranean Sea.[73,74] It has three different coastal borders - the Mediterranean in the south, the Black Sea in the north and the Aegean in the west and "links Asia with Europe through the Sea of Marmara and the Straits of Istanbul and Canakkale". [75] Turkey's geography includes a central plateau surrounded by mountain chains with a rugged mountain region in the east, a large river system, and many lakes.[75]

Turkey holds an unusual position among the countries of the Mediterranean region due to its large population and land mass, religious and political history and tradition, and diverse climate. It is a secular democracy, where 99% of the population is Muslim.[76] Turkey's population is largely urban with 77.3% of the population living in the province and district centers,[73] but it maintains a strong agricultural sector. It is one of the few countries in the world today that remains self-sufficient for food, with the exception of a few agricultural products. [77]

Turkey has a young population with a median age of 30.1 years.[73] The age distribution includes 24.9% under age 15, 67.6 % age 15 to 64, and 7.5% is age 65 or over.[73] Turkey has achieved nearly universal health insurance coverage. [78] In 2012, Gross Domestic Product (GDP) per capita in Turkey was $10,666 (current US $) which is approximately 48% of GDP per capita in Greece, 32% of GDP per capita in Italy, and 37% of GDP per capita in Spain.[79] The Organization of Economic Co-operation and Development (OECD) reported in 2012 that of the Turkish population age 25 to 64, 31% had achieved secondary school education, and 13% had achieved tertiary education (higher than secondary school).[80]

2.4.1 Overweight and Obesity Prevalence in Turkey

Turkey shares the world's problems with overweight/obesity, although figures vary somewhat possibly because of differences in methodology. The Turkish Health Survey of 2012 reported that of the population over age 15, 17.2% was obese and 34.8% was overweight.[81] Obesity prevalence was reported to be higher among women than men (20.9% vs. 13.7%), while overweight prevalence was reported as higher among men than women (39.0% vs. 30.4%).[81] In 2011, the Cancer Screening and Early Diagnosis (KETEM) study among 74,492 Turkish women reported that 35% of participants were obese and 41% were overweight.[82]

2.4.2 Diet-Related Health Conditions and Chronic Diseases in Turkey

Many health conditions and chronic diseases that are often associated with dietary intake such as metabolic syndrome, hypertension, CVD, diabetes and certain types of cancer are prevalent in Turkey. A study conducted across Turkey (n=4,259) reported that Metabolic Syndrome was present in 33.9% of the study population (28% of men and

39.6% of women).[83] The World Health Organization (WHO) reported that 24% of men and 24.9% of women over age 25 had elevated blood pressure in 2008.[84] Hypertriglyceridemia, and low serum HDL-cholesterol, are prevalent in Turkey.[85,86] The International Diabetes Federation reported that 7.5% of Turkish people age 20 to 79 had been diagnosed with diabetes in 2012.[87] Cancer was the second most common cause of death (21.1%) in 2012 following only circulatory system diseases (37.9%).[12]

In sum, it was noted that "increasingly unhealthy habits of food consumption since the 1990s [was] leading to an increase in plasma triglyceride levels …[and] obesity, diabetes, and hypertension."[88] Further research is needed to explore and identify possible relationships between the Turkish diet, various risk factors, and chronic diseases in this population.

2.4.3 Turkish Diet

The last nationwide nutritional survey in Turkey was completed in 1984.[89] Since that time there have been several studies which provide limited information on Turkish dietary patterns, but none have examined the relationship between the Turkish diet and the MD. It has been reported that a new food consumption and risk factors survey began in 2010, but the data does not yet appear to be available in the literature.[90]

One small study conducted among European immigrants in Australia (n=102), has described the Turkish diet as sharing many foods in common with the Lebanese MD, and as having many characteristics of the diet found in Greece, Cyprus and Egypt.[91] However, because this was a very small qualitative study among immigrants who are based overseas, it does not explain the nature of dietary patterns in Turkey nor its relationship to the MD.

Using FAO food balance sheets of food availability, the macronutrient composition of the Turkish diet has been reported to be 25% fat, 12% protein, and 63% carbohydrates, while the daily dietary energy supply has been estimated at 3,500 kcal/person.[92] The Turkish diet has been characterized as including a lot of bread (44%) or bread and other grains (58%), especially wheat.[92] Yogurt, fats, oils, eggs, and fresh fruits and vegetables are reported to be widely available. [92-96]

Data from the Turkish Household Expenditure Survey (n=25,738), from 1960 to 2003, showed that Turkish consumption of red meat, fluid milk and animal fats decreased and poultry and fish consumption increased.[95] An analysis of the Household Budget and Consumption Expenditures survey from 2003-2006 (n=51,423) revealed that approximately 50% of households surveyed ate red meat, 70% ate white meat (poultry), and 33% ate seafood.[97] Olive oil use is reported to be common in the western and southern parts of Turkey but is less common in the north and east.[92]

Compared to the other Mediterranean countries (Greece, Italy, Portugal and Spain) and using the data from the FAO, Sengul reported that more grains (51.1% vs. 30.0%) and less meat are eaten in Turkey (2.7% vs. 13.1%).[96] A comparison of the food supply in Algeria, Morocco, Tunisia and Turkey from 1961 to 2001 found that only Turkey had a traditional MD pattern "with the exception of a low supply of olive oil".[98]

The use of FAO food balance sheets is considered a valid tool for making comparisons among different geographic regions and for analyzing changes over time. [98] However, food availability data does not provide information about actual dietary intake, nor does it allow a comparison between dietary patterns. For example, in 2007, the vegetable supply in Turkey was reported to be similar to supply in Greece and Malta ,

while fruit supply in Turkey was reported to be similar to that of France, Portugal and Cyprus.[99] Using these figures, vegetable supply in Turkey was roughly 2.8 servings/day/capita and fruit supply was 1.3 servings/day/capita based on a 100 g serving size. However, Turkish Ministry of Health data reported daily consumption as 1.57 portions of vegetables and 1.64 portions of fruits, although it is not clear how a portion has been defined in this report.[100] This suggests that food availability data may not be a reliable method to estimate food intake, and another approach is needed.

There is less alcohol consumption in Turkey than in the rest of Europe.[99] The Turkish Health Survey 2012 reported that 17.2% of men and 3.8% of women age 15 and over consume alcohol.[81] The WHO characterized the consumption as 60% beer, 35% spirits and 5% wine (2005).[101]

2.4.4 Regional Dietary Differences in Turkey

Turkey is divided into seven regions with different economic, geographic, industrialization, and demographic characteristics, and as a result, may have different dietary patterns. [75,102] For example, while wheat is eaten throughout the country, maize is commonly used in the northern Black Sea region.[48,92]

Dietary studies of Turkey have typically reported either four or six regional diets but are not consistent in defining the regions, and quantitative information about regional differences in food intake are often not provided. Regional dietary differences have often been characterized somewhat anecdotally. For example, several cities are reported to have a diet high in SFA including Kayseri in central Turkey, Adana in the south, and Trabzon on the northern Black Sea coast.[103-105] The diet in Trabzon is also described as containing a lot of cheese and other dairy.[104] Local production of sunflower and corn oil

common in the southwestern part of Turkey has led to a description of Aydin's diet as "high in PUFAs"; production of olives and olive oil near the Mediterranean western coast of Turkey results in Ayvalik's diet being described as high in MUFAs.[104,105] Alcohol is mentioned in connection with Gaziantep in southeastern Turkey and Kirklareli on the northwestern Black Sea coast.[103,104] Residents of Istanbul, a large a modern city in western Turkey, have been described as eating a diet which consists primarily of fast food, alcohol, carbohydrates and fat.[103,104] In sum, while there have been some general statements about regional differences in the Turkish diet, there has been little formal analysis of dietary intake data to quantify and confirm these differences.

Two small studies which looked at regional differences in dietary intake have been completed in recent years. One reported that the Turkish rural population from the Aegean region (n=386) has a higher intake of carbohydrates, which results in higher calorie consumption, than people living in urban areas.[106] The other, a small study conducted in central and southeastern Anatolia (n=100), found that more than one-third of the diet in both areas was based on wheat products, while the diet among rural women in southeastern Anatolia included wheat and potatoes, but less dairy than the diet found in central Anatolia.[107]

2.4.5 Other Dietary Studies in Turkey

There have been a few descriptive studies that have looked at intake of a specific food item in the Turkish diet, but they have not examined how consumption of the item was related to an overall dietary pattern or health outcome. It has been reported that Turkish people have the highest level of salt intake in the world, estimated at 7.28g/day mostly from bread – a main staple of the Turkish diet.[108,109] However, only one study (n=1193) linked excessive intake of salt and meat and inadequate consumption of fruits

and vegetables with the incidence of hypertension among residents of a semi-rural province in western Turkey.[110] Onat reported a favorable association between moderate alcohol intake and a borderline significantly lower risk for cardiovascular disease in Turkish adults.[111]

Since people do not eat individual foods in isolation from the rest of their diet, a comprehensive approach which evaluates the entire Turkish dietary pattern may be helpful. For example, meals are made up of combinations of foods which may be highly correlated with one another (e.g. bread and butter or olive oil with salad) or nutrients may interact.[47] Furthermore, dietary pattern analysis more closely parallels the real world and provides a different perspective than the traditional single nutrient approach.[61]

2.4.6 Socioeconomic Factors and the Turkish Diet

Socioeconomic characteristics have been linked to diet in many populations but research about associations between socioeconomic factors and the Turkish diet is limited. [35,72,112-114] Socioeconomic variables that are most often considered are occupation, education and income.[112] In his review of the relationship between SES, dietary habits and health-related outcomes, Vlismas found that less education, more manual occupations, and lower income status is typically associated with poorer diet quality.[112] Less education was associated with less adherence to nutrition recommendations in a large cross-sectional study in France (n=51,668), in a cohort of participants from the PREDIMED study in Spain who were at high risk for CVD (n=7305), and in the ATTICA study from Greece (n= 3,042).[72,113,115] In contrast, a study from the Balearic Islands found that MD adherence was similar in all socio-demographic groups, and adherence increased with age especially among males (n=1200).[116]

The few studies that have looked at the relationship between socioeconomic factors and diet in Turkey have shown somewhat mixed results. In a small study conducted in Aydin province (n=384), income was positively associated with meat and fish intake among adults, but it had a non-linear relationship with milk, yogurt, cheese and poultry intake; consumption increased as income levels increased, but it decreased at the highest income levels.[117] Among women in Ankara (n=563), a positive relationship was found between higher socioeconomic status (SES) and total fat, SFA and MUFA intake, but it is unknown if adjustment was made for confounding factors.[118] This study also found a relationship between higher SES and a higher percentage of calories from protein in the diet but a lower percentage of calories from carbohydrates.[118]

A study among urban elderly in the capital city of Ankara (n=1060) indicated that dairy intake did not vary across socioeconomic levels.[119] Consumption of meat, fruit and vegetables at recommended levels was positively associated with the highest SES group, while intake of white bread and foods made with flour at recommended levels was associated with the lowest SES category.[119]

In a small study from Aydin province, higher levels of education were positively linked to greater intake of yogurt, fish and poultry but less intake of milk.[117] Occupation or profession may also play a role in Turkish dietary intake. For example, nurses have been found to eat more fast food than teachers in a small study (n=471) completed in Ankara.[120]

Some regional SES and/or cultural variations may also affect dietary patterns in Turkey. For example, price and availability of different foods has been reported to vary across the country as well as physical exercise opportunities especially for women.[121]

Despite these various findings, no study has taken a comprehensive look at the relationship between the overall Turkish dietary pattern and SES, education levels and other possible confounding variables. Additional research on these relationships is needed.

2.5 Study Goals

The Turkish diet, often described as a MD-type diet, has not been studied extensively in recent years. As a result, it is unknown whether the Turkish diet adheres to the typical MD pattern or if it can be characterized in a different dietary pattern. Therefore, this study was conducted to provide a greater understanding of the Turkish diet including insight into location-specific variations and the relationship of the Turkish diet to the MD pattern in a nationally representative sample of Turkish adults.

The objectives for this study were to: 1) examine the concordance of Turkish diet and MD patterns; 2) explore how MD adherence varied by city (as measured by MedDietScore and MSDPS) after adjusting for likely confounding variables, and 3) identify the key features of the Turkish dietary pattern among adults.

The tested hypotheses were:

1) The Turkish diet is a unique dietary pattern that shares some, but not all, of the characteristics of the reference MD.

2) After adjusting for demographic, socioeconomic and anthropometric factors, MD adherence (measured by the MedDietScore and MSDPS) varies by city.

In addition, exploratory factor analysis was used to determine the characteristics of the Turkish dietary pattern and generate hypotheses.

CHAPTER 3: METHODS

3.1 Study Design and Participants

This was a secondary data analysis of a national dataset which was collected in a geographically diverse sample of 13 cities/provinces across Turkey in 2001-2002. Trained medical (3), sport science (5), nursing (1), child development (2), and dietetic interns (22) from Hacettepe University collected data from 6,083 people, of which 5,278 were adults from 3,002 households. The study protocol was approved by the Ministry of Health of Turkey and conducted through a collaboration between Hacettepe University and the Ministry's Department of Cancer Control. Verbal informed consents were obtained from the participants and the study was carried out in accordance with the guidelines of the Helsinki Declaration of Human Studies.[122] The secondary data analyses were approved by the Institutional Review Board of Rutgers, The State University of New Jersey.

The interviews were conducted through household visits. If the household members were not present during the initial visit, they were visited a second time. The initial data included responses from all members who were 12 years or older, within each participating household. Since members of the same household typically eat similar foods,[123] and to retain the independent observations in the sample,[124] the complex sampling module in SPSS Statistics (version 21.0, 2013, SPSS Inc. an IBM Company, Armonk, NY) was used to randomly select a sub-sample of adults consisting of one person per household. After one participant was eliminated because of missing age information, the final sample included 3,001 adults (Table 2, Figure 4).

Adults were defined as age 19 and older in accordance with the definitions used by both the Turkish and US Dietary Guidelines.[125,126]

Table 2. Number of participants by location

Region	City	Population (2012)[127]	Initial Sample - Adults (n)	Final Sample
Aegean	Izmir	4,005,459	440	250
Aegean	Kutahya	573,421	402	201
Black Sea	Ordu	741,371	347	194
Black Sea	Tokat	613,990	387	198
Black Sea	Sakarya	902,267	239	149
Central Anatolia	Aksaray	379,915	300	166
Central Anatolia	Ankara	4,965,952	574	366
Central Anatolia	Eskisehir	789,750	340	197
Eastern Anatolia	Malatya	762,366	360	198
Eastern Anatolia	Muş	413,260	272	146
Marmara	Istanbul	13,854,740	883	553
Mediterranean	Mersin	1,682,848	353	199
Southeastern Anatolia	Adıyaman	595,261	381	184
Total Adults			5,278	3,001

Figure 4. Cities Included in the Turkish Mediterranean Diet Study[128]

3.2 Survey Instrument

The survey instrument was developed by the original study's investigators (Başoğlu and Turnagöl). Because there were no other validated instruments for the Turkish population to meet the needs of the original study, questions were modified from national surveys used in the United States and in light of the previous research on Turkish dietary intake patterns.[89,129,130]

Demographic and socioeconomic variables included age, gender (male, female), city (survey locations; see Table 2), and highest level of education attained (illiterate, read/write, completed 5^{th} grade, 6-8^{th} grade, 9-12^{th} grade, some college or more). For the analyses, a six category age variable (19-29, 30-39, 40-49, 50-59, 60-69, 70+) and a four category education variable (illiterate, primary school 1-4.9y, middle school 5-8y, some high school or higher) were created. Anthropometric measurements (weight, height, waist circumference) were taken by the study assistants using a Tanita TBF-300M scale,[131] a portable stadiometer, and a non-elastic tape measure and by following standard procedures.[132] During measurements, participants wore light indoor clothing and no shoes, and they were instructed to empty their bladders prior to the weight measurements. Body Mass Index (BMI) was calculated for approximately 90% of the data sample (10% of participants were missing body weight). A six category BMI variable was also used for some of the analyses (<18.5; 18.5-24.9; 25.0-29.9; 30.0-34.9; 35.0-39.9; 40+). The waist circumference variable was dichotomized into low (≤ 102 cm males/≤ 88 cm females) and high (>102cm males/ >88cm females) categories.[133-135]

3.3 Dietary Intake Data Collection

Dietary intake was assessed by a 60 item semi-quantitative Food Frequency Questionnaire (FFQ), which was adapted from the National Cancer Institute (NCI) [89,129,130] and modified to include Turkish foods. The food groups included dairy, fruits, grains, legumes, vegetables, proteins, beverages, soup, sweets and alcohol (Table 3).

The FFQ included questions about whether the food was eaten (yes, no), frequency of consumption (once per month or rare, 2-3 times/month, once/week, 2-3 times/week, 3-4 times/week, 5-6 times/week, daily, does not eat), and the amount eaten at one time (grams or ml, open ended question). For all foods, the amount reported by the participant was multiplied by the frequency variable to obtain the amount of consumed food item per day (in grams or ml). Pictures of foods were shown to participants along with common household measuring tools (cups, tablespoons, teaspoons, etc.) to help participants estimate portion sizes.

Of the 60 items from the original FFQ, 57 foods were used for the study. Tomato paste and pepper paste were excluded from the analyses due to lack of amounts or frequencies. Olive oil was excluded as a free-standing variable for servings/day and macronutrient composition analyses due to lack of amounts or frequencies. Olive oil dressing was included when calories from salad were calculated and olive oil was also used in the MD adherence indices as a categorical variable (yes/no for MedDietScore; 3 categories [exclusive olive oil use/olive oil and other oil use/no olive oil use] for MSDPS).

Table 3: List of foods included in the analyses

	Food Item	Comments
Dairy	Milk	
	Ayran	Salty yogurt drink
	Cacik	Yogurt and cucumber dip
	Yogurt	
	Cheese	32 varieties, full fat feta used for analyses
	Dairy-based soup*	
Fruits	Fresh fruit juice	
	Commercial fruit juice	
	Citrus	
	Compote	Stewed fruits
	Watermelon	
	Peaches*	
	Plums*	
	Apricots*	
	Apples*	
	Pears*	
	Grapes*	
	Figs*	
	Miscellaneous fruit*	Banana, pomegranate, sour cherry, strawberry, cherry, quince.
Grains	Bread	
	White bread*	
	Whole grain bread*	
	Rice	
	Pasta	
	Bulgur	
	Grain-based soup*	
	Commercial soup*	
Vegetables	Carrot juice	
	Tomato juice	
	Regional beverage	Turnip juice and other vegetable juices
	Carrots	
	Salad	
	Tomatoes	
	Potatoes*	
	Non-potato vegetables*	Green beans, zucchini, peas, eggplant, and mixture of the four varieties
	Vegetable-Based soup*	
Legumes	Olives	
	Beans	Garbanzos and other legumes

Table 3: List of foods included in the analyses (cont.)

	Bean snack	"Leblebi" - roasted garbanzo beans
	Nuts and seeds	
	Legume-based soup*	
Proteins	Eggs	
	Salami	Salam, sosis - see Appendix D
	Pastrami	Sucuk, pastirma - see Appendix D
	Red meat	Beef and lamb
	Chicken	
	Turkey	
	Fish	
	Meat-based soup*	
Beverages	Cola	
	Soft drinks	
	Soda	
	Powdered drinks Energy drinks	
	Drinks from concentrate	
	Mineral water	
	Water	
	Other coffee	American style coffee and similar
	Turkish coffee	
	Black tea	
	Green tea	
	Herbal tea	
Sweets	Sugar from hot beverages*	
	Jam and honey	
	Pekmez	Molasses-like fruits syrup
	Flour-based desserts	Baklava and similar
	Milk-based desserts	Puddings and similar
	Ice cream	
Alcohol	Raki	Anise-flavored liquor
	Beer	
	Wine	
	Whiskey	
	Other Alcohol	Gin, vodka and similar
Miscellaneous	Olive Oil	Used as categorical variable in MD indices
	Tomato Paste	No amounts or frequencies – not used
	Red Pepper Paste	No amounts or frequencies – not used

*Variable recoded for the analyses.

In addition to the original items in the FFQ, 19 food items were recoded into new variables based on the detailed food variety information in the original dataset. Several of the 60 items had the variety information about the food item (e.g., other vegetables, soups, bread and other fruits). When participants provided more than one variety in these variables, only the first variety named was used. Nineteen recoded food variables were potatoes, non-potato vegetables (green pepper, peas, zucchini, eggplant and a mixture of these four types), dairy-based-soup, legume-based soup, vegetable-based soup, meat-based-soup, commercial soup, grain-based soup, white bread, whole grain bread, peaches, plums, apricots, pears, apples, grapes, figs, miscellaneous fruits (banana, pomegranate, sour cherry, strawberry, cherry, quince), and sugar from hot beverages. Three variables from the original dataset – soup, other vegetables, and other fruit – were eliminated due to the recoded new variables which substituted for them. In the analyses, "all bread" was used for certain calculations (e.g. total calories per day from bread), but the white bread and whole grain bread variables were used in other calculations in lieu of all bread (e.g. the MD adherence indices). The final number of food items used in the analyses was 72 when all bread was used or 73 when white bread and whole grain bread were used in lieu of all bread (Table 4).

3.4 MD Indices

The MedDietScore and MSDPS indices were used to assess MD adherence. The modified MedDietScore was also briefly explored since it provides weighting for foods eaten in accordance with a recommended MD pattern, although it does not subtract points for overconsumption of foods nor for consumption of non-MD pattern foods.

The MedDietScore [13] is based on consumption (as servings per month) of 11 food components: dairy, grains, fruits, vegetables, potatoes, red meat, poultry, fish, legumes, alcohol and olive oil (Table 4). Servings per month were calculated for all food items based on the serving sizes used by Panagiotakos [137] or the Greek Dietary Guidelines [138] when serving size was not available through Panagiotakos. When a food was not included in either of those two sources, serving sizes from the Dietary Guidelines for Americans 2005 was used.[139] Calories per serving were calculated using the USDA National Nutrient database, recipes provided by Turkish researchers, and Turkish product websites when necessary[140-142] (Appendix B).

The MedDietScore was calculated by assigning a sub-score of 0 to 5 for each food component based on frequency of consumption.[13] Food components that are thought to be beneficial to health received higher sub-scores for greater consumption (non-refined grains, fruits, vegetables, legumes, potatoes and fish). Food components that are thought to be detrimental to health received higher sub-scores for lower consumption (red meat, poultry, full fat dairy).[13] For alcohol, consumption of less than 300 ml/day received the highest possible sub-score, and it decreased to 0 as alcohol consumption increased; not consuming any alcohol was assigned a sub-score of 0.[13] In the original MedDietScore, more olive oil use is assigned a higher sub-score. However, since the original dataset did not include information on frequency or amount of olive oil consumption, olive oil was treated as a dichotomous variable for this analysis (sub-score of 5 if consumed and 0 if it is not consumed). All foods which are not part of the MedDietScore index pattern such as cola or white bread were excluded from the MedDietScore index (Table 4). In order to standardize this score so that it could be

compared to the MSDPS, the MedDietScore was divided by 55 (maximum possible score) and multiplied by 100 to create the standardized MedDietScore.

The modified MedDietScore multiplies the sub-scores for each component based on a weighting factor developed from the recommended intake frequency of MD pattern foods.[52] The sub-scores for grains, fruits, vegetables, legumes, olive oil and alcohol were multiplied by a weighting factor of 3 to adjust for the recommendation to eat these foods daily. The sub-scores for potatoes, fish and dairy were multiplied by a weighting factor of 2 to adjust for the recommendation that these foods be eaten weekly. The sub-scores for poultry and red meat were multiplied by a factor of 1 to adjust for the recommendation to eat these foods monthly.[52] The maximum possible score for the modified MedDietScore is 130 points. This score was divided by 130 and multiplied by 100 in order to get a standardized modified MedDietScore.

The MSDPS [14] is based on 13 food components: dairy, grains, fruits, vegetables, potatoes, eggs, red meat, poultry, fish, legumes, sweets, alcohol and olive oil (Table 4). Servings per day, week and month were calculated for all food items based on the serving sizes used in the Nurses' Health Study or the Dietary Guidelines for Americans 2005 (when serving size was not available from Nurses' Health Study).[139,143] For Turkish coffee, a serving size of 100 ml was used based on general knowledge of Turkish dietary customs. Calories per serving were calculated using the USDA National Nutrient database, recipes provided by Turkish researchers, and Turkish product websites when necessary [140-142] (Appendix B).

The MSDPS index is calculated based on adherence to the "recommended intake levels from the Mediterranean Diet pattern" and accounts for "overconsumption

of foods".[14] The MSDPS assigns sub-scores to each food component from 0 to 10. In this manner, it is somewhat similar to the modified MedDietScore. However, the MSDPS goes further and subtracts points for overconsumption above the recommended levels of intake based on the MD pyramid pattern.[14] For example, to be assigned the maximum sub-score of 10 for whole grain intake, the participant must eat 8 servings/day. If the participant eats either more or less than 8 servings/day, the sub-score is reduced by 1.25 points per serving to a minimum of 0. The maximum possible intermediate MSDPS score is 130. The final MSDPS score was standardized by dividing the developed MSDPS score by 130 and multiplying by 100 which makes it possible to compare the results of the two indices. [14] Weighting is accomplished by calculating the percent of total energy intake attributable to Mediterranean Diet foods versus non-Mediterranean Diet foods. For example, if a person obtains 35% of their total energy from non-Mediterranean Diet foods, the score is multiplied by a weighting factor of .65. [14]

Olive oil was used in the MSDPS index as a categorical variable based on the responses of whether a participant used olive oil or other oils in the diet. A sub-score of 10 was assigned for participants who answered "yes" to the question of whether they used olive oil and "no" to other oils; 5 if they answered "yes" for both olive oil and other oils; and 0, if they answered "no" to olive oil.

Total calories per day and macronutrient content of the dietary intake were calculated based on the USDA National Nutrient database in conjunction with information provided by the Turkish researchers. [140-142] Servings per month of food groups was compared to the "standard" MD pattern published by the Mediterranean Diet Foundation.[19] A categorical variable was also created for total daily energy intake for use in some of the analyses (0 to 999; 1,000-1,999; 2,000-2,999; 3,000-3,999; 4,000-4,999; 5,000-5,999; 6,000 + calories/day).

Table 4. Foods and food components for the MedDietScore and MSDPS indices

	MedDietScore Food Components	**MSDPS Food Components**
Milk	Dairy	Dairy
Ayran	Dairy	Dairy
Cacik	Dairy	Dairy
Yogurt	Dairy	Dairy
Cheese	Dairy	Dairy
Milk-based desserts	Dairy	Dairy
Ice cream	Dairy	Dairy
Dairy-based soup	Dairy	Dairy
Rice	Grains	Non-Mediterranean
White bread	n/a	Non-Mediterranean
Whole grain bread	Grains	Grains
Pasta	Grains	Non-Mediterranean
Bulgur	Grains	Grains
Grain-based soup	n/a	Non-Mediterranean
Commercial soup	n/a	Non-Mediterranean
Fruit juice, fresh	Fruits	Fruits
Fruit juice, commercial	Fruits	Fruits
Watermelon	Fruits	Fruits
Citrus	Fruits	Fruits
Compote	Fruits	Fruits
Peaches	Fruits	Fruits
Plums	Fruits	Fruits
Apricots	Fruits	Fruits
Apples	Fruits	Fruits
Pears	Fruits	Fruits
Grapes	Fruits	Fruits

Table 4. Foods and food components for the MedDietScore and MSDPS indices (cont.)

	MedDietScore.	**MSDPS**
Figs	Fruits	Fruits
Miscellaneous fruits	Fruits	Fruits
Carrot juice	Vegetables	Vegetables
Tomato juice	Vegetables	Vegetables
Regional beverages	Vegetables	Vegetables
Carrots	Vegetables	Vegetables
Salad	Vegetables	Vegetables
Tomatoes	Vegetables	Vegetables
Non-potato vegetables	Vegetables	Vegetables
Vegetable-based soup	Vegetables	Vegetables
Potatoes	Potatoes	Potatoes
Fish	Fish	Fish
Red meat	Red Meat	Red Meat
Salami	Red Meat	Red Meat
Pastrami	Red Meat	Red Meat
Meat-based soup	Red Meat	Red Meat
Chicken	Poultry	Poultry
Turkey	Poultry	Poultry
Eggs	Poultry	Eggs
Olives	Legumes	Legumes
Beans	Legumes	Legumes
Bean snacks	Legumes	Legumes
Nuts and seeds	Legumes	Legumes
Legume-based soup	Legumes	Legumes
Cola	n/a	n/a
Soft drink	n/a	n/a
Soda	n/a	n/a
Powdered drink	n/a	n/a
Concentrated drink	n/a	n/a
Other coffee	n/a	n/a
Turkish coffee	n/a	n/a
Black tea	n/a	n/a
Green tea	n/a	n/a
Herb tea	n/a	n/a
Sugar in hot beverages	n/a	Non-Mediterranean
Energy drink	n/a	Non-Mediterranean
Water	n/a	n/a
Mineral water	n/a	n/a
Alcoholic drinks, beer	Alcohol	n/a
Alcoholic drinks, wine	Alcohol	Wine
Alcoholic drinks, whiskey	Alcohol	n/a
Alcoholic drinks, raki	Alcohol	n/a

Table 4. Foods and food components for the MedDietScore and MSDPS indices (cont.)

	MedDietScore	MSDPS
Alcoholic drinks, other	Alcohol	n/a
Jam and honey	n/a	Sweets
Pekmez	n/a	Sweets
Flour-based desserts	n/a	Sweets
Olive oil	Olive Oil	Olive Oil

3.5 Statistical Analyses

Statistical analyses were performed using IBM SPSS Statistics (version 21.0, 2013, SPSS Inc. an IBM Company, Armonk, NY).

Descriptive statistics including frequency, median, mean and standard deviation were used to explore all variables. Pearson correlation was used to determine the relationship between the two MD indices.

Spearman correlation was used to evaluate the associations between the MD indices and gender, city, education level and waist circumference categories. Pearson correlation was used to examine the associations between the MD indices and age, total energy/day and BMI. Age, gender, total energy/day, education, BMI and waist circumference by quartiles of the indices were evaluated. Independent sample t-tests were used to compare the means of the MedDietScore and the MSDPS by gender and waist circumference categories. One way ANOVA was used to compare the means of the MedDietScore and the MSDPS by city, age, total energy/dayBMI and education level. ANCOVA was used to compare the means of the indices by city after adjusting for gender, age, total energy/day, education and BMI. The standardized version of the MedDietScore was used in these analyses. The reference categories used for

comparisons were age 19 to 29, the city with the lowest index score, male gender, 0 to 999 calories/day, and illiterate.

Logistic regression was used with the MD indices as a dichotomized (≤ median, > median) dependent variable and age, gender, total energy/day, education level, city and BMI as the independent variables. A p value of <0.05 was considered statistically significant. Bonferroni adjustments were made when more than two categories were being compared.

In order to further characterize the Turkish Dietary pattern and examine whether there are important items in the Turkish Dietary pattern which are not included in the pre-determined MD indices, factor analysis using the PCA method with varimax rotation was completed. A preliminary factor analysis was conducted using 73 food items to provide guidance for the creation of 33 components used in the final model. Fruit and vegetable juices were kept separate from whole fruits based on the literature which supports greater benefits from eating whole fruits and vegetables than from consuming juice.[144] Food constructs with a factor loading of >0.30, an eigenvalue of > 1.0 and a favorable evaluation of the scree plot were retained. Varimax rotation was used because it produced a more definitive outcome.[145,64] A comprehensive review of 58 nutrition studies that used factor analysis found that the majority of studies used principal components analysis with varimax (orthogonal) rotation and eigenvalues >1.0.[16]

CHAPTER 4: RESULTS

4.1 Participant Characteristics

The sample was mostly female, with an average age of 41.85 ± 15.7 years and average BMI of 27.2 ± 5.4 (25.5 ±4.5 men and 28.0 ±5.7 women). Approximately two-thirds of the participants had less than a high school education, and 38.8% had a high waist circumference (Table 5).

Table 5. Demographic, socioeconomic and anthropometric characteristics of participants

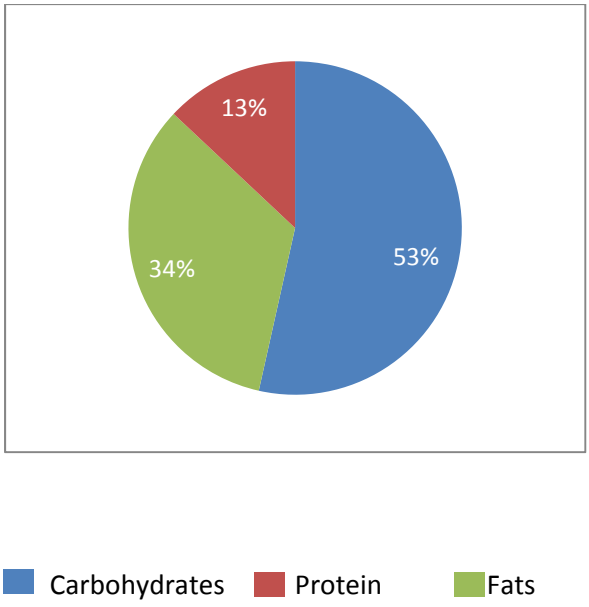
	n	**Mean ± SD[a] or percent**
Age	3001	41.9±15.7
Gender		
Male	1061	35.4%
Female	1940	64.6%
Education		
Illiterate	338	11.3%
Primary school (1-4.9 y)	193	6.4%
Primary - Middle school (5-8 y)	1519	50.6%
Some high school or higher	917	30.6%
BMI (kg/m^2)	2732	27.2±5.4
Waist circumference		
Low ≤ 102 cm males/≤ 88 cm	1783	59.4%
High >102cm males/ >88cm	1163	38.8%

[a]SD = Standard Deviation

4.2 Dietary Intake

Mean total daily energy intake was 2,026.9 ± 872.7 kcal/d (2,459.8 ± 981.1 for men and 1,790.1 ± 702.4 for women). Overall macronutrient composition of dietary intake was 53% carbohydrate, 13% protein and 34% fats (Figure 5). Over one-third of carbohydrate calories came from consumption of bread (35.5%); nearly one-half was from bread and other grains (47.3%) Calories from sugar in black tea made up another 11.9% of carbohydrate calories.

Figure 5. Macronutrient composition (as percentage of energy intake) of Turkish adults' diet



The most commonly consumed foods and beverages (reported by 80% or more of the participants) were yogurt and yogurt-based foods, cheese, bread and grains, salad and tomatoes, watermelon, chicken and eggs, black tea and water (Table 6). In addition to the most commonly consumed foods, many participants (over 60%) also reported eating

legumes and other vegetables, nuts and seeds, red meat, cola and ice cream. Although a high percentage of participants reported eating these foods, the mean daily intake was low which was the result of either being eaten infrequently or in small amounts. For example, while 77% of participants reported eating legumes, the mean daily intake was only 8.3 ± 11.3 g (Appendix C, Table 6). There were several foods that were reported as being consumed by a small number of participants (less than 20%) which also had a low mean daily intake including several types of soup, fruit and vegetable juices, leblebi (garbanzo bean snacks), turkey, certain beverages including specialty teas and energy drinks and pekmez (Appendix C, Table 6).

Table 6. Daily food intake of Turkish adults

		Daily Intake	
	N	**Median**	**Mean ± SD**
Dairy			
Milk (ml)	2984	0.0	34.9 ± 79.8
Ayran (ml)	2987	71.4	139.8 ± 207.5
Cacik (ml)	2981	25.7	42.2 ± 53.3
Yogurt (g)	2975	57.1	74.9 ± 80.1
Cheese (g)	2966	30.0	34.9 ± 27.8
Milk-based dessert (ml)	2968	3.0	9.3 ± 17.7
Ice cream (g)	2826	3.8	11.6 ± 22.5
Dairy-based soup (ml)	2986	0.0	23.5 ± 55.6
Fruits			
Fresh fruit juice (ml)	2986	0.0	6.2 ± 30.8
Commercial fruit juice (ml)	2981	0.0	32.8 ± 86.5
Citrus (g)	2956	0.0	2.5 ± 15.7
Compote (g)	2986	0.0	14.0 ± 36.4
Watermelon (g)	2950	150.0	219.8 ± 223.2
Peaches (g)	2955	0.0	62.4 ± 106.2
Plums (g)	2955	0.0	3.9 ± 29.6
Apricots (g)	2955	0.0	0.9 ± 12.0
Apples (g)	2955	0.0	12.5 ± 60.1
Pears (g)	2955	0.0	2.3 ± 22.9
Grapes (g)	2949	0.0	18.8 ± 47.8
Figs (g)	2955	0.0	2.1 ± 31.4
Miscellaneous fruit (g)	2955	0.0	5.1 ± 44.3

Table 6. Daily food intake of Turkish adults (cont.)

Grains			
All bread (g)	2952	150.0	194.2 ± 142.1
White bread (g)	2959	150.0	186.0 ± 147.2
Whole grain bread (g)	2960	0.0	9.1 ± 42.6
Rice (g)	2955	10.7	15.2 ± 15.1
Pasta (g)	2953	10.0	15.8 ± 16.9
Bulgur (g)	2943	5.0	9.2 ± 13.3
Grain-based soup (ml)	2983	0.0	13.2 ± 51.4
Commercial soup (flour) (ml)	2986	0.0	0.2 ± 5.4
Vegetables			
Carrot juice (ml)	2987	0.0	0.5 ± 8.6
Tomato juice (ml)	2987	0.0	1.0 ± 20.7
Regional beverages (ml)	2983	0.0	1.6 ± 28.9
Carrots (g)	2964	0.0	3.0 ± 16.9
Salad (g)	2954	75.0	89.5 ± 79.3
Tomatoes (g)	2953	150.0	189.6 ± 141.4
Potatoes (g)	2958	0.0	15.2 ± 33.9
Other non-potato vegetables (g)	2955	21.5	37.2 ± 49.0
Vegetable-based soup (ml)	2985	0.0	7.6 ± 33.9
Legumes/olives/nuts/seeds			
Olives (g)	2951	12.0	14.3 ± 13.5
Beans (g)	2953	4.5	8.3 ± 11.3
Bean snacks (g)	2962	0.0	2.1 ± 9.7
Nuts and seeds (g)	2957	3.3	16.4 ± 31.7
Legume-based soup (ml)	2985	0.0	30.8 ± 57.9
Proteins			
Eggs (g)	2951	21.4	23.0 ± 24.1
Salami (g)	2965	0.0	1.8 ± 6.7
Pastrami (g)	2964	0.0	1.9 ± 6.7
Red meat (g)	2949	7.2	13.5 ± 18.7
Chicken (g)	2960	16.5	28.4 ± 37.7
Turkey (g)	2966	0.0	0.9 ± 8.0
Fish (g)	2958	0.0	14.4 ± 46.1
Meat-based soup (ml)	2986	0.0	0.2 ± 4.9
Beverages			
Turkish coffee (ml)	2984	1.0	12.3 ± 27.7
Other coffee (ml)	2984	0.0	29.8 ± 94.3
Black tea (ml)	2985	360.0	483.8 ± 461.6
Green tea (ml)	2990	0.0	3.0 ± 35.6
Herbal tea (ml)	2985	0.0	8.9 ± 48.8
Cola (ml)	2980	22.9	68.2 ± 137.7
Soft drinks (ml)	2984	0.0	25.9 ± 65.3

Table 6. Daily food intake of Turkish adults (cont.)

Soda (ml)	2983	0.0	14.6 ± 53.7
Powdered drinks (ml)	2981	0.0	29.0 ± 81.0
Energy drinks (ml)	2987	0.0	0.6 ± 11.3
Drinks from concentrate (ml)	2987	0.0	0.9 ± 9.8
Mineral water (ml)	2983	0.0	32.5 ± 90.6
Water (ml)	2993	1,120.0	1,411.3 ± 1,087.9
Sweets			
Jam/honey (g)	2959	2.1	6.6 ± 10.9
Pekmez (g)	2959	0.0	1.4 ± 6.9
Flour-based desserts (g)	2955	0.0	6.0 ± 17.8
Sugar from hot beverages (g)	2990	26.0	36.4 ± 40.2
Alcohol			
Beer (ml)	2984	0.0	33.5 ± 205.4
Wine (ml)	2986	0.0	0.8 ± 8.5
Raki (ml)	2985	0.0	4.2 ± 36.2
Whiskey (ml)	2986	0.0	0.7 ± 10.2
Other alcohol (ml)	2986	0.0	0.2 ± 5.2

4.3 MD Adherence

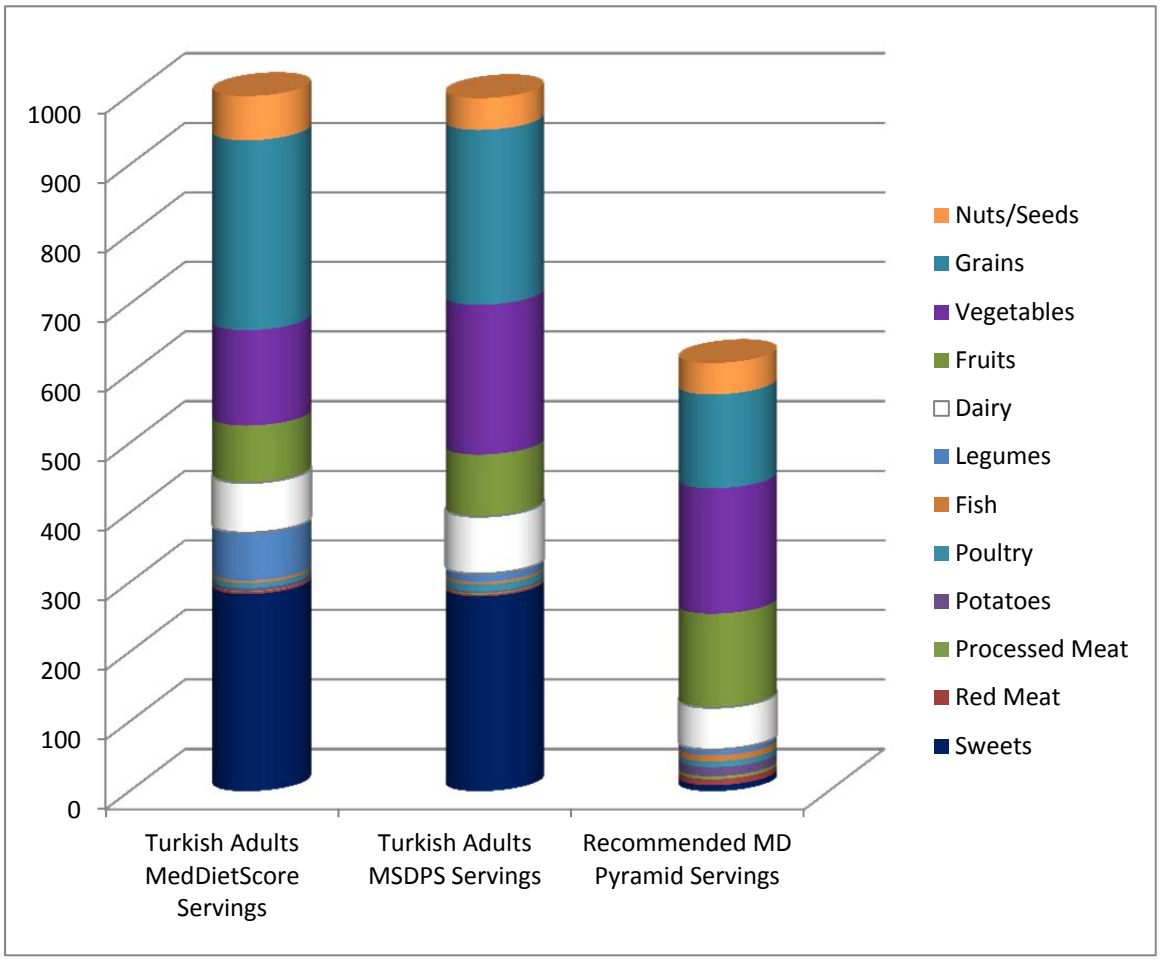
When monthly food intake, as classified by the two MD indices, was compared to the MD Pyramid, [19] results showed that participants reported eating more grains and sweets and less fruits and fish than the recommended amounts (Table 7 and Figure 6).

Table 7. Average monthly food group intake levels (servings/month) determined by the MedDietScore and MSDPS indices in comparison to MD Pyramid recommendations

Food Group (servings/month)*	n	MedDietScore Mean ± SD	MSDPS Mean ± SD	MD Pyramid
Dairy	2993	71.4 ± 44.6	82.0 ± 49.8	60.0
Fruits	2992	82.3 ± 70.3	89.1 ± 74.3	135.0
Vegetables	2992	137.1 ± 83.5	215.0 ± 133.0	≥180.0
Potatoes	2958	4.3 ± 9.7	2.2 ± 4.9	≤12.9
Grains	2991	272.8 ± 179.5	251.4 ± 174.8	135.0
Red meat	2991	3.3 ± 4.7	2.8 ± 3.9	<8.6
Processed meat	2965	0.9 ± 2.6	1.9 ± 5.5	≤4.3
Poultry	2967	7.3 ± 9.8	10.2 ± 13.6	8.6
Eggs	2951	11.3 ± 11.9	11.4 ± 11.9	12.9
Fish	2958	3.6 ± 11.5	3.8 ± 12.2	≥8.6
Legumes	2992	69.0 ± 76.8	11.8 ± 10.8	≥8.6
Nuts/seeds	2967	63.5 ± 75.3	45.7 ± 44.8	45.0
Sweets	2993	283.3 ± 290.3	280.0 ± 290.0	≤8.6
Wine	2986	0.2 ± 2.6	0.2 ± 1.7	Moderation

*See Appendix B for serving size standards; serving sizes were not available for MD Pyramid. [19]

Figure 6. Average food group intake levels (servings/month) determined by the MedDietScore and MSDPS indices in comparison to MD Pyramid recommendations*



*See Appendix B for serving size standards; serving sizes were not available for MD Pyramid. Wine not shown.[19]

The mean MedDietScore index was 27.9 ± 5.3 (out of 55) and the mean standardized MedDietScore index was 50.7 ± 9.7 out of 100. The modified MedDietScore, which adds weighting to take recommended frequency of consumption into account and standardized to be out of 100, was 55.5 ± 10.9. The mean MSDPS index was 16.3 ± 7.3 out of 100, and the foods considered to be part of the MD pattern

comprised 61% of the total daily energy intake. There was a moderate correlation between the MedDietScore and MSDPS (0.346, p<.0001).

An examination of the sub-scores of the individual food components of MedDietScore showed that fruits, vegetables, legumes and whole grains had the highest sub-scores and fish, poultry, potatoes, olive oil use, dairy and alcohol had the lowest sub-scores (Table 8). For the MSDPS, fruits, vegetables and dairy had the highest sub-scores and fish, potatoes, whole grains, olive oil use, legumes, sweets and wine had the lowest sub-scores (before adjusting for consumption of non-Mediterranean foods) (Table 9).

Table 8. MedDietScore food component sub-scores among Turkish adults

		MedDietScore Sub-Scores*	
	n	**Median**	**Mean ± SD**
Whole grains	2965	5.0	4.2 ± 1.2
Potatoes	2958	0.0	0.9 ± 1.6
Fruits	2992	5.0	4.7 ± 0.9
Vegetables	2992	5.0	4.9 ± 0.7
Legumes	2992	5.0	4.7 ± 1.0
Fish	2958	0.0	1.2 ± 1.9
Olive oil	2974	0.0	2.0 ± 2.5
Red meats	2992	4.0	3.4 ± 1.7
Poultry	2967	0.0	1.1 ± 1.8
Dairy	2994	0.0	0.3 ± 1.0
Alcohol	2986	0.0	0.6 ± 1.6

*Maximum component sub-score is 5.0.

Table 9. MSDPS food component sub-scores before adjustment for non-Mediterranean foods.

		MSDPS Sub-Scores *	
	n	**Median**	**Mean ± SD**
Whole grains	2965	0.1	0.5 ± 1.4
Potatoes	2958	0.0	1.3 ± 2.4
Fruits	2992	5.2	4.9 ± 3.1
Vegetables	2992	5.8	5.2 ± 3.3
Legumes	2992	0.0	1.9 ± 3.0
Fish	2958	0.0	0.9 ± 1.9
Olive oil	2970	0.0	2.2 ± 2.9
Red meats	2992	1.8	2.9 ± 3.1
Poultry	2967	2.9	3.5 ± 2.9
Eggs	2951	3.3	3.7 ± 3.5
Dairy	2994	5.6	4.9 ± 3.4
Sweets	2962	0.6	2.6 ± 3.2
Wine	2986	0.0	0.0 ± 0.3

*Maximum component sub-score is 10.0.

4.4 Associations between MD indices and demographic, socioeconomic and anthropometric factors

There were many small significant relationships between the MedDietScore index and demographic, socioeconomic and anthropometric factors. Both the MedDietScore and the MSDPS showed moderate, positive and statistically significant correlations with education. There were small correlations between MedDietScore and BMI, waist circumference and city, but these associations were not statistically significant for MSDPS. The standardized MedDietScore was positively, and the MSDPS was negatively correlated with daily energy intake (Table 10).

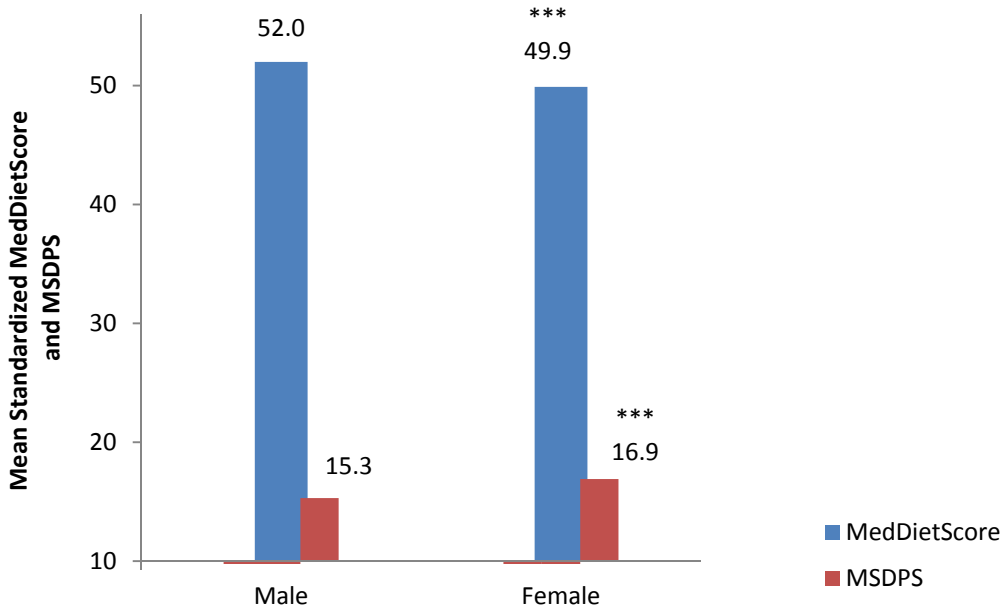
Table 10. Correlations between MD indices and demographic, socioeconomic and anthropometric characteristics among Turkish adults

	MedDietScore	MSDPS
City	-.045[a,c] (p<.01)	-.019[a,c] (p<.30)
Gender	-.111[a,c] (p<.01)	.095[a,c] (p<.01)
Age	-.050[b] (p<.01)	.080 [b] (p<.01)
Education	.210[a,c] (p<.01)	.171 [a,c] (p<.01)
Energy/day	.170[b] (p<.01)	-.138 [b] (p<.01)
BMI	-.049[b] (p<.01)	.033 [b] (p<.09)
Waist circumference	-.093[a,c] (p<01)	.010[a,c] (p<.60)

[a] Spearman correlation
[b] Pearson correlation
[c] Categorical variable. Gender (male, female); City (see Table 2); Education (Illiterate, primary school [1-4.9 years], middle school [5-8 years], some high school or higher); waist circumference (low: ≤ 102 cm males/≤ 88 cm females; high: >102cm males/ >88cm females).

Tests of the difference between the means of the two indices by gender indicated that the mean standardized MedDietScore was significantly higher for males than females, but the mean MSDPS was higher for females than males (p<0.001,Figure 7).

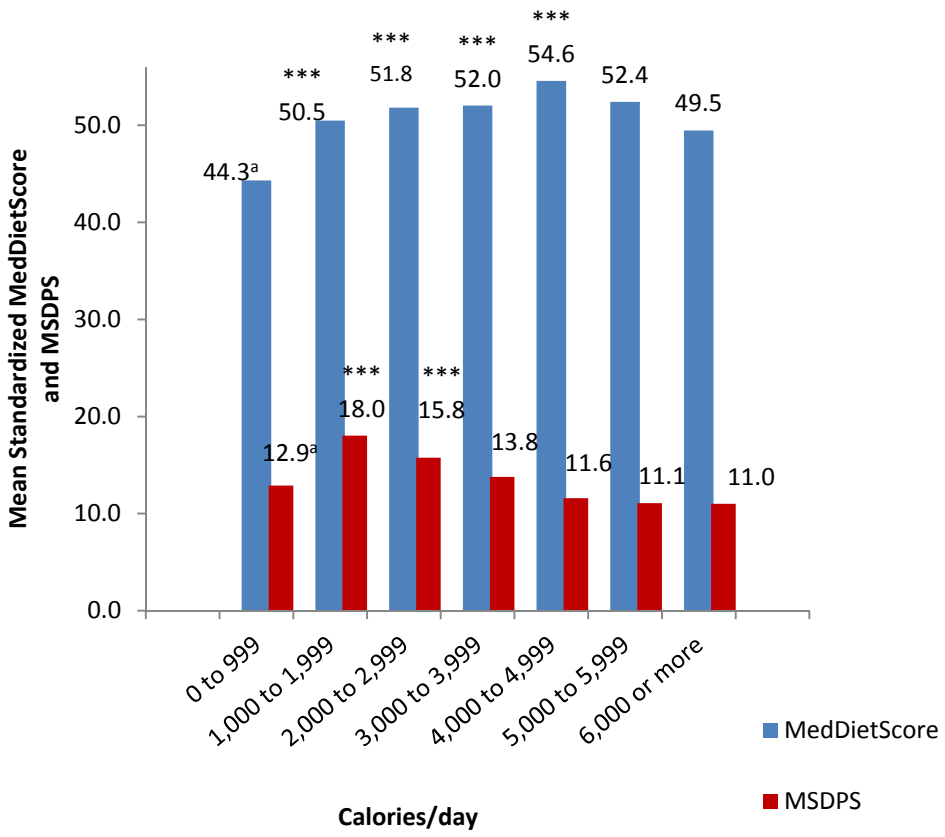
Figure 7. Standardized MedDietScore and MSDPS by gender



* p<.05; ** p<.01; ***p< .001; determined by independent samples t-test.

The relationship between the means of the two indices and total daily energy intake was somewhat different for the two MD indices. Compared with the lowest energy intake level (0 to 999 kcal/d), the mean standardized MedDietScores significantly increased with each level of caloric intake and peaked at the 4,000 to 4,999 kcal/d category. There was a slight decrease in scores after this level, and the differences in scores between the lowest intake level and beyond 4,999 kcal/d were not statistically significant. The MSDPS increased significantly as calories/day went from 0 to 999 up to 2,999 kcal/d ($p<0.01$). Above 3,000 calories/day, the MSDPS index scores started to decrease, and the scores were not significantly different from the scores for participants who consumed the least amount of calories/day (Figure 8).

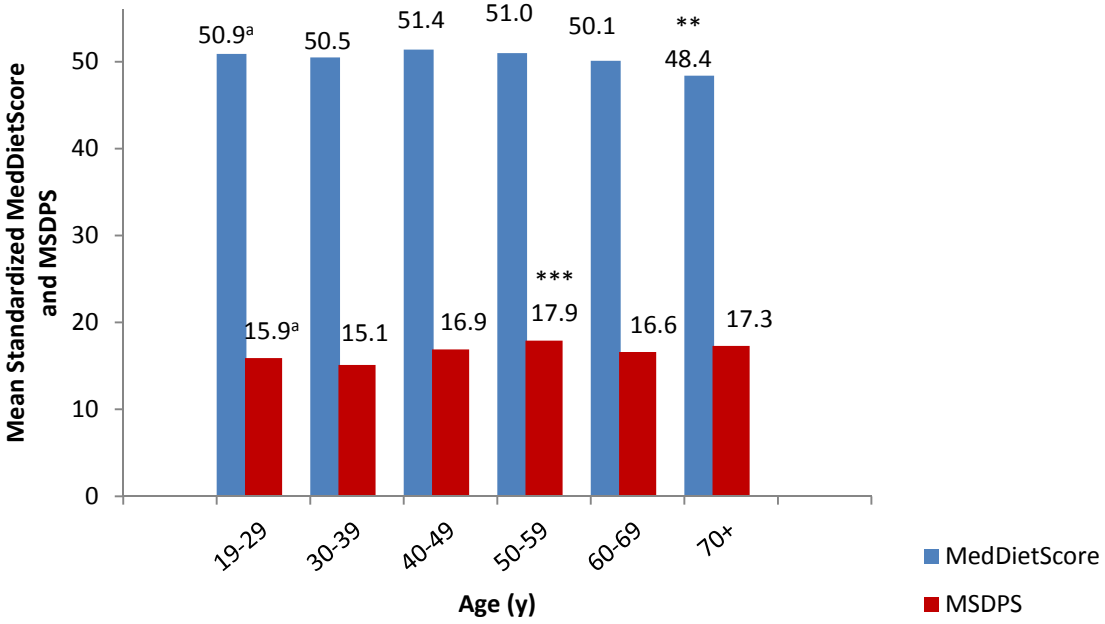
Figure 8. Standardized MedDietScore and MSDPS by total energy intake/day



[a]Reference category is 0 to 999 calories/day
* p<.05; ** p<.01 ***p< .001; determined by one-way ANOVA.

Compared with the youngest participants (19 to 29 years old), the mean standardized MedDietScore was significantly lower in the oldest age category (70+) ($p < 0.01$). The mean MSDPS was significantly higher among 50 to 59 year olds compared with the youngest participants ($p<0.001$, Figure 9).

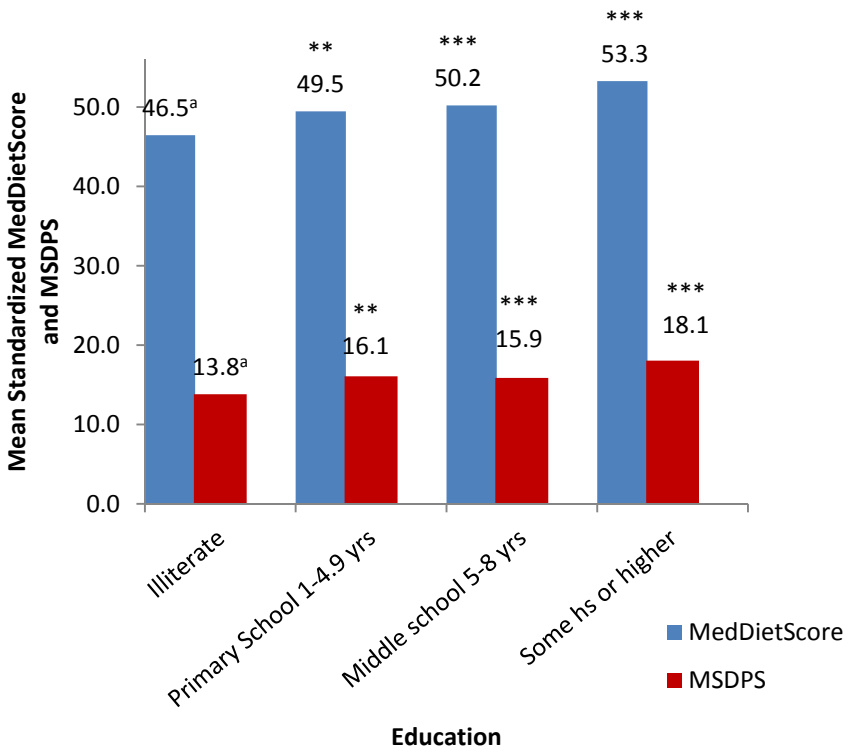
Figure 9. Standardized MedDietScore and MSDPS by age



[a]Reference category is age 19 to 29 y.
* p<0.05; ** p<0.01 ***p< 0.001; determined by one-way ANOVA.

Both indices were positively associated with education level. The means of both indices increased significantly with each education level and were greatest among participants with the highest level of education (p<0.001, Figure 10).

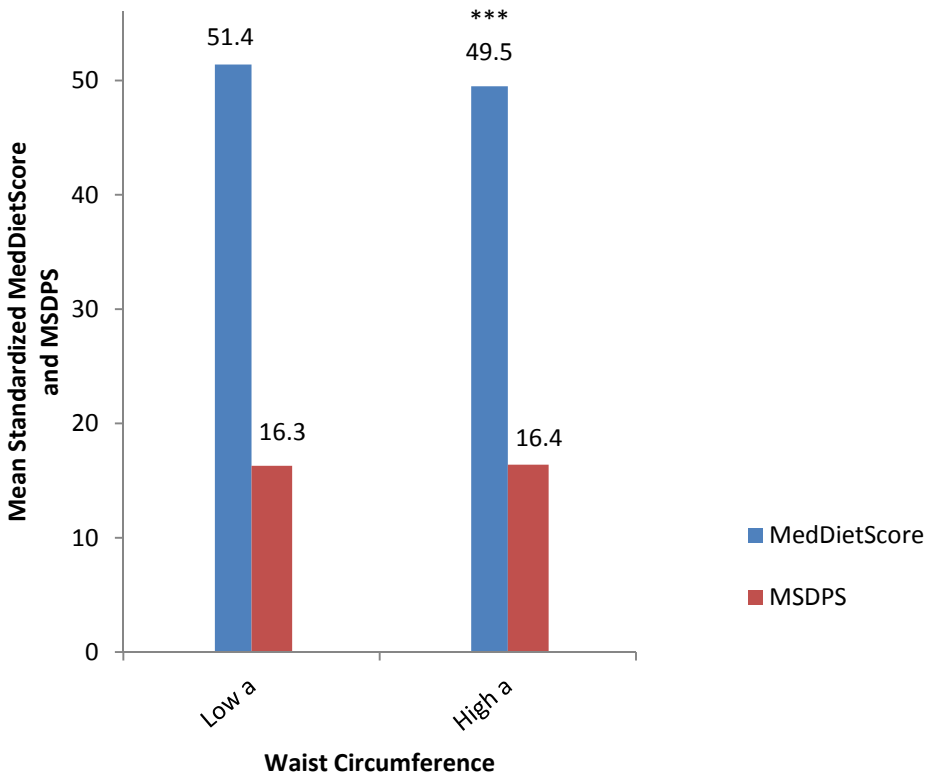
Figure 10. Standardized MedDietScore and MSDPS by education



[a]Reference category is illiterate.
* p<0.05; ** p<0.01 ***p< 0.001; determined by one-way ANOVA.

There was a statistically significant and inverse relationship between the mean MedDietScore and the categories of waist circumference (p<0.001), but this association was not significant for the mean MSDPS (Figure 11). Weight status categories (BMI) were not significantly related to either index.

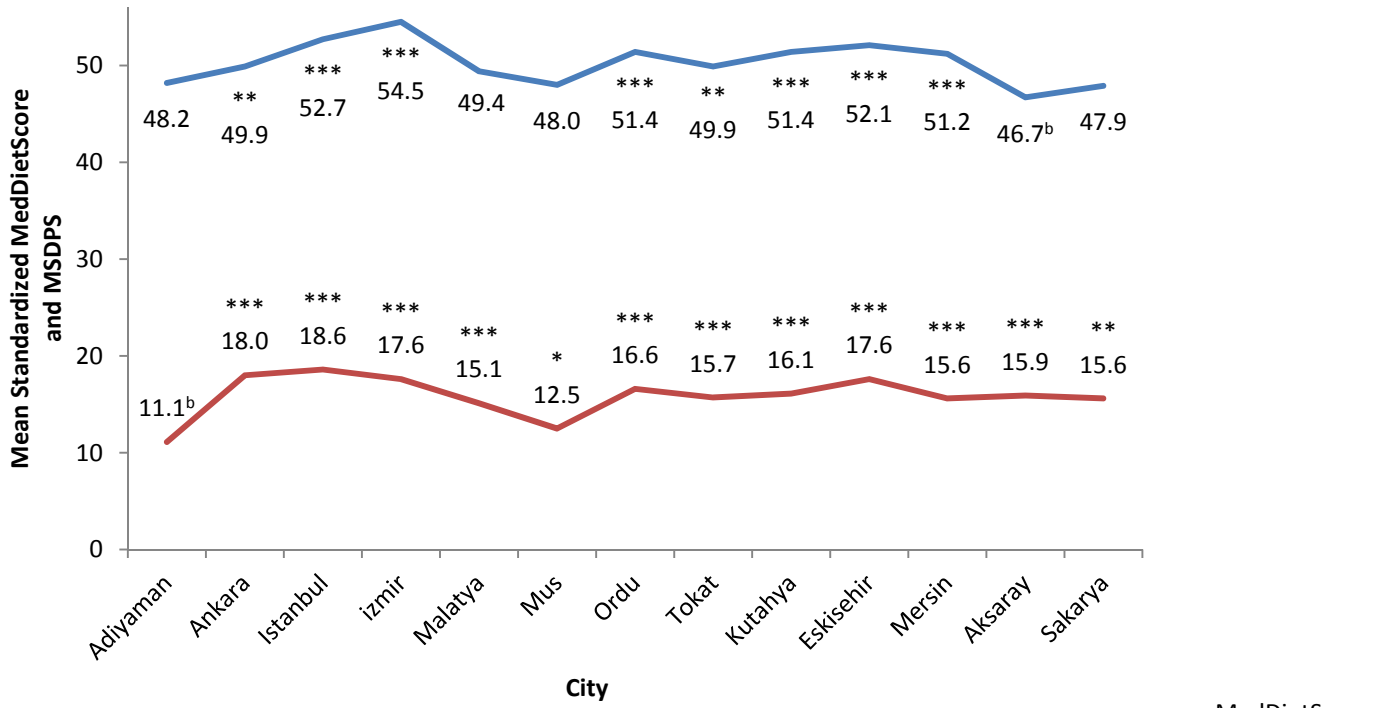
Figure 11. Standardized MedDietScore and MSDPS by waist circumference



[a] low ≤ 102 cm males/≤ 88 cm females, high >102cm males/ >88cm females.
* p<0.05; ** p<0.01 ***p< 0.001; determined by independent samples t-test.

Comparisons of MD indices by city locations indicated that the mean standardized MedDietScore was lowest in Aksaray and highest in Izmir. Compared to the score in Aksaray, scores were significantly higher in all other cites except Adiyaman, Mus, Malatya and Sakarya ($p<0.05$). The mean MSDPS was lowest in Adiyaman and highest in Ankara and Istanbul. Compared with Adiyaman, the mean MSDPS was significantly higher in all other cities ($p < 0.05$). These results for both indices did not significantly change after adjusting for gender, age, education, energy intake and BMI (Figure 12).

Figure 12. Standardized MedDietScore and MSDPS by city adjusted for demographic, socioeconomic and anthropometric factors[a]



[a]Adjusted for age, gender, education, energy intake/day, BMI.
[b]Reference category is Aksaray for MedDietScore and Adiyaman for MSDPS.
* p<0.05; ** p<0.01 ***p< 0.001; determined by ANCOVA.

4.4.1Demographic, socioeconomic and anthropometric characteristics by quartiles of MD indices

The demographic, socioeconomic and anthropometric characteristics by standardized MedDietScore and MSDPS quartiles are shown in Tables 11 and 12. The positive associations between education and the quartiles of indices were evident for both MD indices. Participants in the highest MedDietScore quartile were slightly younger, consumed more calories per day, and had slightly lower BMI. Participants in the highest MSDPS quartile were about three years older and consumed fewer calories per day.

Table 11. Demographic, socioeconomic and anthropometric characteristics by MedDietScore Quartile

	Quartile 1 (0 to 44.5) mean ± SD #%	**#/% Quartile 2 (44.6 to 50.9) mean ± SD #%**	**Quartile 3 (51.0 to 56.4) mean ± SD #/%**	**# Quartile 4 (56.5 to 92.7) mean ± SD #/%**	**p value**
Age (y)	42.9 ± 16.3	42.5 ± 16.1	41.1 ± 14.9	40.7 ± 15.0	0.021[a]
Gender[b]					<0.001[b]
Male	218/29%	214/32%	242/37%	309/44%	
Female	532/71%	455/68%	421/63%	390/56%	
Calories/day [a]	1859.4 ± 930.7	2045.6 ± 840.0	2082.3 ±846.7	2136.9 ± 856.0	<0.001[a]
BMI	27.4 ± 5.6	27.3 ± 5.7	27.3 ± 5.3	26.6 ± 5.2	0.027[a]
Waist circumference					<0.001[b]
Low	407/55%	383/58%	399/61%	462/68%	
High	327/45%	274/42%	255/39%	222/32%	
Education					<0.001[a]
Illiterate	125/17%	97/15%	60/9%	34/5%	
Primary school (1-4.9 y)	51/7%	51/8%	41/6%	34/5%	
Middle school (5-8 y)	401/54%	349/52%	334/51%	320/46%	
Some high school or higher	163/22%	165/25%	220/34%	304/44%	

[a]Determined by one way ANOVA
[b]Determined by Chi Square

Table 12. Demographic, socioeconomic and anthropometric characteristics by MSDPS Quartile

	Quartile 1 (0 to 11.2) mean ± SD #/%	**Quartile 2 (11.3 to15.5) mean ± SD #/%**	**Quartile 3 (15.6 to 20.5) mean ± SD #/%**	**Quartile 4 (20.6 to 48.2) mean ± SD #/%**	**p value**
Age (y)	40.4 ± 15.3	40.7 ± 15.4	42.6 ± 15.7	43.7 ± 16.1	<0.001[a]
Gender					<0.001[b]
Male	307/41%	278/37%	257/34%	214/29%	
Female	449/59%	464/63%	488/66%	532/71%	
Calories/day	2140.8 ± 1071.1	2168.2 ± 862.8	1992.3 ± 810.8	1815.8 ± 639.0	<0.001[a]
BMI	26.9± 5.3	27.1 ± 5.4	27.3 ± 5.5	27.3 ± 5.7	0.485[a]
Waist circumference					0.739[b]
Low	455/61%	448/61%	430/59%	444/61%	
High	286/39%	282/39%	300/41%	289/39%	
Education					<0.001[a]
Illiterate	118/16%	87/12%	80/11%	51/7%	
Primary school (1-4.9 y.)	58/8%	40/5%	46/6%	49/7%	
Middle school (5-8 y.)	410/55%	417/57%	352/48%	335/46%	
Some high school or higher	165/22%	188/26%	259/35%	300/41%	

[a]Determined by one way ANOVA
[b]Determined by Chi Square

The determinants of having a high (> median) MD index score were examined in logistic regression models. After adjusting for total daily energy intake, gender, age, city, and BMI, participants with high school or greater education were 3.3 times more likely to receive a high MedDietScore than participants who were illiterate (Table 13). Similarly, after multivariate adjustments, participants with high school or greater education were 5.5 times more likely to have a high MSDPS than participants who were illiterate (Table 14).

Table 13: Logistic regression model of the determinants of having a high (>median) standardized MedDietScore among Turkish adults

Variables	**OR (95% CI)**	**p value**
Age		
19-29	1.00	
30-39	1.15 (0.91 - 1.45)	0.252
40-49	1.35 (1.04 – 1.75)	0.024
50-59	1.57 (1.15 – 2.14)	0.005
60-69	1.30 (0.92 – 1.84)	0.132
70+	0.86 (0.56 – 1.33)	0.510
Education		
Illiterate	1.00	
Primary School (1-4.9 y.)	1.33 (0.87-2.03)	0.188
Middle School (5-8y.)	1.77 (1.29-2.42)	<0.001
Some HS or higher	3.34 (2.35-4.75)	<0.001
BMI	1.01 (0.99-1.03)	0.423
Gender		
Male	1.00	
Female	0.85 (0.69-1.03)	0.101
Model X^2 =248.6, df = 23, p=.0001; Hosmer and Lemeshow p=.416; Nagelkerke R^2 = .126		

Model adjusted for city and energy intake/day.

Table 14: Logistic regression model of the determinants of having a high (>median) MSDPS among Turkish adults

Variables	OR (95% CI)	p value
Age		
19-29	1.00	
30-39	0.84 (0.67 – 1.06)	0.149
40-49	1.65 (1.28 – 2.13)	<0.001
50-59	2.69 (1.97 – 3.67)	<0.001
60-69	1.90 (1.36 – 2.66)	<0.001
70+	2.56 (1.71 – 3.84)	<0.001
Education		
Illiterate	1.00	
Primary School (1-4.9y.)	1.70 (1.14 - 2.54)	0.007
Middle School (5-8y.)	2.03 (1.50 - 2.75)	<0.001
Some HS or higher	5.50 (3.88- 7.80)	<0.001
BMI	1.00 (0.99-1.02)	0.687
Gender		
Male	1.00	
Female	1.66 (1.36 - 2.02)	<0.001
Model X^2 =371.2, df = 23, p=.0001; Hosmer and Lemeshow p=.749; Nagelkerke R^2 = .171		

Model adjusted for city and energy intake/day.

4.6 Factor Analysis of Turkish Dietary Pattern

Principal components analysis with varimax rotation based on servings/day (MedDietScore serving sizes), with 33 components identified five factors which explained 26.5% of the variance (Table 15 and Figure 13). The identified food intake patterns were: sweetened hot beverages (various coffees and teas); Turkish western (red meat, desserts, ice cream, sweetened beverages, nuts and seeds), Turkish (yogurt, fruits, vegetables; and bulgur and red meat as a secondary loading); grains and eggs (rice, pasta, bulgur, eggs); savory (cheese, olives, pekmez and jam honey, but negative loading for turkey). The rotated component matrix is shown in table 16.

Table 15. Total variance explained and eigenvalues for factor analysis based on servings/day of foods.

Factor	Initial Eigenvalues			Extraction Sums of Squared			Rotation Sums of Squared		
	Total	% of Variance	Cumulative	Total	% of Variance	Cumulative	Total	% of Variance	Cumulative
1	3.091	9.36	9.36	3.09	9.36	9.36	1.63	4.96	4.96
2	1.642	4.97	14.34	1.64	4.97	14.34	1.59	4.83	9.79
3	1.388	4.20	18.54	1.38	4.20	18.54	1.53	4.64	14.44
4	1.355	4.10	22.65	1.35	4.10	22.65	1.50	4.55	18.99
5	1.261	3.82	26.47	1.26	3.82	26.47	1.45	4.41	23.40
6	1.251	3.79	30.26	1.25	3.79	30.26	1.35	4.11	27.51
7	1.175	3.55	33.82	1.17	3.55	33.82	1.31	3.96	31.48
8	1.116	3.38	37.20	1.11	3.38	37.20	1.27	3.85	35.34
9	1.086	3.29	40.49	1.08	3.29	40.49	1.24	3.77	39.12
10	1.050	3.18	43.67	1.05	3.18	43.67	1.21	3.69	42.81
11	1.027	3.11	46.79	1.02	3.11	46.79	1.18	3.59	46.40
12	1.013	3.06	49.85	1.01	3.06	49.85	1.13	3.44	49.85
13	.997	3.02	52.88						
14	.973	2.95	55.83						
15	.963	2.91	58.74						
16	.933	2.82	61.57						
17	.900	2.72	64.30						
18	.888	2.69	66.99						
19	.872	2.64	69.63						
20	.858	2.60	72.23						
21	.816	2.47	74.71						
22	.802	2.43	77.14						
23	.787	2.38	79.52						
24	.772	2.34	81.86						
25	.765	2.31	84.18						
26	.752	2.27	86.46						
27	.724	2.19	88.65						
28	.717	2.17	90.82						
29	.698	2.11	92.94						
30	.686	2.07	95.02						
31	.655	1.98	97.00						
32	.593	1.79	98.80						
33	.394	1.19	100.00						

Extraction Method: Principal Component Analysis.

Figure 13: Scree plot for factor analysis based on servings per day of foods

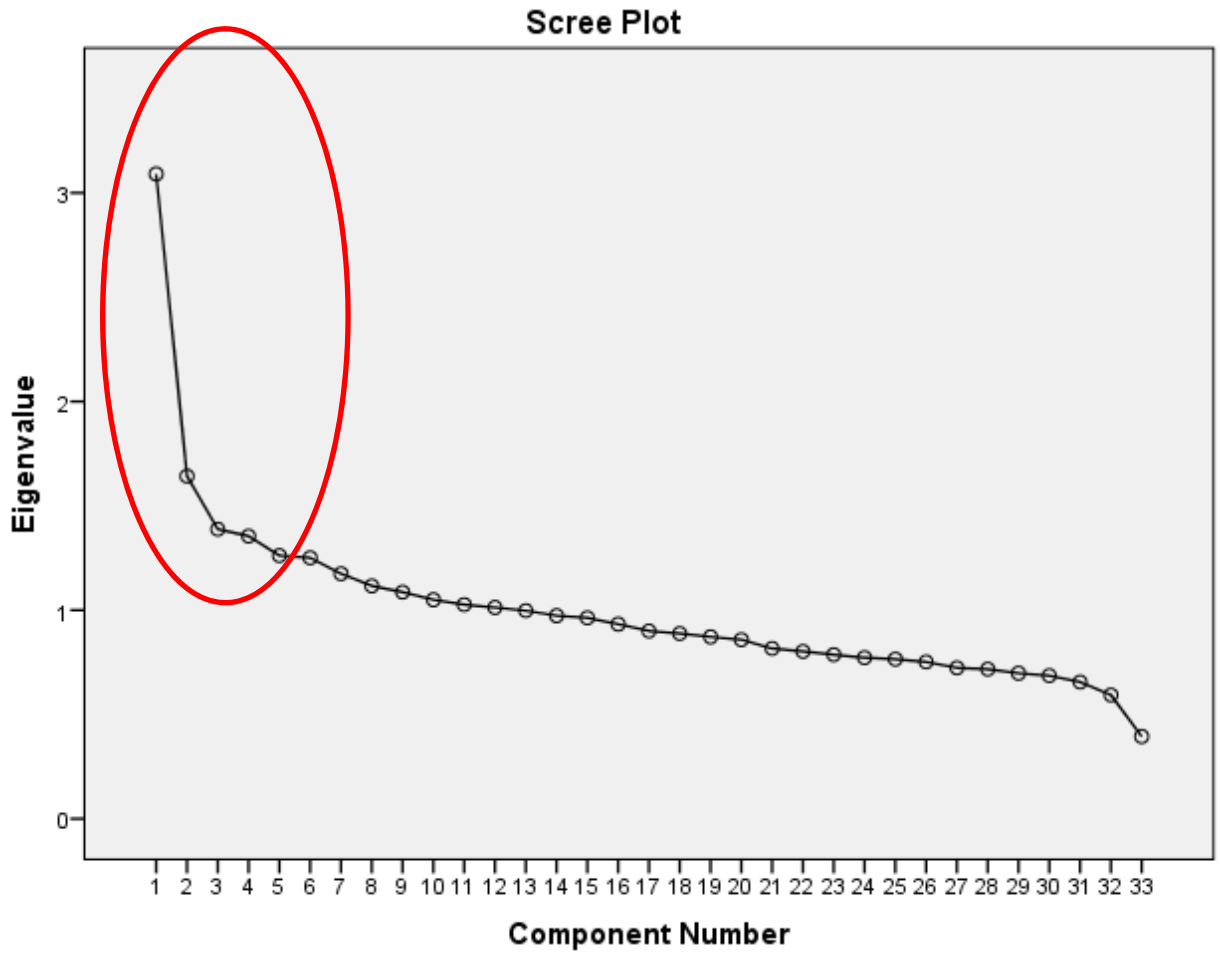


Table 16. Rotated component matrix for factor analysis based on servings/day of

	Componen								
	1	2	3	4	5	6	7	8	9
Sugar	.870(								
Hot beverages	.869'								
Ice cream		.604							
Desserts		.557							
Red meat		.430	*.344*						
Nuts & seeds		.330							
Sweet beverages		.352							
Yogurt			.631						
Fruits			.524						
Vegetables			.451						
Bulgur			*.474*	.498					
Pasta				.683					
Rice				.612					
Eggs				.309					
Cheese					.626				
Olives					.513				
Pekmez, jam, honey					.465				
Turkey					-.307				
Vegetable juice									
Fruit juice									
Whole grain bread									
White bread									
Wine									
Fish									
Other alcohols									
Water									
Leblebi									
Potatoes									
Chicken									
Legumes									
Dairy									
Cured meat									
Misc. beverages									

[a] The figures in grey indicate a secondary loading.

CHAPTER 5: DISCUSSION

This study examined the dietary intake patterns, MD adherence and how MD adherence varied by city after adjustment for demographic, socioeconomic and anthropometric factors in a national and diverse sample of Turkish adults. In addition to using two previously determined MD indices, MedDietScore and MSDPS, sample-specific intake patterns were examined through a factor analysis approach.

Turkish adults in this study followed a unique dietary pattern which included some of the characteristics of the MD, but was overall quite different from the "standard" MD pyramid.[19] Since it is generally recognized that the MD pattern does vary both within and among countries of the Mediterranean region, this result is consistent with MD research previously conducted in other countries. In this study, five dietary patterns were identified through factor analysis: sweetened hot beverages, Turkish western, Turkish, grains and eggs, savory.

The Turkish dietary pattern identified in this study primarily consisted of bread, fruits and vegetables, yogurt and yogurt-based foods, bulgur, some red meat, and black tea. Participants reported low consumption of whole grains, legumes, potatoes, olive oil, wine and fish, which are considered to be key elements of the standard MD pattern [18-20] .

Results of the two different MD adherence indices used in this study were somewhat contradictory with the MedDietScore showing a relatively high (27.9 ± 5.3 out of 55) and the MSDPS showing a relatively low (16.3 ± 7.3 out of 100) adherence to the MD pattern. The very different methodologies used to calculate the two indices most likely had an impact on these results. The MedDietScore does not take overconsumption of foods or consumption of non-MD foods into account, while the MSDPS adjusts for

both these factors. Other factors which may have affected this result are the differences in the number and composition of food components included in each score (MedDietScore has 11 components, the MSDPS has 13 components), treatment of the alcohol variable (MedDietScore includes all alcohols, MSDPS includes only wine consumption), and differences in servings sizes. For example, the MedDietScore uses a 120g serving size for most meats and other proteins, while the MSDPS uses 85g serving size for poultry, 57g serving size for cured meats and 143g serving size for red meats.

The MedDietScore results in this study were similar to the mean MedDietScore calculated in previous research in other nearby Mediterranean countries. For example, the mean MedDietScore was 26.3 among adults in Athens (n=3,042), and 25.5 in obese and 27.8 in normal/overweight Italians from Sicily (n=3,090).[13,146] The MedDietScore among older age groups in this study was lower than MedDietScores reported from elderly populations in other countries in the region. Scores of 33.5 to 34.2 in elderly residents of eastern Mediterranean islands (n=1,129, average age of 74) and 34.1 in men and 35.1 in women in a rural elderly Greek population (n=557, age 65 or older) have been reported by others.[114,147] In this study, more education was associated with a higher MedDietScore, and there was a strong negative correlation between age and education level ($r = -0.45$, $p<.0001$) which may help explain this finding.

Since the MedDietScore does not take overconsumption of foods or consumption of non-Mediterranean foods into account, the data was also analyzed using the MSDPS index. The MSDPS in this study was lower than the MedDietScore; it was also lower than the MSDPS from the American Framingham offspring cohort (n=3,021) which was 25.0 (out of 100). [14] This may be due to differences in the FFQ used for the two different

studies. Since the MSDPS has not been used in other studies from the Mediterranean region, other comparisons to the MSDPS were not possible at this time. It is noteworthy that participants in this study reported a zero median intake of fish, wine and potatoes (foods thought to be a beneficial part of the MD pattern), while the Framingham offspring cohort reported median intakes of 2.24 servings/week of fish, 0.05 servings/day of wine and 3.2 servings/week of potatoes and starchy root vegetables. [14] In addition to these specific food groups, overall proportions of MD and non-MD were different between these two studies. Participants in this study reported that 61% of intake came from MD type foods, while in the Framingham offspring cohort, 73% of intake came from MD type foods. Additional research into the source of these differences is warranted.

In this study, MD adherence varied by gender. The standardized MedDietScore was significantly higher among men than women, while this association was reversed for MSDPS. The difference by gender in MedDietScore could be explained by the fact that MedDietScore was not adjusted for energy intake, and men had higher energy intake than women. Previous research supports higher MedDietScores among women. [148] The association between gender and MSDPS is also consistent with the results of the Framingham offspring cohort which showed that participants in the highest quintile for MSDPS score were more likely to be female.[14] The potential influence of higher energy intake among men versus women might have been tapered in calculating MSDPS because the methodology of MSDPS adjusts for overconsumption of foods. Indeed, MSDPS scores in this study leveled out above 3,000 calories/day.

Both MD indices had significant and positive correlations with education levels, which is consistent with previous studies.[112] At the same time, study results may have been affected by the relatively high percentage of participants with less than a high school education which might have contributed to the lower levels of the MD indices overall. Participants with high school or greater education (versus those were illiterate) were 3.3 times more likely to have a high MedDietScore and 5.5 time more likely to have a high MSDPS even after adjusting for age, gender, energy intake, city and BMI. Since the MD pattern has been associated with better health outcomes for cardiovascular disease and other conditions[149-151] that are prevalent in Turkey [83,85,104] future educational interventions promoting the MD geared towards those with lower literacy levels may be warranted.

After controlling for potentially confounding factors of age, gender, energy intake, education and BMI, both MD scores varied by city location. The means of both indices were low in Adiyaman and Muş which are located in the more rural and mountainous eastern part of Turkey. The MD indices were significantly higher in the large modern cities such as Izmir, Istanbul and Ankara even after controlling for age, gender, BMI, education and energy intake. Pekcan and colleagues[48] reported a difference in Turkish food consumption patterns between rural and urban areas between 1974 and 1984, but no recent study has been done to examine this issue. Local food availability and customs, levels of local economic development and personal income levels may also play a role in dietary patterns. Previous research has shown that many foods grown in the Mediterranean region are both grown and consumed in a local area.[29] There is also literature on the relationships between local food environment and dietary intake, but little

has been published about this topic in Turkey.[152] This is another area that merits additional study.

5.1 Limitations

Data was collected primarily during the summer months, which may have affected availability of certain foods in the local food environment. The methodological differences in the two a priori indices may have had an impact on the results. For example, there are differences in the number of food components (11 in the MedDietScore, 13 in the MSDPS), composition of the food components (e.g. eggs are a separate component in the MSDPS, while they are part of the poultry group in the MedDietScore), and the treatment of the olive oil and alcohol variables in the two indices used for this study.

5.2 Summary and Conclusions

This study provides a good understanding and overview of Turkish dietary intake patterns, how closely the Turkish diet adheres to the MD pattern and how these patterns vary by demographic, socioeconomic and anthropometric characteristics. Participants in this study followed a unique dietary pattern which had some characteristics of the MD, but included features that are not considered typical of a standard MD pattern. Five dietary patterns were identified including a Turkish and a Turkish western pattern. After controlling for potentially confounding factors of age, gender, energy intake, education and BMI, both MD adherence indices varied by city location. Since the last comprehensive look at the Turkish dietary intake was completed almost 30 years ago, this study makes a significant contribution to the understanding of

food intake patterns in this national sample of Turkish adults. Results from this study are consistent with previous research from other countries which has found that there are many different MD patterns. Future research should now be undertaken to evaluate associations between the Turkish dietary pattern and factors such as individual and area level socioeconomic status, urban versus rural differences, and local food environment as well as related health outcomes.

Appendix A: Foods Included in the Original Food Frequency Questionnaire

	Food Item	Comments
Dairy	Milk	
	Ayran	Salty yogurt drink
	Cacik	Yogurt and cucumber dip
	Yogurt	
	Cheese	25 varieties in original, full fat feta used for the analyses
Fruits	Fresh fruit juice	
	Commercial fruit juice	
	Citrus	
	Compote	Stewed fruits
	Watermelon	
	Other Fruits	Peaches, plums, apricots, apples, pears, grapes, figs, and miscellaneous
Grains	Bread	
	Rice	
	Pasta	
	Bulgur	
Vegetables	Carrot juice	
	Tomato juice	
	Regional beverage	Turnip juice and other vegetable juices
	Carrots	
	Salad	
	Tomatoes	
	Other vegetables	Potatoes, green beans, zucchini, peas, eggplant, and mixture of the 4 varieties
Legumes	Olives	
	Beans	Garbanzos and similar
	Bean snack	"Leblebi" - roasted garbanzo
	Nuts and seeds	
Soup	Soup	Dairy-based, grain-based, commercial, legume-based, vegetable-based, meat-based
Proteins	Eggs	
	Salami	Salam, sosis - see Appendix D
	Pastrami	Sucuk, pastirma - see Appendix D
	Red meat	Beef and lamb
	Chicken	
	Turkey	
	Fish	

Appendix A: Foods Included in the Original Food Frequency Questionnaire (cont.)

Beverages	Cola	
	Soft drinks	
	Soda	
	Powdered drinks	
	Energy drinks	
	Concentrated drinks	
	Mineral water	
	Water	
	Other coffee	American style coffee
	Turkish coffee	
	Black tea	
	Green tea	
	Herbal tea	
Sweets	Jam and honey	
	Pekmez	Molasses-like fruit syrup
	Flour-based desserts	Baklava and similar
	Milk-based desserts	Puddings and similar
	Ice cream	
Alcohol	Raki	Anise-flavored liquor
	Beer	
	Wine	
	Whiskey	
	Other alcohol	Gin, vodka, etc.
Miscellaneous	Tomato paste	No amounts or frequencies
	Red pepper paste	No amounts or frequencies
	Olive oil	No amounts or frequencies

Appendix B: Serving sizes and calculation of calories per serving

Serving Size Calculations					
	Panagiotakos Reference for MedDietScore	**Serving Sizes Used MedDietScore**	**Calories (kcal) per serving MedDietScore**	**Serving Sizes Used MSDPS (Nurses' Health Study (NHS)/ US Department of Agriculture (USDA)**	**Calories (kcal) per Serving MSDPS**
GRAINS					
Bread[a]	1 slice (25 g based on GDG*)	25 g	66 kcal/25 g whole wheat 63 kcal/25 g	1 slice = 25 g	66 kcal/25 g whole wheat 63 kcal/25 g
Rice[b]	1/2 cup	28.5 g uncooked = 1/2 cup cooked = 1 oz. uncooked	178 kcal/28.5 g	1 cup cooked = 158g cooked = 57g uncooked	356 kcal/57g uncooked
Pasta [c]	1/2 cup	28.5 g uncooked = 1/2 cup cooked = 1 oz. uncooked	188 kcal/28.5 g	1 cup cooked = 140g cooked = 57g uncooked	377 kcal/57 g uncooked
Bulgur[d]	1/2 cup	28.5 g uncooked = 1/2 cup cooked = 1 oz. uncooked	207 kcal/28.5 g	1 cup cooked = 182g cooked = 57 g	413 kcal/57 g uncooked
FRUITS					
Apple[e]	80 g	80 g	42 kcal/80g	1 small = 149 g	77 kcal/149 g

Appendix B: Serving sizes and calculation of calories per serving (cont.)					
Serving Size calculations					
	Panagiotakos Reference for MedDietScore	**Serving Sizes Used MedDietScore**	**Calories per serving MedDietScore**	**Serving Sizes Used MSDPS (NHS/ USDA)**	**Calories per Serving MSDPS**
FRUITS (cont.)					
Banana[f]	60 g	60 g.	53 kcal/60 g (USDA)	1 small = 101 g	90 kcal/101 g
Orange[g]	100 g (citrus)	100 g	49 kcal/100 g	1 = 121 g	59 kcal/121 g
Apricots[h]	2 small	70 g	34 kcal/70 g	1 = 35 g	17 kcal/35 g
Peach[i]	1 medium	150 g	58 kcal/150 g	1 = 150 g	58 kcal/150 g
Strawberry[j]	1 1/4 c	76 g	24 kcal/76 g	1/2 cup =76 g	24 kcal/76 g
Cherries[k]	12	98.4 g	62 kcal/98.4 g	1/2 cup = 77 g	49 kcal/77g
Grapes[l]	17 small	40.8 g	27 kcal/40.8g (USDA)	1/2 cup = 46 g	31 kcal/46 g
Watermelon[m]	200 g	200 g	60 kcal/200g	1 cup = 152 g	46 kcal/152g
Fresh fruit juice[n]	Ranges from 1/4 to 2/3 cup.	120 ml, USDA = 120 ml	54 kcal/120 ml	120 ml	54 kcal/120 ml
Commercial fruit juice[o]	Same as fresh fruit juice	120ml	56 kcal/120 ml	120 ml	56 kcal/120 ml
Compote[p]	1/2 cup	135 g	152 kcal/135 g	135 g	152 kcal/135 g
Plum[q]	n/a	1 fruit = 66 g	30 kcal/66 g	1 fruit = 66 g	30 kcal/66 g

Appendix B: Serving sizes and calculation of calories per serving (cont.)					
Serving Size Calculations					
	Panagiotakos Reference for MedDietScore	**Serving Sizes Used MedDietScore**	**Calories per serving MedDietScore**	**Serving Sizes Used MSDPS (NHS/ USDA)**	**Calories per Serving MSDPS**
FRUITS (cont.)					
Pear[r]	n/a	178g	101 kcal/178g	1 fruit = 178g	101 kcal/178g
Figs[s]	n/a	50g	37 kcal/50 g	1 fruits =50g	37 kcal/50 g
Miscellaneous fruit[t]	average of 6 fruits	77.5 g	48 kcal/77.5	81 g	52 kcal/81 g
Pomegranate[u]	Pomegranate	87g	72 kcal/87g	87g	72 kcal/87g
Sour Cherry[v]	sour cherry	51.5g	26 kcal/51.5g	51.5g	26 kcal/51.5g
Quince[w]	Quince	92 g	52 kcal/92 g	1 fruits = 92 g	52 kcal/92 g
VEGETABLES					
Vegetables[x]	1 cup of raw leafy vegetables	47 g	8 kcal/47 g	1 cup =47 g	8 kcal/47 g
Other Vegetables[y]	1/2 cup (about 100 g) of other vegetables	72g	24 kcal/72 g	72g	24 kcal/72 g
Potatoes[z]	1/ 2 cup boiled/mashed	105 g (GDG =100g)	156 kcal/105g	1 cup = 210 g	313 kcal/210 g
Carrot juice[aa]		1/2 cup=120ml	56 kcal/120 ml	1/2 cup=120ml	56 kcal/120 ml

Appendix B: Serving sizes and calculation of calories per serving (cont.)					
Serving Size Calculations					
	Panagiotakos (Reference for MedDietScore)	**Serving Sizes Used MedDietScore**	**Calories per serving MedDietScore**	**Serving Sizes Used MSDPS (NHS/ USDA)**	**Calories per Serving MSDPS**
VEGETABLES (cont.)					
Tomato juice[bb]		1/2 cup=120ml	25 kcal/120ml	1/2 cup=120ml	25 kcal/120ml
Regional beverages[cc]		1/2 cup=120ml	66 kcal/120 ml	1/2 cup=120ml	66 kcal/120 ml
Carrots[dd]	1/2 cup	64g	28 kcal/64 g	1/2 cup = 64g	28 kcal/64 g
Salad[ee]	1 cup	47 g	69 kcal/47 g	1 cup = 47 g	69 kcal/47 g
Tomato[ff]	½ cup	90g	19 kcal/90 g	2 slices = 40g	8 kcal/40 g
PROTEINS					
Poultry[gg]	120 g of cooked poultry	120g	342 kcal/120 g chicken ;227 kcal/120g turkey	3 oz. =85 g	235kcal/85g; 161 kcal/85 g turkey
Fish[hh]	120 g cooked fish	120 g	146 kcal/120 g	4 oz. = 114 g	139 kcal/114g
Red meat[ii]	120 g of cooked meat	120 g	295kcal/120g	5 oz. =143 g	351 kcal/143g

Appendix B: Serving sizes and calculation of calories per serving (cont.)					
Serving Size Calculations					
	Panagiotakos Reference for MedDietScore	**Serving Sizes Used MedDietScore**	**Calories per serving MedDietScore**	**Serving Sizes Used MSDPS (NHS/ USDA)**	**Calories per Serving MSDPS**
PROTEINS (cont.)					
Salami[jj]		120 g	455 kcal/120g	2 oz. = 57 g	216 kcal/57g
Pastrami[jj]		120 g	420 kcal/120g	2 oz. = 57g	200 kcal/57g
Eggs[kk]	n/a	large egg/61 g	91 kcal/61 g	1 egg = 61 g	88 kcal/61 g
LEGUMES					
Beans[ll]	1 cup, cooked	68g uncooked	248 kcal/68 g uncooked	1/2 cup cooked = 34.2g uncooked	125 kcal/34.2g uncooked
Bean snack (Leblebi)[mm]	1 cup	68g uncooked	248 kcal/68 g uncoooked	1/2 cup cooked = 34.2g uncooked	124 kcal/34.2g uncooked
Olives[nn]	n/a	15g (NLEA)	22 kcal/15 g	15g	22 kcal/15 g
Nuts and seeds[oo]	1 nut or 1/2 large nut	14 g	90 kcal/14 g	1 oz. = 28.5g	183 kcal/28.5 g
DAIRY					
Dairy – full fat milk[pp]	1 cup milk	244 ml	149 kcal/244 g	244 ml	149 kcal/244 g
Yogurt[qq]	1 cup yogurt (180 g)	245 g or 245 ml	164 kcal/245g	5 oz. = 153 g	103 kcal/153 g

Appendix B: Serving sizes and calculation of calories per serving (cont.)					
Serving Size Calculations					
	Panagiotakos Reference for MedDietScore	**Serving Sizes Used MedDietScore**	**Calories per serving MedDietScore**	**Serving Sizes Used MSDPS (NHS/ USDA)**	**Calories per Serving MSDPS**
DAIRY					
Cheese[rr]	30 g cheese	30 g	80 kcal/30 g	1 oz. = 28.5g	76 kcal/28.5g
Milk based desserts[ss]	n/a	120ml	168 kcal/120ml	1 cup	336 kcal/240ml
Ayran[tt]	1 cup - see milk	240ml	106 kcal/240 ml	1 cup	106 kcal/240 ml
Cacik[uu]	180 g - see yogurt	245 ml	135 kcal/245 ml	5 oz. = 150ml	83 kcal/150ml
Ice cream[vv]	n/a	66g	119 kcal/66 g	1/2 cup = 66g	119 kcal/66g
Soup[ww]	n/a	240 ml			
Legume-based soup[xx]		240 ml	221 kcal/240 ml	240 ml	221 kcal/240 ml
Vegetable-based soup[xx]		240 ml	114 kcal/240ml	240 ml	114 kcal/240ml

Appendix B: Serving sizes and calculation of calories per serving (cont.)					
Serving Size Calculations					
	Panagiotakos Reference for MedDietScore	**Serving Sizes Used MedDietScore**	**Calories per serving MedDietScore**	**Serving Sizes Used MSDPS (NHS/ USDA)**	**Calories per Serving MSDPS**
SOUP (cont.)					
Meat-based soup[xx]		240 ml	144 kcal/240ml	240 ml	144 kcal/240ml
Dairy-based soup[xx]		240 ml	144 kcal/240ml	240 ml	144 kcal/240ml
Grain-based soup[xx]		240 ml	144 kcal/240ml	240 ml	144 kcal/240ml
Commercial soup[yy]		240 ml	144 kcal/240ml	240 ml	144 kcal/240ml
BEVERAGES					
Other coffee[zz]	n/a	240ml	2 kcal/240 ml	240ml	2 kcal/240 ml
Turkish coffee[aaa]	n/a	100ml	1 kcal/100 ml	100ml	1 kcal/100 ml
Black/Green/ Herbal tea [bbb]	n/a	100ml	1 kcal/100 ml	240ml	2 kcal/240ml
Black/Green/ Herbal tea with sugar[ccc]	n/a	100ml	16 kcal/4.2g	240ml	16 kcal/4.2g
Cola[ddd]	n/a	240ml	101 kcal/240 ml	1 can = 12 oz.	152 kcal/12 oz.
Soft drink/soda[eee]	n/a	240ml	84 kcal/240 ml	1 can = 12 oz.	124 kcal/12 oz

Appendix B: Serving sizes and calculation of calories per serving (cont.)					
Serving Size Calculations					
	Panagiotakos (Reference for MedDietScore)	**Serving Sizes Used MedDietScore**	**Calories per serving MedDietScore**	**Serving Sizes Used MSDPS (NHS/ USDA)**	**Calories per Serving MSDPS**
BEVERAGES(cont.)					
Powder drink /energy drink /concentrated drink [fff]	n/a	240ml	35 kcal/240 ml powder/ 105 kcal/252ml energy; 114 kcal/240ml conc.	240 ml	35 kcal/240ml powder;105 kcal/252 ml energy/ 114 kcal/240ml conc.
Mineral water	n/a	240ml	0 kcal	240ml	0 kcal
Water		240ml	0 kcal	240ml	0 kcal
Other coffee with sugar[ggg]			16 kcal/4.2g		16 kcal/4.2g
Turkish coffee with sugar[hhh]			16 kcal/4.2g		16 kcal/4.2g
ALCOHOL					
Beer[iii]	TDG* = 375 ml	Serving sizes not used	160 kcal/375ml (TDG)	1 can = 12 oz. = 356 g	153 kcal/can
Wine[jjj]	100 ml glass of wine	100 ml per Panagiotakos	85 kcal/100ml	5 oz. = 148 g	123 kcal/148 g

Appendix B: Serving sizes and calculation of calories per serving (cont.)					
Serving Size Calculations					
	Panagiotakos (Reference for MedDietScore)	**Serving Sizes Used MedDietScore**	**Calories per serving MedDietScore**	**Serving Sizes Used MSDPS (NHS/ USDA)**	**Calories per serving MSDPS**
ALCOHOL (cont.)					
Raki[kkk]	TDG = 30 ml	Serving sizes not used	95 kcal/30 ml (TDG)		
Whiskey[lll]	TDG = 35 ml	Serving sizes not used	87 kcal/35 ml (TDG)		
Other alcohol[lll]	TDG = 45 ml	Serving sizes not used	113 kcal/45 ml (TDG)		
SWEETS					
Flour-based desserts[mmm]	n/a	38g	155 kcal/38 g	38g	155 kcal/38 g
Jam & honey[nnn]	n/a	1 Tbsp = 20.5 g	62 kcal/20.5 g	1 Tbsp = 20.5 g	63 kcal/20.5 g
Pekmez[ooo]	n/a	1 Tbsp = 21g	62 kcal/21 g	1 Tbsp = 21g	63 kcal/21 g
Sugar[ppp]		1 tsp = 4.2g	16 kcal/4.2g	1 tsp = 4.2g	16 kcal/4.2g

*GDG: Greek Dietary Guidelines[136] TDG: Turkish Dietary Guidelines[125]

[a] MedDietScore serving size. [153] 1 slice = 28 g or 25 g (depending on the type of bread) in USDA food composition database. Greek dietary guidelines 1 slice = 25 g. [138,154,155]

[b] MedDietScore serving size. [153] 1/2 cup cooked = 1 oz. dry and 1 serving [139] 1 oz. dry = 28.53 g dry. (Thomas, personal communication, July 24, 2013). MSDPS 1 cup cooked = 1 serving. [143] Calories based on USDA for rice plus 15 g added fat per rice pilaf dishes in Turkish recipes. [141,142,156]

[c] MedDietScore serving size. [153] 1/2 cup cooked or 1 oz. dry is one serving [139]. 1 oz. Uncooked = 28.5g uncooked. MSDPS 1 cup cooked = 1 serving. [143] Calories based on USDA for macaroni plus 25 g added fat per Turkish recipes. [141,142,157]

[d] MedDietScore serving size. [153] 1/2 cup cooked = 91 g = 1 oz. dry. [139] 1 oz. = 28.53 g [158] MSDPS 1 cup cooked = 1 serving. [143] Calories based on bulgur dishes in Turkish recipes. [141,142]

[e] MedDietScore serving size. [153] Medium apple is 182 g. Small apple is 149g. Extra Small apple (2 ½") is 101g. [159]

[f] MedDietScore serving size. [153] Extra small banana <6" is 81g. Small banana is 101g. [160]

[g] MedDietScore serving size. [153] 121 g for fruit 2 5/8" in diameter, Valencia oranges from California (Florida oranges are larger). [161]

[h] MedDietScore serving size. [153] Each apricot is 35g, 2 small apricots = 70 g. [162]

[i] MedDietScore serving size. [153] Medium peach is150 g. [163]

[j] MedDietScore serving size. [153] 1/2 cup = 1 serving [139] Servings size for NHS is ½ cup for strawberries = 76 g.[164]

[k] MedDietScore serving size. [153] 1 cherry = 8.2 g, 12 cherries = 98.4 g. [165] MSDPS serving size of 1/2 cup for strawberries and blueberries, no servings size for cherries listed. [143]

[l]MedDietScore serving size. [153] American style grapes are 2.4g, 17 grapes = 40.8g.[166] Thompson European style grapes are 4.9 g, 17 grapes = 83.3g. [167] GDG shows serving as 30 g, used American style grapes at 40.8g

[m] MedDietScore serving size = 200g. [153] 1 cup diced = 152 g. [168]

[n] MedDietScore serving size. [153] Serving size is ½ cup, close to Panagiotakos serving size. [139] [169] MSDPS serving size 120 ml, NHS says "small glass".[143]

[o] MedDietScore serving size. [153] Serving size is ½ cup, close to Panagiotakos serving size.. [139] [170] MSDPS serving size 120 ml, NHS says "small glass".[143]

[p]1/2 cup is one serving.[139]1/2 cup of cooked stewed apricots = 135 g. [171]

[q] 1 fruit = 66 g. [172]

[r] 1 medium = 178 g. [173]

[s] 1 medium = 50 g. [174]

[t] Average of fruits listed in variable (banana, pomegranate, cherry, strawberry, quince, sour cherry). [160,164,165,175-178]

[u] ½ cup seeds and juice = 87 g. [175]

[v]1/2 cup = 51.5 g. [176]

[w] 1 fruit = 92g. [178]

[x] MedDietScore serving size. [153] 1 cup = 47 g (lettuce). [179]

[y] MedDietScore serving size. [153] Different vegetables have different cooked weights, thus serving size and calories used based on averaged values of 4 vegetables (includes one mixed dish) from Turkish recipes. Cooked green

peppers, ½ cup = 67.5 g. [180] cooked peas 1/2 cup=0 g. [181,182] eggplant ½ cup cooked = 49.5 g. [183] Zucchini ½ cup cooked = 90 g.. [141,142,184]

[z]MedDietScore serving size. [153] 1 cup = 210 g, which equals 105 g for 1/2 cup. Added 4 g fat per Turkish recipes.[141,142,185] MSDPS 1 cup = 210 g = 1 serving. [143]

[aa]1/2 cup is one serving. [139] [186]

[bb]½ cup = 1 serving. [187]

[cc]½ cup = 1 serving. [141,188] [142,189]

[dd]MedDietScore serving size. [153] 1/2 cup chopped, raw = 64 g. [190]

[ee]MedDietScore serving size. [153] 1 cup = 47 g (lettuce) plus 1 Tbsp. olive oil. [179,191]

[ff]MedDietScore serving size. [153] ½ cup = 90 grams. [192]

[gg]MedDietScore uses 120 g for protein servings. (Panagiotakos, personal communication, 12/5/2012). USDA common portions are 3 oz. for most proteins. [193-195]

[hh]MedDietScore uses 120 g for protein servings. [153] USDA common portions are 3 oz. for most proteins. [193,196]

[ii]MedDietScore uses 120 g for protein servings. (Panagiotakos, personal communication, 12/5/2012). USDA common portions are 3 oz. for most proteins. [193] MSDPS 4-6 oz. serving for meat as main dish.[143] For calories used ½ beef and ½ ground lamb. [197,198]

[jj]MedDietScore uses 120 g for protein servings. (Panagiotakos, personal communication, 12/5/2012). USDA common portions are 3 oz. for most proteins. [193] See appendix D.

[kk]1 large egg = 61 g, 1 egg = 1 oz. serving. [199]

[ll]MedDietScore serving size. [153] 1 cup of garbanzo beans cooked = 164 g. Conversion factor of 2.4 used to convert to uncooked.[200,201] MSDPS serving is ½ cup cooked = 34.2g uncooked. [143]

[mm] Serving sizes based on MedDietScore and MDSPS.[143,153] Calories adapted from Coskuner.[202]
[nn] Olives serving size is 15 g per Code of Federal Regulations, Title 21 (only source). [177] [203]
[oo] MedDietScore serving size. [153] 1/2 ounce is serving size. [139] 1/2 ounce = 14 g. Used combination of pistachios, sunflower seeds, sesame seeds, walnuts and almonds based on Turkish snack sector report.[49,204-208]
[pp] MedDietScore serving size. [153] 1 oz. is 30.5 ml so 1 cup would be 244 ml.[209]
[qq] MedDietScore serving size. [153] 1 cup regular whole milk yogurt =245 g. [210] Fat calories based on full fat yogurt from Turkish recipes. [141,142] Protein and carbohydrate calories from USDA. [210]
[rr] MedDietScore serving size. [153] 1 oz. feta = 28.35 g. Calories based on full fat feta cheese. [211]
[ss] Pudding serving is 4 oz. = ½ cup=120 ml. Used Turkish recipes for calories. [141,142]
Servings size for MSDPS based on frozen yogurt, sherbet, ice cream servings size all 1 cup in NHS.[143]
[tt] Used 50/50 (yogurt/water) ratio for ayran. Based on 1 cup = 240 ml, 240*.5=120ml (N. Fitzgerald, Rutgers University, personal communication, July 15, 2013).Fat calories based on full fat yogurt from Turkish recipes. [141,142] Protein and carbohydrate calories from USDA. [210]
[uu] 56 g full fat yogurt per 100ml. Based on 1 cup = 245ml, .56*245ml = 138ml. Fat calories based on full fat yogurt from Turkish recipes. [141,142] Protein and carbohydrate calories from USDA. [210]
[vv]1/2 cup = 66 g. [212] Calories from Turkish recipe. [141,142].
[ww] Serving size is 1 cup. [177] (no other source)

[xx] Used values from Turkish recipes. [141,142]

[yy] Used grain soup value for commercial soup after consulting Knorr website (a common brand sold in Turkey). 8 people in database reported consumption, no info on recipes available in Turkish recipe. Knorr mushroom soup 1st ingredient is potato starch, CHO 64g/100ml and 390kcal/100 m[213] Knorr minestrone soup 1st ingredients Maltodextrin,Starch (potato, pea), 68 g CHO/100ml and 340 kcal/100 ml [214] Grain soup values from Turkish recipes. [141,142]

[zz] Used regular coffee from USDA database. [215]

[aaa] Serving size of 100 ml based on general knowledge of Turkish and American dietary customs. MSDPS serving size 100 ml.[143,215]

[bbb] Serving size of 100 ml based on general knowledge of Turkish and American dietary customs. MSDPS serving size 240 ml.[143,216,217]

[ccc] Tea with sugar counted based on sugar content. 1 teaspoon sugar = 4.2g.[218]

[ddd] Used 1 cup serving size for MedDietScore and 1 can serving size for MSDPS. [219]

[eee] Used 1 cup serving size for MedDietScore and 1 can serving size for MSDPS. [219] [fff] Used lemonade for powder drink, energy drink and fruit punch for drink from concentrate. [220-222]

[ggg] Coffee with sugar counted based on sugar content.1 teaspoon sugar = 4.2g. [218]

[hhh] Turkish coffee with sugar counted based on sugar content. 1 teaspoon sugar = 4.2 g. [218]

[iii] Serving sizes not used in the indices, Turkish dietary guidelines information on serving sizes used for reference.[125] To calculate calories, USDA values used. [223]

[jjj] Standard US serving is 5 oz. which is 148 g.[224]

[kkk] Raki is an anise-flavored alcohol common in Turkey. [141 142]

[lll] Serving sizes not used in the indices, Turkish dietary guidelines information on serving sizes included for reference. To calculate calories, USDA values used. [225]

[mmm] One piece of cake is 1/12 of oz. cake (sponge cake) which is 38 g. [226] Calories based on Turkish recipes. [141,142]

[nnn] Serving size is 1 Tablespoon per Code of Federal Regulations, Title 21 (only source). [177] Jams "do not count" towards fruits/vegetables due to high sugar content. [227] 1 Tbsp. of honey = 21 g. 1 Tbsp of jam = 20 g. Used jam and honey for calories. [228,229]

[ooo] Pekmez is a food unique to Turkey, a "molasses-like" fruit syrup. Values for jam and honey were used. 1 Tbsp. of honey = 21 g. [228]

[ppp] See coffee, Turkish coffee, black tea, green tea, herb tea with sugar.

Appendix C - Foods Originally Reported by Turkish Adults

	n		n	Percent
Milk	2986	Yes	1391	46.6
		No	1595	53.4
Ayran	2994	Yes	2649	88.3
		No	345	11.5
Cacik	2994	Yes	2430	81.0
		No	564	18.8
Yogurt	2982	Yes	2618	87.2
		No	364	12.1
Cheese	2967	Yes	2797	93.2
		No	170	5.7
Dairy-based soup	2986	Yes	888	29.6
		No	2098	69.9
Fresh fruit juice	2987	Yes	290	9.7
		No	2697	90.3
Commercial fruit juice	2987	Yes	1292	43.1
		No	1695	56.5
Citrus	2959	Yes	146	4.9
		No	2813	93.7
Compote	2986	Yes	1183	39.4
		No	1803	60.1
Watermelon	2958	Yes	2875	95.8
		No	83	2.8
Miscellaneous fruit	2955	Yes	78	2.6
		No	2877	95.9
Bread	2964	Yes	2927	97.5
		No	37	1.2
Rice	2964	Yes	2789	92.9
		No	175	5.8
Pasta	2963	Yes	2682	89.4
		No	281	9.4
Bulgur	2953	Yes	2399	79.9
		No	554	18.5
Grain-based soup	2986	Yes	335	11.2
		No	2651	88.3
Commercial soup	2986	Yes	6	0.2
		No	2980	99.3
Carrot juice	2987	Yes	41	1.4
		No	2946	98.2
Tomato juice	2987	Yes	45	1.5
		No	2942	98.0
Regional beverages	2983	Yes	94	3.2
		No	2889	96.8

Appendix C - Foods Originally Reported by Turkish Adults (cont.)

	n		n	Percent
Carrots	2964	Yes	275	9.2
		No	2689	89.6
Salad	2960	Yes	2738	91.2
		No	222	7.4
Tomato	2962	Yes	2817	93.9
		No	145	4.8
Potato	2960	Yes	890	29.7
		No	2070	69.0
Non-potato vegetables	2960	Yes	1921	64.0
		No	1039	34.6
Vegetable-based soup	2986	Yes	210	7.0
		No	2776	92.5
Olives	2963	Yes	2587	86.2
		No	376	12.5
Beans/legumes	2968	Yes	2311	77.0
		No	657	21.9
Beans snack (Leblebi)	2962	Yes	433	14.4
		No	2529	84.3
Nutseeds	2965	Yes	1785	59.5
		No	1180	39.3
Legume-based soup	2986	Yes	1163	38.8
		No	1823	61.1
Eggs	2965	Yes	2430	81.0
		No	535	17.8
Salami	2965	Yes	641	21.4
		No	2324	77.4
Pastrami	2965	Yes	978	32.6
		No	1987	66.2
Red meat	2967	Yes	2195	73.1
		No	772	25.7
Chicken	2967	Yes	2697	73.1
		No	270	25.7
Turkey	2966	Yes	150	5.0
		No	2816	93.8
Fish	2966	Yes	973	32.4
		No	1993	66.4
Meat-based soup	2986	Yes	11	0.4
		No	2975	99.1
Other coffee	2986	Yes	1079	36.0
		No	1970	63.5
Turkish coffee	2986	Yes	1532	51.0
		No	1454	48.5
Black tea	2991	Yes	2887	96.2
		No	104	3.5

	n		n	Percent
Green tea	2990	Yes	33	1.1
		No	2957	98.5
Herbal tea	2990	Yes	474	15.8
		No	2516	84.1
Cola	2986	Yes	2046	68.2
		No	940	31.3
Soft drink	2987	Yes	1390	46.3
		No	1597	53.2
Soda	2987	Yes	853	28.4
		No	2134	71.1
Powder drink	2987	Yes	1213	40.4
		No	1774	59.4
Energy drink	2987	Yes	26	0.9
		No	2961	98.7
Concentrated drink	2987	Yes	52	1.7
		No	2935	97.8
Mineral water	2987	Yes	1100	36.7
		No	1887	62.9
Water	2993	Yes	2960	98.6
		No	33	1.1
Jam & honey	2961	Yes	1691	56.3
		No	1270	42.3
Pekmez	2960	Yes	399	13.3
		No	2561	85.3
Flour-based desserts	2958	Yes	1260	42.0
		No	1698	56.6
Milk-based desserts	2968	Yes	1630	54.3
		No	1338	44.6
Ice cream	2829	Yes	1815	64.2
		No	1014	35.8
Black tea with sugar	2909	Yes	2473	82.4
		No	332	11.1
Green tea with sugar	2990	Yes	19	0.6
		No	14	0.5
Herbal tea with sugar	2942	Yes	325	10.8
		No	101	3.4
Other coffee with sugar	2969	Yes	880	29.3
		No	182	6.1
Turkish coffee with sugar	1454	Yes	1431	47.7
		No	73	2.4
Raki	2986	Yes	200	6.7
		No	2786	92.8
Beer	2986	Yes	331	11.0
		No	2655	88.9

Appendix C - Foods Originally Reported by Turkish Adults (cont.)

	n		n	Percent
Wine	2986	Yes	72	2.4
		No	2914	97.1
Whiskey	2986	Yes	53	1.8
		No	2933	97.7
Other alcohol	2986	Yes	22	0.7
		No	2964	98.8

Appendix D – Calorie calculations for pastrami and salami.

Original FFQ contained two questions about pastrami and salami. Based on a Turkish website (http://www.turkas.net/turkas.saglikli.beslenme.besin.degerleri.asp), the following calories were calculated for servings sizes noted:

salami	379 calories per 100 g	455 kcal/120g	average of salam and sosis
pastrami	350 calories per 100 g	420 kcal/120g	average of pastirma and sucuk

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162. US Department of Agriculture and U.S. Department of Health and Human Services. Basic Report: 09021, Apricots, raw. *National Nutrient Database for Standard Reference Release 26* 2014; http://ndb.nal.usda.gov/ndb/foods/show/2218. Accessed March, 2014.
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165. US Department of Agriculture and U.S. Department of Health and Human Services. Basic Report: 09070, Cherries, sweet, raw. *National Nutrient Database for Standard Reference Release 26* 2014; http://ndb.nal.usda.gov/ndb/foods/show/2261. Accessed March, 2014.
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173. US Department of Agriculture and U.S. Department of Health and Human Services. Basic Report: 09252, Pears, raw. *National Nutrient Database for Standard Reference Release 26* 2014; http://ndb.nal.usda.gov/ndb/foods/show/2401?fg=&man=&lfacet=&format=&count=&max=25&offset=&sort=&qlookup=pear. Accessed March, 2014.
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water. *National Nutrient Database for Standardized Reference Releast 26* 2014; http://ndb.nal.usda.gov/ndb/foods/show/4290. Accessed March, 2014.

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