1 **AT: Original Article**

2 **RH:** MEDITERRANEAN DIET ADHERENCE 1960-2011

3 **Worldwide adherence to Mediterreanean Diet between 1960 and 2011**

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21 **Abstract**

22 **Background:** From the 1960s to the early 21st-century adherence to the Mediterranean diet

23 (MD) declined around the world. This was partly due to the westernization of eating habits.

24 However, in the last decade a new variable came into play, the economic crisis, which may

25 have affected dietary patterns.

26 **Objective:** We analyzed worldwide trends of adherence to the MD between the periods 1961-

27 1965, 2000-2003 and 2004-2011.

28 **Methods:** Data was obtained from the Food and Agriculture Organization Food Balance Sheets

29 in three study periods: 1961-1965, 2000-2003 and 2004-2011. The Mediterranean Adequacy

30 Index (MAI) was calculated for 41 selected countries using the averages of available energy

31 intake for different food groups. Changes in MAI indicated the trends in adherence in the

32 different periods.

33 Results: In many countries, MAI deteriorated from 1961 to 1965 and 2004 to 2011, yet an

34 increase was observed in 16 countries. Between the last two observation periods, MAI values

35 stabilized in 16 of the 41 selected countries. Regional rankings for the three study periods based

36 on descending MAI scores were: Southern Mediterranean, Mediterranean Europe, Central

37 Europe and Northern Europe.

38 **Discussion and Conclusions:** Adherence to the MD significantly decreased between 1961-65

39 and 2000-03, whereas from 2004-2011 there was a stabilization of MAI values and even an

40 increase among 16 countries. Efforts are needed to preserve the dietary traditions and lifestyle

41 habits within the Mediterranean region in order to counteract increasing rates of chronic

42 disease..

43 **Key words:** Mediterranean Diet, Mediterranean Adequacy Index, Food Balance Sheets,

44 Westernization, Dietary patterns, Economic crisis; Mediterranean Diet adherence

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46   Abbreviations used: Mediterranean Diet (MD, Mediterranean Adequacy Index (MAI), Food balance sheets

47   (FBS), Food and Agriculture Organization (FAO), World Health Organization(WHO), Gross National Product

48   (GNP).

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50

51   **Introduction**

52   The Mediterranean Diet (MD) is widely considered the overall dietary pattern of the Mediterranean

53   basin, which spans from Southern Europe, to Northeast Africa (1,2).

54   The abundance and variety of traditionally healthy foods in the Mediterranean region may be partly

55   attributed to the strategic location along the north 40th parallel, which passes through the

56   Mediterranean Sea, Asia, Japan, North America and the Iberian Peninsula. The temperate climate

57   conditions paired with a dry season are characteristics of the Mediterranean region. Culinary

58   traditions and foods (such as the cultivation of the triad wheat, grapes and olives) of the countries

59   along the northern and southern 40th parallel overlap with those inherent to the Mediterranean

60   region. For example, the vast olive groves of California; the fine wines of Chile, Argentina, South

61   Africa and Australia; and the oranges of China all emulate aspects of the Mediterranean dietary

62   pattern.

63   The overall MD vastly described elsewhere is primarily a plant-based diet with several common

64   features (3-5): moderate consumption of dairy products, fish, eggs, white meat and wine;

65   occasional consumption of red and processed meat, and sweets; and use of olive oil as the principle

66   fat source.

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68   The traditional MD, defined in the 1960s, has evolved over time due to social and cultural factors

69   (4). Recent Spanish and Italian studies have shown how economic factors, such as the global

70   financial crisis may have played a role in altering dietary habits (6,7). Epidemiological data suggest

71   that higher quality diets are associated with higher costs (8-10). Thus, it should be determined

72 whether the degree of adherence to the MD has changed due to the economic recession, and

73 whether it is necessary to develop measures to safeguard the traditional dietary habits.

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75 The modern MD pyramid (5) which promotes a return to the traditional diet, incorporates various

76 food components and other elements related to the lifestyle behaviors and cultural traditions. The

77 MD pattern is widely recognized as a healthy, prudent diet, and high adherence to the diet has been

78 associated with improved health and reduced risk of chronic disease (11-13). Preserving the

79 traditional dietary heritage of the Mediterranean basin has been cited as an effective, sustainable

80 and economically viable method for promoting health (14). Many food indexes and scores have

81 been developed to assess adherence to healthy dietary patterns (15). The Mediterranean Adequacy

82 Index (MAI) is one such index, and it has been used to study the adherence of a country or a

83 population to the MD (16-20).

84 The present study was performed within the framework of the "Paralelo 40-World Mediterranean

85 Diet Surveillance System" with the aim of evaluating adherence to the MD in 41 selected countries

86 using the MAI score, and to assess worldwide trends over the last 50 years, including the 3 years

87 immediately following the 2008 economic crisis.

88

89 **Methods**

90 *Study population*

91 The data were obtained from annual food balance sheets (FBS) from the FAOSTAT database (21),

92 which provides information about each food item available for global human consumption. The

93 total food available for human consumption per country is based on the total quantity of foodstuffs

94 produced and imported minus exported food items or those used for non-human use or lost during

95   storage or transportation. The annual kcal/capita/day was used to assess the overall pattern of each

96   nation´s food supply and to compare that pattern over time and among countries (17, 22).

97   In the present study, 169 countries were included in the calculation of a worldwide MAI score.

98   MAI scores were calculated for 41 selected countries and these countries were further divided into

99   Mediterranean and Non-Mediterranean categories. The Mediterranean category was divided into 2

100   subcategories: Mediterranean Europe (Albania, Cyprus, France, Greece, Italy, Malta, Portugal,

101   Spain, and Turkey) and Southern Mediterranean (Algeria, Egypt, Israel, Lebanon, Libyan Arab

102   Jamahiriya, Morocco, Syria, and Tunisia). The Non-Mediterranean regions were further divided

103   into Central Europe (Austria, Bulgaria, Czechoslovakia, Germany, Hungary, Poland, Romania, and

104   Switzerland), Northern Europe (Denmark, Finland, Ireland, Norway, Sweden, and the United

105   Kingdom) and Other World (Argentina, Australia, Brazil, Canada, Chile, Islamic Republic of Iran,

106   Japan, Mauritania, South Africa, and the United States). Geographical, cultural and socio-economic

107   factors were considered when classifying countries (17). Czechoslovakia underwent political

108   changes between the study periods and was therefore divided into the Czech Republic and Slovakia.

109   The data for the last two periods were calculated using the sum of these two countries and are

110   referred to as Czechoslovakia in this paper (22).

111   *Dietary assessment*

112   The mean energy estimates were calculated for each time period and were derived from the

113   calories/capita/day values per year and per country as reflected in the FAO Food Balance Sheets.

114   The average energy intake was calculated for the most recent study period of 2004-2011 and then

115   compared with the data obtained in the previous periods (1961-1965 and 2000-2003). The

116   calculation was done according to da Silva *et al* (20). Adherence to the MD was assessed using the

117   MAI tool defined by Alberti-Fidanza *et al.* (23) adapting the classification of the Mediterranean

118   and Non-Mediterranean products. The MAI is calculated by dividing the energy intake provided

119   by the total sum of the Mediterranean food groups by the energy provided by the Non-

120   Mediterranean food groups (18, 24, 25). Since each time period spans a number of years, the

121   country MAI scores for each period were calculated as the mean of the yearly MAI scores for that

122   country within the time period assessed. For each subcategory a mean MAI value was derived from

123   the mean MAI scores per country within that subcategory. A higher MAI value indicates a greater

124   adherence to the MD.

125   The Mediterranean food group included the following food items: olive oil, olives, cereals

126   (excluding beer), starchy roots, herbs, spices, fruit, vegetables, nuts, fish, seafood, legumes, and

127   wine. The Non-Mediterranean food group included: sugar, sweeteners, alcoholic beverages (except

128   wine and beer), meat, beer, sugar crops, oil crops, offal, stimulants (coffee, cocoa beans, tea),

129   animal fat, other sources of fat (excluding olive oil), and miscellaneous products. Eggs and dairy

130   products were excluded from evaluation since they are considered elements common to all dietary

131   patterns, and data on the different dairies was not available. Only primary foods such as milk were

132   included in the FBS.

133   ***Statistical methods***

134   For the statistical analysis, an F-test was applied to first evaluate whether the variance of the

135   populations was equal. Following the F-test, a Student´s t-test for independent samples, assuming

136   equal or unequal variances depending on the result of F-test, was used to verify the differences

137   between the mean MAI scores among subcategories in the corresponding time periods. For paired

138   samples, the Student´s t-test was used to compare the mean MAI value of each category between

139   time periods. Significance was set at 0.05.

140   **Results**

141   The MAI scores of 169 countries were calculated by comparing the proportion of calories per capita

142   between the Mediterranean and Non-Mediterranean food groups (Figure 1). Forty-one of these

143   countries were further divided, based on region, for subcategory analysis.

144 *Comparison between subcategories*

145 The worldwide MAI value of the 169 countries decreased from 2.86 in the first period (1961–1965)

146 to 2.03 in the third period (2004-2011). The mean MAI values of each time period for the 41

147 countries included in our analysis were 2.35 (SD 1.47), 1.51 (SD 0.88) (P<0.05) and 1.47 (SD 0.84)

148 (P>0.05) for periods 1 (1961-1965), 2 (2000-2003) and 3 (2004-2011), respectively (Table 1).

149 During the first time period, the MAI for the Mediterranean category (3.46) was higher than the

150 worldwide MAI (Table 1). In the Non-Mediterranean category, the MAI was 1.57, lower than that

151 of the worldwide MAI. However, in the second time frame (2000-2003), the Mediterranean

152 category and the world shared the same MAI value of 2.03, while the MAI value in the Non-

153 Mediterranean category fell to 1.14. In our current analysis of the 2004-2011 time frame the

154 Mediterranean (2.00) category scored a lower MAI value than the worldwide mean. Only the

155 countries within the Southern Mediterranean subgroup showed a higher mean MAI value than the

156 world MAI.

157 *Comparison within the Mediterranean category*

158 Of the 17 countries within the Mediterranean category, the mean MAI score from the first, second,

159 and third time frames decreased from 3.46 to 2.03 (P<0.01) to 2.00 (P<0.01), respectively. From

160 the 1960s until the most recent time frame, the MAI scores significantly decreased in both the

161 Southern Mediterranean (p=0.005) and Mediterranean Europe subcategories (p<0.001) (Table 2).

162 Between the 2000-2003 and 2004-2011 periods, the mean MAI score for the Mediterranean

163 countries decreased, albeit not significantly (Table 2). Within the same time frame, the mean MAI

164 scores in Mediterranean Europe decreased, but increased in the Southern Mediterranean, although

165 not significantly.

166 *Comparison between Mediterranean and Non-Mediterranean countries*

167 Comparing the Mediterranean with the Non-Mediterranean categories, the Mediterranean countries

168 yielded the highest MAI values in all the periods studied. Between each period both groups showed

169 decreases in MAI scores. However the changes between the last 2 study periods were not

170 statistically significant (Table 2).

171 *Comparison within subcategory groups*

172 Between the first and last study periods, the MAI score of Mediterranean Europe, Southern

173 Mediterranean, and Central Europe significantly decreased. Over the same periods, however, there

174 were non-significant increases in MAI scores in Northern Europe (Table 2). By contrast in

175 Southern Mediterranean countries the high MAI value of the 5 subcategories was maintained

176 during the three study periods.

177 *Ranking of countries by MAI*

178 Ranking the different regions according to the MAI, for the three study periods was as follows:

179 Southern Mediterranean, Mediterranean Europe, Other World Countries, Central Europe and

180 Northern Europe.

181 During the 1961–1965 period, the MAI values in 14 of the 41 countries were higher than 3.00

182 (Table 3). Twelve of these countries were from the Mediterranean category; and three countries in

183 the Mediterranean Europe subcategory (Greece, Albania and Turkey) had MAI scores over 5.00.

184 The remaining 2 countries, Japan and Romania, were from the Non-Mediterranean group. Between

185 1961–1965 and 2000–2003, the MAI scores in all 17 of the Mediterranean countries decreased.

186 Turkey (2.80), Albania (2.51) and Greece (2.04) led the Mediterranean Europe group with the

187 highest MAI scores for period 2. The number of Non-Mediterranean countries ranked within the

188 top 15 according to the MAI scores doubled from two to four. The MAI scores in 8 (33%) of the

189 Non-Mediterranean countries increased, while scores decreased in the remaining 16. The countries

190 with increased MAI values were from Northern Europe and Other World subcategories. Romania

191 (2.02) and Bulgaria (1.20) ranked highest among the Central European countries, despite showing

192 a large decrease compared to the first study period. Greece, Albania, Turkey, and Japan presented

193 the greatest reduction in MAI values between these periods. During the first study period, these 4

194 countries ranked within the top 6 MAI values, but fell to the 5th (Turkey), 7th (Albania), 10th

195 (Greece) and 16th places (Japan), thereafter (Table 3). Iran showed the largest increase (0.78) in the

196 MAI score between the first two study periods, improving its ranking from 16th to 2nd. While in

197 Morocco, Malta and France the MAI scores decreased and showed the least movement away from

198 their respective original values.

199 From 2000 to 2003, no country achieved a MAI value over 5.00 and Egypt held the highest MAI

200 value at 4.09. The number of countries with MAI scores of 3.00 or higher decreased from 14 to

201 only 3 (Egypt, Iran and Morocco) by the end of the last period (Table 3).

202 Between the 2000-2003 and 2004-2011 periods, the MAI scores in 6 countries (35%) within the

203 Mediterranean group increased, and decreased in the remaining 11 countries. Within the same time

204 frame, the MAI values of 10 (42%) of the Non-Mediterranean countries increased, thereby

205 doubling the number of countries in which the MAI value had increased. The largest variations in

206 MAI values were the increased scores reported in Egypt (0.27), Algeria (0.27) and Israel (0.16) and

207 the decreased scores in Iran (-0.66), Turkey (-0.29) and Romania (-0.43) (Figure 1). Egypt ranked

208 the highest among all the countries while Italy and Portugal maintained MAI values closest to their

209 respective previous values, although the scores had fallen in both countries. Greece continued to

210 rank 10th among all the countries selected. As in the second period, France ranked last among the

211 Mediterranean countries from 2004 to 2011.

212 In the most recent study period (2004-2011), none of the countries attained a MAI value of 5.00 or

213 higher. Only Egypt maintained a MAI score above 4.00, exhibiting a slight increase since the last

214 survey (4.09 to 4.36). There were 2 countries with MAI values above 3.00, which were Morocco

215 (3.17) and Algeria (3.07) (Table 3). Among the top 15 countries, ranked according to MAI score,

216 7 countries were from the Southern Mediterranean subcategory and 4 from Mediterranean Europe;

217 the same as in the previous period. Romania (1.73) and Bulgaria (1.17) maintained the highest MAI

218 values within the Central European subgroup, although these values had decreased in both

219 countries. The United States had the lowest MAI score in all 3 surveys.

220 In only 5 countries (12%) (Denmark, Sweden, the United Kingdom, Australia and Canada) the

221 MAI scores increased from 1961–1965 to 2000–2003, and again between 2000-2003 and 2004-

222 2011. Among these countries, the MAI scores significantly increased in Canada (0.71 to 0.80;

223 p<0.01) and the United Kingdom (0.67 to 0.91; p<0.001). However, since these countries started

224 with low MAI values their most recent mean MAI scores still fall below the mean MAI scores of

225 the Mediterranean countries during any time period.

226 ***Discussion***

227 The adherence to the MD over a 50-year period was analyzed between the first study in 1961-1965

228 to the most recent surveys in 2000-2003 and 2004-2011 in 169 countries. Over this time, many

229 countries had departed from the MD. However this trend slowed between the last two periods

230 where the decreases in MAI values stabilized in 16 out of 41 selected countries.

231 ***Mediterranean versus Non-Mediterranean group comparisons***

232 The Mediterranean group shifted away from their traditional MD pattern between all the study

233 periods. This overall trend in departure from the MD pattern within the Mediterranean region has

234 been described in previous studies (2, 26, 27). However, the present study shows that between

235 1961-1965 and 2004-2011, this movement away from the MD diet was less pronounced, suggesting

236 a slowed digression over the last decade, as shown in the previous study by da Silva et al. 2009

237 (20).

238 We found that the movement away from the MD was most pronounced in the Mediterranean

239 Europe, Southern Mediterranean and Central Europe subcategories. Within the Mediterranean

240   group, the Mediterranean Europe subcategory showed the most pronounced deterioration in the

241   MD pattern while the Southern Mediterranean subcategory maintained the highest adherence to the

242   MD; this was similar to what has been described in a previous study (27). Therefore, the difference

243   between the MAI scores in Southern Mediterranean and Mediterranean Europe increased over

244   time.

245   ***Country subgroup comparisons***

246   From the 60s to today, the Mediterranean countries with the highest MAI values have transitioned

247   away from their traditional dietary patterns, as described previously (17). . However, a direct

248   comparison cannot be made given the differences in the food item classifications. Those

249   Mediterranean regions have undergone significant cultural, social and political changes, which may

250   have influenced the dietary transition and changes in food habits (2, 26). From the 1960s to the

251   present study, the most significant changes in energy intake have been related to the decrease of

252   carbohydrate sources associated with increases of fat sources, particularly of animal origin. As a

253   result, the proportion of calories from Non-Mediterranean foods has increased. Even so, the MAI

254   values in Mediterranean Europe were consistently higher than those of the Northern Europe and

255   Central Europe subgroups throughout the three time periods studied.. Although the availability of

256   most Mediterranean foods has increased, the availability of the Non-Mediterranean foods, mainly

257   vegetable oils, sugar, sweeteners and meat, can contribute to the deterioration of the MD pattern

258   (28). This shift also illustrates how food habits have become more homogeneous globally.

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260   Within several of the Non-Mediterranean countries, the MAI scores increased between the first and

261   the last study periods, although, the Northern European countries maintained the lowest MAI

262   scores over the last 50 years. This shows that Non-Mediterranean products contribute more energy

263   to the diet than Mediterranean products (28). As reported in other studies, in Northern Europe the

264   MAI scores have risen since the early 1960s (20, 29, 30).

265   ***Country rankings***

266   Comparing countries, Greece showed the greatest decrease in the MAI score with a fall in the

267   ranking from first to tenth place since the 1960s. However from the second to the third period, the

268   MAI only slightly decreased and appears to have stabilized. Egypt stands out as having the highest

269   MAI of all the selected countries for both the second and third periods, with even slightly increased

270   scores, indicating a steady increase in adherence to the MD. This complements previous studies

271   from the World Health Organization which suggested that Egypt has the closest adherence to

272   dietary recommendations (2,31). This may be indirectly associated with its low Gross National

273   Product (30), and the influence this has on the type of foods available.

274   Central European countries such as Romania and Bulgaria with a historically high MD adherence

275   showed a large decrease in MAI. The mean MAI of Central Europe is now close to 1.00, which

276   illustrates that the proportion of calories derived from Mediterranean and Non-Mediterranean foods

277   is nearly equal. Traditionally, the food patterns of these countries shared many characteristics with

278   the Mediterranean dietary pattern (2, 32), however, the movement away from these foods continues

279   to increase.

280   ***Mediterranean-type dietary pattern over the Mediterranean region***

281   The broad "Other World" category includes a heterogeneous group of countries with a variety of

282   dietary patterns, traditions and cultures. This group crosses continents and includes countries from

283   North and South America, Asia, and Africa. Within this category, Iran showed the greatest increase

284   in MAI values since the start of the study, moving from 15th to 2nd to 4th place in the MAI rankings

285   by country over the three respective time frames.

286   Over the 50-year period, MAI scores increased in only 10% of countries between the periods of

287   1961–1965 and 2000–2003 and again between 2000-2003 and 2004-2011. None of these were

288   Mediterranean countries. All of these countries were from the Non-Mediterranean group:

289   Denmark, Sweden, the United Kingdom, Australia and Canada. The movement towards higher

290   MAI scores among these countries suggests that consumers are striving to incorporate more

291   Mediterranean foods as part of a healthy dietary pattern.

292   The dietary pattern of both Japan and Iran share common MD features such as a high consumption

293   of cereals, vegetables, fruit, and fish (18). Although the principle Japanese grain is rice and the

294   Mediterranean grain is wheat (33), indicating that both nutrient profiles are represented by a high

295   consumption of cereals, the MAI values in Japan within in both periods showed a similar change

296   in score. As with Mediterranean countries, Japan has also changed its traditional dietary food

297   pattern, which is echoed in the diet of the population and the quantity and type of products

298   consumed (33-35).

299   ***Mediterranean Diet Adherence and Economic Recession***

300   The relationship between the economic recession and dietary pattern was explored. A large Italian

301   population study reported an association between adherence to the MD and socioeconomic factors,

302   with greater wealth being associated with increased adherence to the MD. (6). Another Italian study

303   concluded that adherence to the MD was lower in subjects reporting a negative impact of the

304   economic crisis on diet as compared with those declaring no effect, describing a reduced

305   expenditure on foods such as fresh fish, nuts and vegetables (36). Greece, Spain and Portugal have

306   been affected by the economic downturn during the last survey period from 2004-2011. The MAI

307   increased in Spain, remained stable in Portugal and decreased in Greece. Despite these trends, none

308   of these changes were statistically significant from the 2000-2003 period. Other factors than those

309   related to the economy, such as education, age and urbanization, may have played a role in dietary

310   changes (37). Spanish research (7) suggests that the economic downturn was associated with

311   decreased consumption of fish, fruit and vegetable and increased consumption of legumes for the

312   first time since the 1960s.

313   According to an FAO report on the *financial crisis on nutrition* (38) the economic crisis has shifted

314   the composition of food expenditures toward staple foods and away from animal-based foods such

315   as meat. Thus, effect of the economic crisis may have affected nutrition status worldwide by

316   possibly avoiding excesses, reducing portion sizes, or prioritizing staple foods.

317   ***Strengths and limitations***

318   Strengths and limitations regarding the methodology have been explained in more detail in the

319   previous study (20, 28). The validity of the MAI has been confirmed by Fidanza et al. (24), who

320   demonstrated a relationship between the MAI value and both total mortality rates and 25-year

321   coronary heart disease mortality rates of populations in 10 European countries followed over 10

322   years. The advantage of calculating the MAI based on the energy provided by foods, is that the

323   various energy densities of foods do not influence the overall dietary consumption patterns.

324   However, the MAI can be calculated using g/day, although the values will be different from those

325   calculated as a percentage of total energy due to variability in energy densities of foods and

326   beverages.

327   One of the limitations of the MAI is the variability in the categorization of food groups classified

328   as Mediterranean and Non-Mediterranean (39). Additionally, the MAI reduces the MD as a whole

329   to a simple list of products, which does not take into account the different frequency and

330   proportions of the food items within each food group (25), how they align with the MD

331   recommendations or the influence of these foods on the diet-disease relationship (24). For

332   example, both red meat and white meat are included in the broad category of meats, rather than

333   being separated (31). Certain food items, such as eggs and dairy products, were not included in our

334   calculation of the MAI, partly because data from the FBS represents raw food products or primary

ingredients which do not necessarily fall into the food groups used to construct the MAI. For instance, the data for milk but not dairy products and the availability of eggs is presented but not the food groups in which it is found, such as cakes and pastries. Additionally, evidence regarding the health benefits of dairy products is somewhat controversial (40), and the category of dairy is not considered exclusive to only one dietary pattern.

The limitations of the FBS are tied to the inaccuracy of the underlying data sources (22, 29) (such as data on production, storage, losses and crops). Secondly, an inherent limitation of the FBS is that the data calculates an estimate of the total energy available for human consumption and not necessarily energy consumed (29). Indeed, two comparative analyses found that the FBS tends to overestimate food consumption as compared to individual dietary surveys (41, 42). The third limitation of the FBS is the inability to quantify food availability based on subgroups of the population, such as age, gender and education, since energy estimates are provided per capita (29). Lastly, figures related to energy provided by home production or consumption by tourists, are not taken into account. Despite this, the FBS provides a cost-efficient and effective method of assessing longitudinal comparisons of dietary patterns within and between nations (17, 29).

Conclusions

Adherence to the MD decreased significantly between the 1961-65 and 2000-03 study periods. The last period from 2004-2011 showed a stabilization of MAI values, and in 16 countries MAI values increased. The MD represents one of the healthiest dietary patterns in the world and has been recognized as an effective tool for improving public health, quality of life and decreasing the incidence of chronic diseases, such as cardiovascular disease, diabetes, obesity, cognitive impairment, and cancer (11). This is especially relevant for using the Mediterranean Diet as a model in comparison to the Western dietary pattern, rich in animal-based foods and sugars (43,44).

358   Maintaining MD patterns are crucial for public health. Governments and non-governmental

359   organizations should promote health and agricultural policies (29), and take into account the

360   inevitable effect of the economic crisis on dietary habits of the population (29,45,46,47). Therefore,

361   an effort to preserve the dietary traditions and lifestyle habits within the Mediterranean region, and

362   by extension the 40th parallel, is paramount to counteract increasing rates of chronic disease. Such

363   efforts would not only benefit public health, the economy, and the environment, yet would also

364   provide a means of preserving the dietary heritage and gastronomic traditions of the Mediterranean

365   region.

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512 **Table 1. Descriptive statistics for all studied country groups in all studied periods (1961-**
513 **65, 2000-03 and 2004-11).**

	Groups	N	Mean ± SD
	World	210	2.86 ± NA
	All Selected Countries	41	2.35 ± 1.47
	Mediterranean Countries	17	3.46 ± 1.28
	Non-Mediterranean Countries	24	1.57 ± 1.04
1961-65	Mediterranean Europe	9	3.43 ± 1.54
	Other Mediterranean Countries	8	3.48 ± 1.01
	Central Europe	8	1.71 ± 1.08
	North Europe	6	0.83 ± 0.16
	Other World Countries	10	1.92 ± 1.16
	World	210	2.03 ± NA
	All Selected Countries	41	1.51 ± 0.88
	Mediterranean Countries	17	2.03 ± 0.90
	Non-Mediterranean Countries	24	1.14 ± 0.67
2000-03	Mediterranean Europe	9	1.63 ± 0.69
	Other Mediterranean Countries	8	2.49 ± 0.93
	Central Europe	8	1.01 ± 0.45
	North Europe	6	0.85 ± 0.07
	Other World Countries	10	1.41 ± 0.89
	World	210	2.03 ± NA
	All Selected Countries	41	1.47 ± 0.84
	Mediterranean Countries	17	2.00 ± 0.93
	Non-Mediterranean Countries	24	1.10 ± 0.53
2004-11	Mediterranean Europe	9	1.53 ± 0.56
	Other Mediterranean Countries	8	2.53 ± 1.00
	Central Europe	8	0.96 ± 0.36
	North Europe	6	0.90 ± 0.03
	Other World Countries	10	1.33 ± 0.71

514
515 NA: Not Available
516
517

518 **Table 2. P values for all the country groups studied between the periods of 1961-65 and**
519 **2000-2004 and 2000-2003 and 2004-2011.**

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522

	P value between 1961-65 and 2004-2011 periods	*P* value between 2000-2003 and 2004-2011 periods
All Selected Countries	0,00274	0,86472
Mediterranean Countries	0,00002	0,46847
Non-Mediterranean Countries	0,00529	0,25851
Mediterranean Europe	0,00075	0,12730
Other Mediterranean Countries	0,00478	0,57791
Central Europe	0,02344	0,16247
North Europe	0,24187	0,04113
Other World Countries	0,06003	0,27528

p> 0,05 no significant changes

525 **Table 3. Ranking of countries by the Mediterranean adequacy index (MAI) in the three**

526 **study periods.**

Ranking of countries by the MAI

Countries	1961-65		2000-03		2004-11	
	Ranking	MAI	Ranking	MAI	Ranking	MAI
Greece	1	5,54	10	2,04	10	1,87
Albania	2	5,07	7	2,51	6	2,37
Turkey	3	5,03	5	2,80	7	2,37
Egypt	4	4,81	1	4,09	1	4,36
Tunisia	5	4,57	6	2,65	5	2,56
Japan	6	4,11	16	1,51	16	1,45
Romania	7	3,89	11	2,02	12	1,73
Libya	8	3,81	9	2,09	8	2,15
Algeria	9	3,61	4	2,81	3	3,07
Portugal	10	3,39	18	1,27	19	1,26
Morocco	11	3,37	3	3,25	2	3,17
Syria	12	3,35	8	2,25	9	2,12
Spain	13	3,35	21	1,19	18	1,29
Italy	14	3,30	15	1,62	14	1,61
Iran	15	2,87	2	3,65	4	2,99
Mauritania	16	2,87	13	1,77	11	1,86
Lebanon	17	2,70	14	1,72	15	1,56
Bulgaria	18	2,68	20	1,20	22	1,17
Cyprus	19	2,39	27	0,96	26	0,93
Chile	20	2,24	19	1,27	17	1,30
Brazil	21	2,05	24	1,04	24	1,03
South Africa	22	1,87	12	1,78	13	1,63
Poland	23	1,84	22	1,12	23	1,08
Israel	24	1,62	23	1,09	20	1,25
Malta	25	1,56	17	1,42	21	1,22
Hungary	26	1,48	37	0,73	36	0,75
France	27	1,28	31	0,82	31	0,88
Argentina	28	1,13	25	0,97	30	0,90
Czechoslovakia	29	1,10	30	0,83	34	0,82
Finland	30	1,04	28	0,87	27	0,92
Austria	31	0,98	38	0,73	38	0,71
Ireland	32	0,97	33	0,80	29	0,91
Norway	33	0,88	26	0,97	25	0,95
Switzerland	34	0,88	39	0,72	40	0,68
Germany	35	0,82	34	0,76	37	0,74
Sweden	36	0,72	32	0,82	33	0,86
Canada	37	0,71	36	0,75	35	0,80
Australia	38	0,68	40	0,70	39	0,71
UK	39	0,68	29	0,87	28	0,91

Denmark	40	0,67	35	0,76	32	0,87
USA	41	0,63	41	0,64	41	0,62

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Figure 1. Variation of the Mediterranean adequacy index (MAI) in all countries between the periods of 2000-2003 and 2004-2011.

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