WORK PACKAGE 2
DRAFT REPORT
Food insecurity is defined by a household economic, social and individual condition of limited or uncertain access to nutritious food to maintain a healthy and active life. Food insecurity has received much attention in recent years, even in high-income countries due to the increasing trend of poverty and social inequalities indicators, as a result of the global financial crisis. In fact, nutritional status is a key indicator of poverty and hunger, poor health, and inadequate education and social conditions. The first United Nations’ Millennium Development Goal is to eradicate extreme poverty and hunger. Following this objective, European Union has been developing programs and funding projects to fight food insecurity. Also, the aim of the National Health Plan is to maximize health gains by evolving all social partners at national, regional and local levels in the promotion of healthy policies and the improvement of health to all individuals, reducing inequalities. Furthermore, one of the aims of the Portuguese National Program for the Promotion of Healthy Eating (PNPAS) is to provide updated data on food consumption and nutrition, mainly among vulnerable population. Health inequalities between different population groups worldwide and in Portugal exist due to differences in factors that influence health, such as health related-behaviors, employment status, education and income. Besides the health impacts of such disparities, issues are even higher from an economic standpoint. Periods of economic, political and social instability tend to greatly affect the population’s diet. Facing the current economic crisis, the austerity programmes implemented by the Portuguese government and imposed by International Monetary Fund (IMF) might be causing negative impacts in inequality and poverty levels. Despite the fact that Portugal already ranks amongst the most unequal countries in the Organization for Economic Cooperation and Development (OECD), the last European Union Statistics on Income and Living Conditions (EU-SILC), showed that the financial crisis accelerated the income inequality and poverty. EU-SILC 2014 data showed that 19.5% of Portuguese population was at-risk-of-poverty. Furthermore, high unemployment rates found in Portugal are a big concern as a reflexion of the financial crisis and its austerity measures. In this country, unemployment rates, mainly long-term unemployment and youth unemployment are all at their highest levels since 2000. In addition, Portugal’s governmental budget was extensively affected by the financial crisis and the austerity programs implemented prompted cuts in government budgets for public services such as education, health and social security. In 2010, spending on health in Portugal recorded its first drop, and in 2011, social security budget decreased over 5%. It is expected that all of these accelerating social and economic changes that are occurring in the last few years, might have a direct and relevant impact in food security of Portuguese households. In this context, food insecurity emerges as a public health problem in Portugal, with relevant impacts on populations’ health and nutritional status. Evaluate food insecurity can be helpful to evaluate the extension of this problem and its associated factors in Portugal, in order to provide a basis for planning public health actions and targeting decisions to minimize the health impacts of the financial crisis. In fact, food insecurity presents as a good indicator of inadequate dietary intake, as well as, of social and economic deprivation.

A major public health challenge in Portugal relates to the lack of epidemiological information, valid and useful to support public health decision-making. The major national population
health surveys (health interview survey, serological survey and food and nutrition survey) have been conducted on irregular basis and do not have recent data.

Considering that the broad aim of this EEA Grants area of the Public Health Initiatives Program is to improve national health registries, health information and data management capabilities, contributing to improve current knowledge on health status of the Portuguese population and the use of this knowledge for development of evidence-base public health practices. More specifically, this area intends to improve information on prevalence and determinants of food insecurity in Portugal. In this WP2, the Promoting Food Security project has developed a national base survey on food insecurity households and presents in this report, data on food insecurity prevalence in Portugal and its sociodemographic and economic determinants and its health and health related characteristics.
2 METHODS

The results presented in this report were collected at EpiDoC 3 - Promoting Food Security Study. EpiDoC 3 constitutes the third evaluation of the Epidemiology of Chronic Diseases Cohort Study - EpiDoC cohort.

In this evaluation we aimed to determine the prevalence of Food Insecurity in Portugal, its socioeconomic determinants and its impact on subjects health and health related issues.

2.1 EpiDoC COHORT DESCRIPTION

STUDY DESIGN AND PARTICIPANTS

EpiDoC cohort is an ongoing project that started with EpiDoC 1 study (EpiReumaPt) and has already two other assessments of cross-sectional evaluations, performed to the same subjects, called EpiDoC 2 (CoReumaPt) and EpiDoC 3 (Promoting Food Security) studies. EpiDoC cohort was design to study health determinants and outcomes, chronic non-communicable diseases and their impact in health resources consumption.

EpiDoC Cohort is composed by adults (≥18 years old) who were non-institutionalized and living in private households in the Mainland and the Islands (Azores and Madeira). All the 10,661 participants of EpiDoC 1 study who signed the Informed Consent for follow-up, and those who provided their telephone number, were enrolled in the subsequent follow-up evaluations of EpiDoC closed cohort (EpiDoC 2 and EpiDoC 3 studies) (Figure 1). Subjects unwilling to sign the Informed Consent, unable to speak Portuguese or with an inability to answer the questionnaire, despite being aided, were excluded. Regardless, a caregiver could be the one answering the questionnaire.

In each evaluation a nuclear questionnaire regarding socioeconomic, chronic diseases in particular rheumatic diseases, quality of life and health consumption is applied and is repeated in every evaluation in order to gather longitudinal data. Moreover, each wave of evaluation has also specific and distinct questions regarding other several health and health-related issues that allow obtaining cross-sectional and longitudinal data from these population-based studies.

EpiCoC Cohort started with EpiDoC 1 cross-sectional study, which enrolled 10,661 subjects. 10,153 participants out of them agreed to participate in the follow-up study. The main objective of EpiDoC 1 study (EpiReumaPt) was to determine rheumatic and musculoskeletal diseases (RMD) prevalence and its burden in Portugal. Interviews and observations took place between September 2011 and December 2013. EpiDoC 1 study involved a three-stage approach. First, candidate households were selected using a random route process. The adults with permanent residence in the selected household with the most recently completed birthday were enrolled (one adult per household). Trained interviewers undertook structured face-to-face questionnaires in participants’ households collecting a vast number of variables and performing a screening for RMDs. Questions were asked about several rheumatic symptoms and an algorithm for the screening of each RMD was applied. An individual was considered to have a positive screening if the subject mentioned a previously known RMD, if
any of the specific disease algorithms in the screening questionnaires was positive, or if the subject reported muscle, vertebral or peripheral joint pain in the previous 4 weeks \(^{15}\).

Secondly, all participants who screened positive for at least one RMD plus 20% of individuals with no rheumatic complaints (negative screening) were invited for a structured evaluation by a rheumatologist at the local Primary Care Center. Finally, a team of 3 experienced rheumatologists revised all the clinical laboratorial and imaging data and confirmed the diagnoses according to validated criteria\(^{15}\). The cross-sectional study EpiDoC 1 finished the collection of data on December 2013 and included 10661 participants.

Between March 2013 and July 2015, we undertook EpiDoC 2 study (CoReumaPt). A structured questionnaire was applied through phone call interviews to the same 10,153 eligible participants of EpiDoC 1 study (EpiReumaPt) who consented to be re-contacted for follow-up. This study systematically collected and analyzed longitudinal data (the nuclear questionnaire) as well as allowed adding new questions regarding life styles (i.e. food patterns), health innovation and social interactions. Specific domains beyond RMDs were addressed for all population, such as sociodemographic & socioeconomic data, anthropometric measures, non-communicable chronic diseases and risk factors for cardiovascular events, anxiety, depression, physical function and quality of life, falls and bone fractures, hospitalizations, home care assistance and medical appointments, medications and other treatment, alcohol and smoking habits, physical exercise and lifestyles, mortality information, habits regarding new technologies, search for health information, development and adoption of health innovation, trust in conventional healthcare system, alternative medicines, adverse events. This study included 7,591 participants, representative of the adult Portuguese population.

Finally, EpiDoC 3 study (Promoting Food Security) was done between September 2015 and July 2016. This study continued to systematically collect and analyze longitudinal data (the nuclear questionnaire) and also new data were collected to characterize household food insecurity, its determinants and its health consequences in Portugal. In the end, 5653 participants completed the study through phone call interviews.
2.2 EpiDoc 3 Study (Promoting Food Security)

The third evaluation of this closed cohort, the EpiDoc 3 study (Promoting Food Security), occurred between September 2015 and July 2016. This study continued to systematically collect and analyze longitudinal data (the nuclear questionnaire) and also characterizing household food insecurity, its determinants and its health consequences in Portugal.

2.2.1 EpiDoc 3 study’s (Promoting Food Security) Data collection

The data collection of EpiDoc 3 study (Promoting Food Security) was performed from September 1st 2015 to July 28th 2016. A trained research assistant team was responsible for collecting the follow-up data from these subjects, by randomly call all the individuals. When a contact was not available, they were held more attempts in different moments (morning, afternoon, evening and weekends) in order to perform six attempts. The last contact had to have at least 1 month of interval from the previous one. Only then the contact would be abandoned. Rescheduling of the telephonic interviews was also an option.

The interview was telephonically performed with the assistance of a CATI (computed assisted telephone interview) system (an in-house software platform, created by the informatics team of Sociedade Portuguesa de Reumatologia (SPR)). Data is collected in a standardized form and database access is protected by unique username and password, for each research team member.

The questionnaire was constructed using the core questions of the EpiDoc Cohort and adding Food Insecurity related items. Before starting the study, we performed a qualitative evaluation, by performing 10 interviews with the first version of the questionnaire to our target population. An expert on qualitative studies was listening the interviews and adjustments to the questionnaires were made based on cognitive processing theory. Participants were asked to rephrase the questions whenever they consider necessary. The final
version of the questionnaire was also put on evaluation in order to assess questionnaire duration and participant response rate.

2.2.2 EpiDoC 3 study’s (Promoting Food Security) Measurements

Sociodemographic and economic characteristics
Information on sociodemographics (sex, age, ethnicity, years of education, marital status, NUT II), were collected in EpiDoC 1 study. In EpiDoC 3 study (Promoting Food Security) subjects were asked about present household composition, employment status, main source of income, number of children in the household, number of elderly in the household and single parent family and information regarding the household income perception.

Health and Health related characteristics
In EpiDoC 3 study core questionnaires with self-reported diseases (high cholesterol level, high blood pressure, diabetes, hiperuricemia, rheumatic disease, allergy, gastrointestinal disease, mental disease (depression and anxiety symptoms), cardiac disease, pulmonary disease, cancer, neurologic disease and psoriasis), year of the diagnosis, and disease-specific questionnaires for rheumatic diseases were performed again. Health-related quality of life and physical function were also asked in EpiDoC 3 study and are also core questions of the EpiDoC Cohort. Health-related quality of life was assessed using the European Quality of Life questionnaire with five dimensions and three levels (EQ-5D-3L) \(^{(17, 18)}\), for which a higher score corresponds to a higher quality of life. Physical function was evaluated based on the Health Assessment Questionnaire (HAQ, 0-3, the higher the worse functional ability) \(^{(19)}\). We used Portuguese validated versions of these assessment scales. Data regarding hospitalization in the previous 12 months (Yes/No), number of outpatient clinic appointments in the public and private sector, doctor visits reduction due to economic difficulties (Yes/No), stop taking medication due to economic difficulties (Yes/No) were also recorded.

Lifestyle characteristics
Self-reported height and weight were collected and based on such data, Body Mass Index (BMI, weight/height\(^2\), in kg/m\(^2\)) was calculated and categorized according to the World Health Organization (WHO) classification in four categories: underweight (BMI < 18.5 kg/m\(^2\)), normal (BMI between 18.5-24.9 kg/m\(^2\)), overweight (BMI between 25-29.9 kg/m\(^2\)) and obesity (BMI ≥ 30 kg/m\(^2\)) \(^{(20)}\).

Questions concerning lifestyle habits included frequency of alcohol intake (daily, occasionally, never), Quantity of alcohol units per week (less or equal than three alcohol units per week; more than three alcohol units per week but less than three alcohol units per day; more than three alcohol units per day), smoking habits (daily, occasionally, past smoker, never smoked), frequency and type of physical activity, sleep habits (number of hours of sleep per day, categorized in < 6 and ≥ 6 hours/day), frequency of watching TV (categorized in doesn’t watch, ≤ 2, 3-4 and ≥ 5 hours/day) and frequency of using computer/videogames/tablets (categorized in doesn’t use, ≤ 2, 3-4 and ≥ 5 hours/day). Physical activity level was classified based on the question related to the reported weekly frequency of physical activity, and three different categories of physical activity level were obtained.
according to the following criteria: inactive (< 1 hour/week), moderately active (between 1-2.5 hours/week), and active (≥ 2.5 hours/week).

Dietary intake was assessed through a group of questions, namely food frequency questions for the following foods and beverages: soup\(^1\), vegetables, fresh fruit, milk and other dairy products (Question: “How many time per week do you eat or drink...?”; Categories of response: everyday, 6 times/week, 3-5 times/week, 1-2 times/week, rarely, never), meat and fish (Question: “How many meals of ... do you consume per week?; Categories of response: 10-14 meals/week, 7-10 meals/week, 4-6 meals/week, 1-3 meals/week, rarely, never). Questions regarding the dietary intake also included the number of meals per day (2, 3, 4, 5 or more meals per day), type of meals per day and the amount of water daily consumed (1-2, 3-4, 5-7, > 7 glasses of 150ml/day).

In order to assess adherence to the Mediterranean diet, PREDIMED questionnaire was applied. This is a 14-item questionnaire. The questions were based on number of servings and frequencies of consumption for typical food or food groups of the Mediterranean diet such as olive oil, nuts, fruits, vegetables, pulses, seafood, or questions about low consumption of foods that are not part of the traditional Mediterranean diet, such as red or processed meats, sweetened beverages and sweets, commercial bakery or sugar desserts. The questions had criteria for servings or frequencies that had to be met in order to earn 1 point. Each point earned corresponds to an increase in compliance with the Mediterranean diet. A score ≥ 10 corresponds to a high adherence to Mediterranean diet and a score ≤ 10 corresponds to a low adherence to Mediterranean diet\(^{21}\). We had the goal of validating the Portuguese version for face-to-face and phone call interview application during the course of this project. The paper will be published soon.

Case Definition and assessment

Household food insecurity was assessed using a psychometric scale adapted from the Brazilian Food Insecurity Scale which was adapted from the US Household Food Security Survey Module. This tool measures both the quantitative and qualitative components of food insecurity during the last three months. A score ranging from 0 to 14 was obtained as a result of the total number of affirmative responses. According to this score, households were classified in four different categories of food insecurity: food security, low food insecurity, moderate food insecurity and severe food insecurity (Table 1)\(^{22, 23}\).

### Table 1. Definition of Food Insecurity Levels

<table>
<thead>
<tr>
<th>Food Security Level</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Security</td>
<td>Households show access at all times to enough food for an active and healthy life.</td>
</tr>
<tr>
<td>Low Food Insecurity</td>
<td>Households reported at least anxiety about lack of food to meet dietary needs. At this level, coping strategies to deal with economic and food constraints can also have an impact on the reduction of diet quality.</td>
</tr>
</tbody>
</table>

\(^1\) The question regarding to the frequency of soup consumption didn’t specify that we are asking about the consumption of vegetable soup, however “soup” in Portugal are traditionally prepared with vegetables.
### Moderate Food Insecurity
Adults in the household reported food intake reduction and changes in eating patterns due to economic difficulties in accessing food.

### Severe Food Insecurity
At this level, households without children experienced the physical sensation of hunger and households with children reported a reduction of children’s food intake.

#### 2.2.3 Statistical analysis

**Sample Weights**
Extrapolation weights were computed and used in further statistical analysis, in order to guarantee the representativeness of the sample regarding Portuguese population (Mainland and Autonomic Regions). These were obtained by calibrating the extrapolation weights originally designed for the EpiDoC 1 study’s sample. We first compared the participants and non-participants of EpiDoC 3 study, concerning their sociodemographic, socioeconomic and health status characteristics. Based on this comparison, we adjusted the weights based on the stratification by NUT II region, sex, age group (resulting from the aggregation of the original classes in 18-35, 36-55, 56-65, ≥66 years in the Norte, Centro and Lisboa regions, and 18-65, ≥66 years in Alentejo, Algarve, the Azores and Madeira).

Prevalence estimates for Food Insecurity were computed as weighted proportions, in order to take into account the sampling design (see sample Weights). Weighted proportions of Food Insecurity according NUTII, age groups, gender, employment status, years of school, single parent family, household with children, household with elderly, household income perception, BMI and adherence to Mediterranean Diet were calculated.

After these descriptive analysis participants were categorized into “food secure” (high food security) and “food insecure” (including low, moderate and severe security groups). In order to assess socioeconomic Food Insecurity determinants, subjects with and without Food Insecurity were compared. Univariable analyses were first performed considering the study design. Multivariate regression models were used to assess the differences between individuals with and without Food Insecurity, regarding: sociodemographic and economic characteristics -age, gender, years of education, NUTII, ethnicity, marital status, household composition, employment status, single parent family, household income perception. The variables significantly different in the univariable analysis were included in the multivariable model. The following variables were included in the model: age, gender, years of education, NUTII, employment status, single parent family, household income perception.

We also have calculated the association between Food Insecurity and dietary consumption (Mediterranean Diet adherence; consumption for typical food or food groups of the Mediterranean diet such as olive oil, nuts, fruits, vegetables, pulses, seafood, or questions about low consumption of foods that are not part of the traditional Mediterranean diet, such as red or processed meats, sweetened beverages and sweets, commercial bakery or sugar desserts), other lifestyles habits (regular physical exercise; smoking habits and alcohol intake), and anthropometric data (BMI), univariable analyses were first performed considering the
study design. Multivariate regression models were used to assess the differences between individuals with and without Food Insecurity, regarding: lifestyles and anthropometric characteristics adjusted for the sociodemographic and economic characteristics previously described (age, gender, years of education, NUTII, employment status, single parent family).

Association of Food Insecurity with chronic diseases and health related characteristics were evaluated. Univariable analyses were first performed considering the study design. Multivariate regression models were used to assess the differences between individuals with and without Food Insecurity, regarding: self-reported chronic diseases ((high cholesterol level, high blood pressure, diabetes, hyperuricemia, gastrointestinal disease, mental disease (depression and anxiety symptoms), cardiac disease, pulmonary disease, cancer) and confirmed diagnosis of rheumatic diseases, adjusted for the sociodemographic and economic characteristics previously described (age, gender, years of education, NUTII, employment status, single parent family). Moreover, adjusted multivariate analyses were also performed to assess differences of health status and function (EQ5D and HAQ) between food secure and insecure subjects. Adjustments were made with the following variables: sociodemographic and economic characteristics previously described, self-reported chronic diseases and confirmed rheumatic disease.

Finally, we have calculated the impact of food insecurity on Health consumption, univariable analyses were first performed considering the study design. Multivariate regression models were used to assess the differences between individuals with and without Food Insecurity, regarding: hospitalization in the previous 12 months (Yes/No), number of outpatient clinic appointments in the public and private sector, doctor visits reduction due to economic difficulties (Yes/No), stop taking medication due to economic difficulties (Yes/No) adjusted for the sociodemographic and economic characteristics previously described (age, gender, years of education, NUTII, employment status, single parent family) and for number of chronic diseases.

Statistical Software
All analyses were weighted and performed using STATA IC version 12 (StataCorp. 2011. Stata Statistical Software: Release 12. College Station, TX: StataCorp LP).

2.2.4 Ethical issues and personal protection
Details of ethical issues of EpiDoC cohort were described elsewhere (24). EpiDoC 3 study was performed according to the principles established by the Declaration of Helsinki (25) and revised in 2013 in Fortaleza. The study was reviewed and approved by the National Committee for Data Protection (Comissão Nacional de Proteção de Dados) and by the NOVA Medical School Ethics Committee. The participants provided informed consent to contribute in all phases of the study (26).

Participants’ confidentiality is safeguarded by the nonexistence of identifiers on the database (only unique ID participants’ codes). Their names and contacts are stored separately from study data transmitted to the coordinating centre (based on the headquarters of the SPR).
Thus, all data for future analysis will be kept anonymously and securely by the EpiDoC authorized staff. During Follow-up, consent was signed by those accepting to participate in the EpiDoC 3 study. There will be absolutely no disclosure of individual health information to the general public.
3 RESULTS

3.1 FOOD INSECURITY PREVALENCE
In EpiDoc 3 study (Promoting Food Security), a total of 5,653 participants were observed. The Promoting Food Security population did not differ from the Portuguese population (Table 2).

Table 2. Sociodemographic characteristics of the adult Portuguese population: Promoting Food Security and Census 2011 populations (Portuguese population).

<table>
<thead>
<tr>
<th></th>
<th>Promoting Food Security n=5,653</th>
<th>CENSUS 2011 n=8,657,240</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>3,607 (52.49%)</td>
<td>4,585,118 (53.0%)</td>
</tr>
<tr>
<td>Age (mean ± sd)</td>
<td>49.64 (18.11)</td>
<td>41.31 (16.28)</td>
</tr>
<tr>
<td>Age group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-29</td>
<td>355 (15.40%)</td>
<td>1,470,782 (17.0%)</td>
</tr>
<tr>
<td>30-39</td>
<td>605 (19.08%)</td>
<td>1,598,250 (18.5%)</td>
</tr>
<tr>
<td>40-49</td>
<td>1,049 (18.26%)</td>
<td>1,543,392 (17.8%)</td>
</tr>
<tr>
<td>50-59</td>
<td>1,143 (15.89%)</td>
<td>1,400,011 (16.2%)</td>
</tr>
<tr>
<td>60-69</td>
<td>1,112 (13.72%)</td>
<td>1,186,442 (13.7%)</td>
</tr>
<tr>
<td>70-74</td>
<td>491 (6.7%)</td>
<td>496,438 (5.7%)</td>
</tr>
<tr>
<td>≥75</td>
<td>893 (10.95%)</td>
<td>961,925 (11.1%)</td>
</tr>
<tr>
<td>Education level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 12 years</td>
<td>1,052 (23.99%)</td>
<td>1,741,567 (20.1%)</td>
</tr>
<tr>
<td>10-12 years</td>
<td>1,049 (25.60%)</td>
<td>1,560,958 (18.0%)</td>
</tr>
<tr>
<td>5-9 years</td>
<td>1,122 (19.55%)</td>
<td>2,134,401 (24.6%)</td>
</tr>
<tr>
<td>0-4 years</td>
<td>2,392 (30.86%)</td>
<td>3,239,724 (37.4%)</td>
</tr>
<tr>
<td>NUTS II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norte</td>
<td>1,659 (36.45%)</td>
<td>3,007,823 (34.7%)</td>
</tr>
<tr>
<td>Centro</td>
<td>1,087 (23.21%)</td>
<td>1,938,815 (22.4%)</td>
</tr>
<tr>
<td>Lisboa</td>
<td>1,131 (24.83%)</td>
<td>2,300,053 (26.6%)</td>
</tr>
<tr>
<td>Alentejo</td>
<td>320 (7.22%)</td>
<td>633,691 (7.3%)</td>
</tr>
<tr>
<td>Algarve</td>
<td>183 (3.74%)</td>
<td>370,704 (4.3%)</td>
</tr>
<tr>
<td>Azores</td>
<td>657 (2.16%)</td>
<td>192,357 (2.2%)</td>
</tr>
<tr>
<td>Madeira</td>
<td>611 (2.40%)</td>
<td>213,797 (2.5%)</td>
</tr>
</tbody>
</table>

Sample size is not constant due to missing data:
Promoting Food Security - Gender (n=5648); Age (n=5648); Education (n=5648); NUTII (n=5648)

In 2015-2016, 19.3% of Portuguese households experienced some level of food insecurity during the previous 3 months. A majority of food insecure households were in the lower level of food insecurity (14.0%). But 3.5% and 1.8% had moderate and severe food insecurity respectively, suggesting that their situation of food insecurity have significantly changed eating patterns of one or more household member and/or that have reduced their food intake (Figure 2). The prevalence of food insecurity was higher in Madeira (29.0%), Azores (28.8%) and Algarve (22.4%) (Figure 3). For the most severe levels of food insecurity, higher levels were also found for Algarve (9.7% - 4.7% of moderate food insecurity and 5.0% of severe food insecurity), Madeira (9.3% - 4.4% of moderate food insecurity and 4.9% of severe food
insecurity) and Azores (8.6% - 6.1% of moderate food insecurity and 2.5% of severe food insecurity). Furthermore, Lisboa showed the lowest food insecurity prevalence (16.4%) (Figure 4).

**HOUSEHOLD FOOD INSECURITY, PORTUGAL 2015-2016**

- Food Security 80.7%
- Moderate Food Insecurity 3.5%
- Low Food Insecurity 14.0%
- Severe Food Insecurity 1.8%

*Figure 2. Portuguese households by food security status, 2015-2016.*
Figure 3. Household food security in Portugal by Nuts II, 2015-2016.

Figure 4. Household food security in Portugal by Nuts II, 2015-2016.
The differences between sexes and age groups are clear (Figure 5). Women have reported more frequently situations of food insecurity (23.5% vs 14.7% in men). These differences were observed for all levels of food insecurity (Figure 6). In general a high proportion of food insecurity was found in the households of the individuals among the 50-59 age group (27.8%). A high proportion of food insecurity was also found for the households of the individuals aged between 70-74 years. The lower proportion of food insecurity was found in households from the individuals aged 30 years and above (9.6%) (Figure 6).

Figure 5. Household food security in Portugal by gender, 2015-2016.

Figure 6. Household food security in Portugal by age group, 2015-2016.

Figure 7 shows the presence of a social gradient in the prevalence of food insecurity according to the educational level. Higher proportions of food insecurity were found for the households of the individuals with lower levels of education (30.1% in individuals with 0-4 years of education vs 6% in individuals with more than 12 years of education).
Our results showed higher proportions of food insecurity in the households of the individuals who are temporally work disabled (40.2%), unemployed (32.3%) and domestic worker (33.1%). On the other hand, the lowest proportions of food insecurity were observed in the households of the individuals that are students (5.9%) or that are full-time employed (12.7%) (Figure 8).

Food insecurity rates also vary according to the characteristics of the households. Food insecurity was more prevalent among single-parent families (26.4%). Among households with children and the households with elderly the prevalence of food insecurity was 20.9% and 18.2%, respectively (Figure 9).

Figure 7. Household food security in Portugal by educational level, 2015-2016.

Figure 8. Household food security in Portugal by employment status, 2015-2016.
As figure 10 shows, household income is a strong predictor of food insecurity. This result is not surprising since food insecurity is related to the economic difficulties in accessing food. This graph shows that the probability of food insecurity rises as household income declines. For the households that have a monthly income less than 500 euros the prevalence of food insecurity was 39.1% and for the households with an income above 4000 euros no situations of food insecurity were reported (Figure 11).

Figure 9. Household food security in Portugal by household composition, 2015-2016.

Figure 10. Household food security in Portugal by household income, 2015-2016.
The prevalence of severe food insecurity found in the monthly income category of 2,501€ to 3,000€ is not expected. However, we need to take into account that our income data was collected in the previous four years of the household food insecurity assessment. We hypothesized that some of the individuals could become in an employment situation during these 4 years as a consequence of the economic crisis in Portugal. Actually, when we analyze the prevalence of severe food insecurity, in the income group of 2,501€ to 3,000€, by employment status we found a high prevalence of individuals in the category of “unemployed/employed part-time/domestic worker” (20.28% of unemployed/employed part-time/domestic worker vs 1.16% of employed full time/student/temporally work disabled/retired) (Table 3).

Table 3. Prevalence of severe food insecurity according to employment status.

<table>
<thead>
<tr>
<th>Income 2501€ to 3000€</th>
<th>Unemployed/Employed part-time/Domestic worker</th>
<th>Employed full time/Student/Temporarily work disabled/Retired</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe Food Insecurity</td>
<td>20.28%</td>
<td>1.16%</td>
</tr>
</tbody>
</table>

As expected, a high percentage of food insecure households have reported that they find it difficult (36.1%) and very difficult (65.8%) to live with the present income (Figure 12).
The BMI of the individuals seems to be related to food insecurity. Food insecurity was more prevalent in the households of overweight (19.9%) and obese (26.4%) individuals (Figure 13 and 14). These differences were observed for all levels of food insecurity.

A high proportion of the individuals from the food insecure households had a low adherence to the Mediterranean Diet (20.6%) (Figure 15).

**Figure 12. Household food security in Portugal by income perception, 2015-2016.**

**Figure 13. Household food security in Portugal by BMI, 2015-2016.**
**3.2 FOOD INSECURE HOUSEHOLDS– DESCRIPTIVE ANALYSIS**

3.2.1 Sociodemographic characteristics

*Figure 14. Household food security in Portugal by BMI, 2015-2016.*

*Figure 15. Household food security in Portugal by PREDIMED, 2015-2016.*
Table 4 summarizes socioeconomic and demographic characteristics of participants.

**Table 4. Sociodemographic characteristics of the adult Portuguese population: Promoting Food Security.**

<table>
<thead>
<tr>
<th></th>
<th>Promoting Food Security n=5,653</th>
<th>Food Secure n=4,151</th>
<th>Food Insecure n=1,380</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>3,607 (52.49%)</td>
<td>2,506 (49.82%)</td>
<td>1,101 (62.72%)</td>
</tr>
<tr>
<td><strong>Age</strong> (mean ± sd)</td>
<td>49.64 (18.11)</td>
<td>48.36 (17.48)</td>
<td>54.54 (19.30)</td>
</tr>
<tr>
<td><strong>Age group</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-29</td>
<td>355 (15.40%)</td>
<td>320 (17.31%)</td>
<td>35 (8.02%)</td>
</tr>
<tr>
<td>30-39</td>
<td>605 (19.08%)</td>
<td>492 (20.7%)</td>
<td>113 (12.87%)</td>
</tr>
<tr>
<td>40-49</td>
<td>1,049 (18.26%)</td>
<td>782 (18.0%)</td>
<td>267 (19.28%)</td>
</tr>
<tr>
<td>50-59</td>
<td>1,143 (15.89%)</td>
<td>785 (14.28%)</td>
<td>358 (22.09%)</td>
</tr>
<tr>
<td>60-69</td>
<td>1,112 (13.72%)</td>
<td>805 (13.61%)</td>
<td>307 (14.15%)</td>
</tr>
<tr>
<td>70-74</td>
<td>491 (6.7%)</td>
<td>347 (6.04%)</td>
<td>144 (9.26%)</td>
</tr>
<tr>
<td>≥75</td>
<td>893 (10.95%)</td>
<td>620 (10.07%)</td>
<td>273 (14.32%)</td>
</tr>
<tr>
<td><strong>Ethnicity/Race</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>5,536 (97.21%)</td>
<td>4,087 (98.2%)</td>
<td>1,449 (93.43%)</td>
</tr>
<tr>
<td>Black</td>
<td>81 (2.32%)</td>
<td>43 (1.36%)</td>
<td>38 (6.04%)</td>
</tr>
<tr>
<td>Asian</td>
<td>2 (0.06%)</td>
<td>2 (0.07%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Gipsy</td>
<td>5 (0.11%)</td>
<td>2 (0.05%)</td>
<td>3 (0.35%)</td>
</tr>
<tr>
<td>Other</td>
<td>14 (0.30%)</td>
<td>12 (0.33%)</td>
<td>2 (0.18%)</td>
</tr>
<tr>
<td><strong>Years of education</strong> (mean ± sd)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 12 years</td>
<td>1,052 (23.99%)</td>
<td>966 (28.04%)</td>
<td>86 (8.31%)</td>
</tr>
<tr>
<td>10-12 years</td>
<td>1,049 (25.60%)</td>
<td>862 (27.01%)</td>
<td>187 (20.15%)</td>
</tr>
<tr>
<td>5-9 years</td>
<td>1,122 (19.55%)</td>
<td>795 (18.61%)</td>
<td>327 (23.2%)</td>
</tr>
<tr>
<td>0-4 years</td>
<td>2,392 (30.86%)</td>
<td>1,513 (26.35%)</td>
<td>879 (48.34%)</td>
</tr>
<tr>
<td><strong>NUTS II</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norte</td>
<td>1,659 (36.45%)</td>
<td>1,243 (36.44%)</td>
<td>416 (36.49%)</td>
</tr>
<tr>
<td>Centro</td>
<td>1,087 (23.21%)</td>
<td>819 (23.22%)</td>
<td>268 (23.17%)</td>
</tr>
<tr>
<td>Lisboa</td>
<td>1,131 (24.83%)</td>
<td>908 (25.67%)</td>
<td>223 (21.58%)</td>
</tr>
<tr>
<td>Alentejo</td>
<td>320 (7.22%)</td>
<td>243 (7.13%)</td>
<td>77 (7.58%)</td>
</tr>
<tr>
<td>Algarve</td>
<td>183 (3.74%)</td>
<td>127 (3.53%)</td>
<td>56 (4.55%)</td>
</tr>
<tr>
<td>Azores</td>
<td>657 (2.16%)</td>
<td>430 (1.91%)</td>
<td>227 (3.1%)</td>
</tr>
<tr>
<td>Madeira</td>
<td>611 (2.40%)</td>
<td>381 (2.10%)</td>
<td>230 (3.54%)</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>922 (28.48%)</td>
<td>743 (30.79%)</td>
<td>179 (19.63%)</td>
</tr>
<tr>
<td>Married</td>
<td>3,457 (53.44%)</td>
<td>2,574 (53.18%)</td>
<td>883 (54.41%)</td>
</tr>
<tr>
<td>Divorced</td>
<td>391 (6.09%)</td>
<td>258 (4.99%)</td>
<td>133 (10.32%)</td>
</tr>
<tr>
<td>Widow(er)</td>
<td>697 (7.62%)</td>
<td>448 (6.66%)</td>
<td>249 (11.32%)</td>
</tr>
<tr>
<td>Consensual union</td>
<td>177 (4.36%)</td>
<td>125 (4.37%)</td>
<td>52 (4.32%)</td>
</tr>
<tr>
<td><strong>Household income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;500€</td>
<td>945 (16.66%)</td>
<td>504 (12.67%)</td>
<td>441 (31.15%)</td>
</tr>
<tr>
<td>501€ to 750€</td>
<td>949 (20.91%)</td>
<td>622 (19.42%)</td>
<td>327 (26.33%)</td>
</tr>
<tr>
<td>751€ to 1000€</td>
<td>717 (19.89%)</td>
<td>523 (18.98%)</td>
<td>194 (23.19%)</td>
</tr>
<tr>
<td>1001€ to 1500€</td>
<td>638 (16.97%)</td>
<td>539 (19.07%)</td>
<td>99 (9.35%)</td>
</tr>
<tr>
<td>Income perception</td>
<td>Promoting Food Security n=5,653</td>
<td>Food Secure n=4,151</td>
<td>Food Insecure n=1,380</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>----------------------------------</td>
<td>---------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>1501€ to 2000€</td>
<td>386 (11.08%)</td>
<td>345 (12.68%)</td>
<td>41 (5.26%)</td>
</tr>
<tr>
<td>2001€ to 2500€</td>
<td>246 (6.37%)</td>
<td>224 (7.3%)</td>
<td>22 (3.01%)</td>
</tr>
<tr>
<td>2501€ to 3000€</td>
<td>148 (3.98%)</td>
<td>139 (4.8%)</td>
<td>9 (0.99%)</td>
</tr>
<tr>
<td>3001€ to 4000€</td>
<td>83 (1.94%)</td>
<td>77 (2.28%)</td>
<td>6 (0.71%)</td>
</tr>
<tr>
<td>&gt;4000€</td>
<td>55 (2.20%)</td>
<td>55 (2.81%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td><strong>Income perception</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Living comfortably in the present income</td>
<td>1,017 (22.75%)</td>
<td>988 (27.41%)</td>
<td>29 (3.29%)</td>
</tr>
<tr>
<td>Living in the present income</td>
<td>2,268 (43.17%)</td>
<td>2,015 (48.93%)</td>
<td>253 (19.13%)</td>
</tr>
<tr>
<td>Finding difficult in the present income</td>
<td>1,544 (25.00%)</td>
<td>924 (19.80%)</td>
<td>620 (46.66%)</td>
</tr>
<tr>
<td>Finding it very difficult in the present income</td>
<td>671 (9.08%)</td>
<td>200 (3.85%)</td>
<td>471 (30.91%)</td>
</tr>
<tr>
<td><strong>Household composition</strong> (mean ± sd)</td>
<td>2.72 (1.19)</td>
<td>2.73 (1.12)</td>
<td>2.65 (1.48)</td>
</tr>
<tr>
<td><strong>Household composition</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 person</td>
<td>953 (14.92%)</td>
<td>677 (14.09%)</td>
<td>276 (18.22%)</td>
</tr>
<tr>
<td>2 people</td>
<td>1,999 (31.90%)</td>
<td>1,494 (23.13%)</td>
<td>505 (34.56%)</td>
</tr>
<tr>
<td>3 people</td>
<td>1,356 (28.84%)</td>
<td>1,023 (19.42%)</td>
<td>333 (23.65%)</td>
</tr>
<tr>
<td>≥ 4 people</td>
<td>1,289 (24.35%)</td>
<td>957 (24.54%)</td>
<td>332 (23.57%)</td>
</tr>
<tr>
<td><strong>Single-parent family</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Employment status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed full-time</td>
<td>2,254 (49.05%)</td>
<td>1,870 (53.27%)</td>
<td>384 (32.56%)</td>
</tr>
<tr>
<td>Employed part-time</td>
<td>190 (3.98%)</td>
<td>134 (4.09%)</td>
<td>56 (3.52%)</td>
</tr>
<tr>
<td>Domestic worker</td>
<td>450 (4.72%)</td>
<td>265 (3.95%)</td>
<td>185 (7.72%)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>504 (11.16%)</td>
<td>299 (9.43%)</td>
<td>205 (17.93%)</td>
</tr>
<tr>
<td>Student</td>
<td>88 (3.13%)</td>
<td>79 (3.63%)</td>
<td>9 (1.21%)</td>
</tr>
<tr>
<td>Temporally work disabled</td>
<td>114 (1.58%)</td>
<td>64 (1.19%)</td>
<td>50 (3.12%)</td>
</tr>
<tr>
<td>Retired</td>
<td>2,008 (26.38%)</td>
<td>1,434 (24.44%)</td>
<td>574 (33.95%)</td>
</tr>
<tr>
<td><strong>Employment status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed full-time/Student/Temporally work disabled/Retired</td>
<td>4,388 (80.01%)</td>
<td>3,447 (82.52%)</td>
<td>941 (69.53%)</td>
</tr>
<tr>
<td>Unemployed/Employed part-time/domestic worker</td>
<td>1,135 (19.99%)</td>
<td>698 (17.48%)</td>
<td>437 (30.47%)</td>
</tr>
</tbody>
</table>

Sample size is not constant due to missing data:
Promoting Food Security - Gender (n=5648); Age (n=5648); Ethnicity (n=5648); Education (n=5648); NUTII (n=5648); Marital Status (n=5648); Household income (n=5648); Household composition (n=5,597); Single-parent family (n=5,648); Employment Status (n=5,608)
Food secure - Gender (n=4,151); Age (n=4,151); Ethnicity (n=4,151); Education (n=4,151); NUTII (n=4,151); Marital Status (n=4,151); Household income (n=4,151); Household composition (n=4,151); Single-parent family (n=4,151); Employment Status (n=4,145)
Food Insecure - Gender (n=1,497); Age (n=1,497); Ethnicity (n=1,497); Education (n=1,497); NUTII (n=1,497); Marital Status (n=1,497); Household income (n=1,497); Household composition (n=1,446); Single-parent family (n=1,497); Employment Status (n=1,463)
3.2.2 Health characteristic

With respect to health-related characteristics, the observed mean number of chronic diseases in Portuguese adult population was 0.84 ± 1.14. The most frequently reported chronic diseases were high cholesterol level (25.25%) and high blood pressure (24.70%). Respondents of food insecure households had, on average 1.15 ± 1.51 number of chronic diseases and in particular a high prevalence of high blood pressure (3.07%), diabetes (15.18%) high cholesterol level (33.56%). Anxiety and depression were also frequently reported by respondents of food insecure households (anxiety – 4.22% and depression – 10.89%).

The quality of life, measured through EQ-5D, was low in the respondents of food insecure households (mean EQ-5D score of 0.60 ± 0.40) and the physical disability score was high in the respondents of food insecure households (mean HAQ score of 0.68 ± 0.81).

The high consumption of health care resources by the respondents of food insecure households also matches with the health status (Table 5).

Table 5. Description of the health characteristics of the Promoting Food Security

<table>
<thead>
<tr>
<th>Description of the health characteristics</th>
<th>Promoting Food Security n=5,653</th>
<th>Food Secure n=4,151</th>
<th>Food Insecure n=1,380</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-communicable diseases</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Number of non-communicable diseases</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(self-reported)</td>
<td>0.84 (±1.14)</td>
<td>0.76 (±1.04)</td>
<td>1.15 (±1.51)</td>
</tr>
<tr>
<td><strong>Non-communicable diseases</strong> (self-reported)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High blood pressure</td>
<td>1,830 (24.70%)</td>
<td>1,263 (22.47%)</td>
<td>567 (34.07%)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>667 (9.01%)</td>
<td>433 (7.53%)</td>
<td>234 (15.18%)</td>
</tr>
<tr>
<td>High cholesterol level</td>
<td>1,790 (25.25%)</td>
<td>1,244 (23.27%)</td>
<td>546 (33.56%)</td>
</tr>
<tr>
<td>Hyperuricemia</td>
<td>125 (1.91%)</td>
<td>94 (1.84%)</td>
<td>31 (2.24%)</td>
</tr>
<tr>
<td>Pulmonary disease</td>
<td>206 (2.24%)</td>
<td>135 (5.03%)</td>
<td>71 (2.78%)</td>
</tr>
<tr>
<td>Cardiac disease</td>
<td>687 (9.13%)</td>
<td>467 (12.64%)</td>
<td>220 (9.81%)</td>
</tr>
<tr>
<td>Gastrointestinal disease</td>
<td>537 (8.9%)</td>
<td>369 (8.25%)</td>
<td>168 (11.63%)</td>
</tr>
<tr>
<td>Neoplasic disease</td>
<td>312 (2.47%)</td>
<td>219 (22.47%)</td>
<td>93 (34.07%)</td>
</tr>
<tr>
<td>Depression symptoms</td>
<td>450 (6.1%)</td>
<td>285 (4.96%)</td>
<td>165 (10.89%)</td>
</tr>
<tr>
<td>Anxiety symptoms</td>
<td>268 (3.78%)</td>
<td>190 (3.68%)</td>
<td>78 (4.22%)</td>
</tr>
<tr>
<td><strong>Non-communicable diseases (diagnosed)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnosis of rheumatic disease</td>
<td>508 (6.93%)</td>
<td>325 (5.79%)</td>
<td>183 (11.7%)</td>
</tr>
<tr>
<td><strong>Quality of life</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EQ5D score</td>
<td>0.78 (0.29)</td>
<td>0.83 (0.25)</td>
<td>0.64 (0.36)</td>
</tr>
<tr>
<td><strong>Physical function</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HAQ score (0-3)</td>
<td>0.35 (0.55)</td>
<td>0.27 (0.46)</td>
<td>0.68 (0.81)</td>
</tr>
</tbody>
</table>

Sample size is not constant due to missing data:
Promoting Food Security – Number of non-communicable diseases (n=5,132); High blood pressure (n=5,404); Diabetes (n=5,454); High cholesterol level (n=5,364); Pulmonary disease (n=5,480); Cardiac disease (n=5,451); Gastrointestinal disease (n=5,465); Neoplasic disease (n=45,485); Hyperuricemia (n=5,464); Depression symptoms (n=5,430); Anxiety symptoms (n=5,430); Rheumatic disease (n=5,519)
Food Secure- Number of non-communicable diseases (n=3,878); High blood pressure (n=4,053); Diabetes (n=4,096); High cholesterol level (n=4,027); Pulmonary disease (n=4,112); Cardiac disease (n=4,102); Gastrointestinal disease
(n=4,110); Neoplasic disease (n=4,116); Hyperuricemia (n=4,097); Depression symptoms (n=4,070); Anxiety symptoms (n=4,070); Rheumatic disease (n=4,140)

Food Insecure - Number of non-communicable diseases (n=1,254); High blood pressure (n=1,351); Diabetes (n=1,358); High cholesterol level (n=1,337); Pulmonary disease (n=1,368); Cardiac disease (n=1,349); Gastrointestinal disease (n=1,369); Neoplasic disease (n=1,379); Depression symptoms (n=1,360); Anxiety symptoms (n=1,360); Rheumatic disease (n=1,379)

Table 6. Description of the health resources consumption of the Promoting Food Security

<table>
<thead>
<tr>
<th>Healthcare resources consumption</th>
<th>Promoting Food Security n=5,653</th>
<th>Food Secure n=4,151</th>
<th>Food Insecure n=1,380</th>
</tr>
</thead>
<tbody>
<tr>
<td>Was hospitalized since last contact</td>
<td>721 (11.03%)</td>
<td>498 (9.86%)</td>
<td>223 (15.91%)</td>
</tr>
<tr>
<td>Went to medical appointments since last contact</td>
<td>5,079 (90.81%)</td>
<td>3,796 (90.43%)</td>
<td>1,283 (92.40%)</td>
</tr>
<tr>
<td>Went to medical appointments in hospitals since last contact</td>
<td>2,011 (38.83%)</td>
<td>1,375 (36.17%)</td>
<td>636 (48.62%)</td>
</tr>
<tr>
<td>Went to medical appointments in primary health care centers since last contact</td>
<td>4,059 (82.63%)</td>
<td>2,940 (81.65%)</td>
<td>1,119 (86.225)</td>
</tr>
<tr>
<td>Number of medical appointments in public sector since last contact</td>
<td>3.23 (±4.02)</td>
<td>2.87 (±3.48)</td>
<td>4.80 (±5.87)</td>
</tr>
<tr>
<td>Number of medical appointments in private sector since last contact</td>
<td>1.21 (±3.24)</td>
<td>1.27 (±3.77)</td>
<td>0.99 (±3.77)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chronic disease management difficulties</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Medication non-adherence due to economic constrains</td>
<td>492 (6.08%)</td>
<td>168 (3.07%)</td>
<td>324 (18.67%)</td>
</tr>
<tr>
<td>Reduction in visits to medical appointments due to economic constrains</td>
<td>508 (6.42%)</td>
<td>223 (3.89%)</td>
<td>285 (16.99%)</td>
</tr>
</tbody>
</table>

Sample size is not constant due to missing data:

Promoting Food Security - Was hospitalized since last contact (n=5,530); Went to medical appointments since last contact (n=5,079); Went to medical appointments in hospitals since last contact (n=4,869); Went to medical appointments in primary health care centers since last contact (n=4,874); Medication reduction due to economic constrains (n=5,517); Doctor visits reduction due to economic constrains (n=5,525)

Food Secure - Was hospitalized since last contact (n=4,150); Went to medical appointments since last contact (n=3,796); Went to medical appointments in hospitals since last contact (n=3,565); Went to medical appointments in primary health care centers since last contact (n=3,565); Medication reduction due to economic constrains (n=4,142); Doctor visits reduction due to economic constrains (n=4,147)

Food Insecure - Was hospitalized since last contact (n=1,380); Went to medical appointments since last contact (n=1,283); Went to medical appointments in hospitals since last contact (n=1,304); Went to medical appointments in primary health care centers since last contact (n=1,309); Medication reduction due to economic constrains (n=1,375); Doctor visits reduction due to economic constrains (n=1,378)

3.2.3 Anthropometric data

Prevalence of overweight and obesity was 53.36% in the Portuguese population (37.66% for overweight and 15.7% for obesity). In general, respondents of food insecure households had a high proportion of overweight and obese subjects (39.59% were overweight and 21.66% were obese, (Table 7).
3.2.4 Lifestyle characteristics

Regarding lifestyle habits, namely in terms of alcohol intake and smoking habits, 29.75% of the individuals had reported a daily intake of alcohol beverages and 14.5% were current smokers. Our results show that respondents of food insecure households had a low regular alcohol intake: 41.78% of the respondents of food insecure households never consume alcoholic drinks, while 30.82% of respondents of food insecure households consume it daily. A great share of respondents of food insecure households never smoked (66.21%). A high proportion of individuals were classified as physical inactive (59.17%). Only 32.12% of the Food insecure respondents were physically active (Table 8).

Table 7. Description of anthropometric data of the Promoting Food Security Population

<table>
<thead>
<tr>
<th>Anthropometric data</th>
<th>Promoting Food Security n=5,653</th>
<th>Food Secure n=4,151</th>
<th>Food Insecure n=1,380</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Mass Index (kg/m²)</td>
<td>25.83 (4.41)</td>
<td>25.63 (4.13)</td>
<td>26.68 (5.47)</td>
</tr>
<tr>
<td>(mean ± sd)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>88 (2.11%)</td>
<td>71 (2.28%)</td>
<td>17 (1.41%)</td>
</tr>
<tr>
<td>Normal weight</td>
<td>2,009 (44.53%)</td>
<td>1,611 (46.23%)</td>
<td>398 (37.34%)</td>
</tr>
<tr>
<td>Overweight</td>
<td>2,098 (37.66%)</td>
<td>1,583 (37.20%)</td>
<td>515 (39.59%)</td>
</tr>
<tr>
<td>Obesity</td>
<td>979 (15.70%)</td>
<td>668 (14.29%)</td>
<td>311 (21.66%)</td>
</tr>
</tbody>
</table>

Sample size is not constant due to missing data:
Promoting Food Security - Body Mass Index (n=5,174)
Food Secure - Body Mass Index (n=3933)
Food Insecure - Body Mass Index (n=1241)

Table 8. Description of lifestyle characteristics of the Promoting Food Security Population

<table>
<thead>
<tr>
<th>Alcohol intake</th>
<th>Promoting Food Security n=5,653</th>
<th>Food Secure n=4,151</th>
<th>Food Insecure n=1,380</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol intake</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily</td>
<td>1,565 (29.75%)</td>
<td>1,259 (30.82%)</td>
<td>306 (25.36%)</td>
</tr>
<tr>
<td>Occasionally</td>
<td>2,020 (39.64%)</td>
<td>1,575 (41.3%)</td>
<td>445 (32.86%)</td>
</tr>
<tr>
<td>Never</td>
<td>1,945 (30.61%)</td>
<td>1,305 (27.88%)</td>
<td>640 (41.78%)</td>
</tr>
</tbody>
</table>

Smoking habits

<table>
<thead>
<tr>
<th>Smoking habits</th>
<th>Promoting Food Security n=5,653</th>
<th>Food Secure n=4,151</th>
<th>Food Insecure n=1,380</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>3,499 (63.43%)</td>
<td>2,590 (62.52%)</td>
<td>909 (66.21%)</td>
</tr>
<tr>
<td>Past smoker</td>
<td>1,143 (20.72%)</td>
<td>900 (21.72%)</td>
<td>243 (17.70%)</td>
</tr>
<tr>
<td>Current smoker</td>
<td>800 (14.50%)</td>
<td>594 (14.34%)</td>
<td>206 (15.00%)</td>
</tr>
<tr>
<td>Occasionally</td>
<td>74 (1.34%)</td>
<td>59 (1.42%)</td>
<td>15 (1.09%)</td>
</tr>
</tbody>
</table>

Physical activity

<table>
<thead>
<tr>
<th>Physical activity</th>
<th>Promoting Food Security n=5,653</th>
<th>Food Secure n=4,151</th>
<th>Food Insecure n=1,380</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inactive</td>
<td>3,498 (59.17%)</td>
<td>2,430 (56.94%)</td>
<td>1,068 (67.72%)</td>
</tr>
<tr>
<td>Moderate</td>
<td>31 (0.76%)</td>
<td>29 (0.92%)</td>
<td>2 (0.16%)</td>
</tr>
</tbody>
</table>
Sample size is not constant due to missing data:

Promoting Food Security
- Alcohol intake (n=5,530);
- Alcohol intake profile (n=1,556);
- Smoking habits (n=5,535);
- Physical activity (n=5,648);
- Sleep habits (n=5,436);
- TV (n=5,626);
- Videogames (n=5,637)

Food Secure
- Alcohol intake (n=4,139);
- Alcohol intake profile (n=1,252);
- Smoking habits (n=4,143);
- Physical activity (n=4,151);
- Sleep habits (n=4,088);
- TV (n=4,140);
- Videogames (n=4,142)

Food Insecure
- Alcohol intake (n=1,391);
- Alcohol intake profile (n=304);
- Smoking habits (n=1,392);
- Physical activity (n=1,497);
- Sleep habits (n=1,348);
- TV (n=1,488);
- Videogames (n=1,495)

With respect to dietary habits, about 96.47\% of the participants do at least 3 meals per day. Almost all the respondents do the following meals: breakfast (99.24\%), mid-morning snack (97.93\%), lunch (99.27\%), afternoon snack (98.81\%) and dinner (99.26\%). Furthermore, the water intake reported by the participants was under the recommendations for a high proportion of the subjects (67.83\%) (Table 9).

Table 9. Description of dietary habits of the Promoting Food Security Population

<table>
<thead>
<tr>
<th>Dietary habits</th>
<th>Promoting Food Security n=5,653</th>
<th>Food Secure n=4,151</th>
<th>Food Insecure n=1,380</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of meals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 meals/day</td>
<td>242 (4.06%)</td>
<td>126 (3.44%)</td>
<td>116 (6.53%)</td>
</tr>
<tr>
<td>3 meals/day</td>
<td>1,897 (31.70%)</td>
<td>1,290 (29.32%)</td>
<td>607 (41.18%)</td>
</tr>
<tr>
<td>4 meals/day</td>
<td>1,680 (31.22%)</td>
<td>1,301 (32.51%)</td>
<td>379 (26.11%)</td>
</tr>
<tr>
<td>5 or more meals/day</td>
<td>1,774 (33.01%)</td>
<td>1,434 (34.73%)</td>
<td>340 (26.18%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequent meals</th>
<th>Promoting Food Security n=5,653</th>
<th>Food Secure n=4,151</th>
<th>Food Insecure n=1,380</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast</td>
<td>5,301 (99.24%)</td>
<td>3,979 (100%)</td>
<td>1,322 (96.24%)</td>
</tr>
<tr>
<td>Mid-Morning</td>
<td>1,862 (97.93%)</td>
<td>1,494 (100%)</td>
<td>368 (88.55%)</td>
</tr>
<tr>
<td>Lunch</td>
<td>5,525 (99.27%)</td>
<td>4,114 (100%)</td>
<td>1,411 (96.43%)</td>
</tr>
<tr>
<td>Snack</td>
<td>3,275 (98.81%)</td>
<td>2,592 (100%)</td>
<td>683 (93.2%)</td>
</tr>
</tbody>
</table>

Sample size is not constant due to missing data:

Promoting Food Security- Alcohol intake (n=5,530); Alcohol intake profile (n=1,556); Smoking habits (n=5,535); Physical activity (n=5,648); Sleep habits (n=5,436); TV (n=5,626); Videogames (n=5,637)

Food Secure - Alcohol intake (n=4,139); Alcohol intake profile (n=1,252); Smoking habits (n=4,143); Physical activity (n=4,151); Sleep habits (n=4,088); TV (n=4,140); Videogames (n=4,142)

Food Insecure - Alcohol intake (n=1,391); Alcohol intake profile (n=304); Smoking habits (n=1,392); Physical activity (n=1,497); Sleep habits (n=1,348); TV (n=1,488); Videogames (n=1,495)
The majority of the participants in this study had a lower adherence do Mediterranean Diet (MD) (88.27%). A higher percentage of low adherence to MD was found for the individuals of food insecure households (94.06%). A high proportion of the participants did not consume ≥2 servings per day of vegetables (79.39%), ≥3 servings per day of fruit (71.09%), ≥3 servings per week of pulses (75.22%), ≥3 servings per week of nuts (84.52%) and ≥3 servings per week of fish/seafood (42.16%) (Table 10).
Table 10. Description of adherence to Mediterranean diet of the Promoting Food Security Population

<table>
<thead>
<tr>
<th>Dietary habits</th>
<th>Promoting Food Security</th>
<th>Food Secure n=4,151</th>
<th>Food Insecure n=1,380</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PREDIMED</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low adherence to MD</td>
<td>4,927 (88.27%)</td>
<td>3,628 (86.88%)</td>
<td>1,299 (94.06%)</td>
</tr>
<tr>
<td>High adherence to MD</td>
<td>604 (11.73%)</td>
<td>523 (13.12%)</td>
<td>81 (5.94%)</td>
</tr>
<tr>
<td>Use olive oil as principal source of fat for cooking</td>
<td>4,886 (87.57%)</td>
<td>3,720 (88.37%)</td>
<td>1,166 (84.21%)</td>
</tr>
<tr>
<td>Olive oil consumption (&gt; 4 Tbsp)</td>
<td>1,135 (22.29%)</td>
<td>927 (24.07%)</td>
<td>208 (14.86%)</td>
</tr>
<tr>
<td>Vegetables consumption (≥2 servings per day)</td>
<td>1,277 (21.61%)</td>
<td>1,006 (22.33%)</td>
<td>271 (18.62%)</td>
</tr>
<tr>
<td>Fruit consumption (≥3 servings per day)</td>
<td>1,773 (29.91%)</td>
<td>1,450 (31.25%)</td>
<td>323 (24.35%)</td>
</tr>
<tr>
<td>Consumption of red meat, hamburger or sausages (&lt;1 serving per day)</td>
<td>4,115 (67.51%)</td>
<td>2,985 (64.72%)</td>
<td>1,130 (79.19%)</td>
</tr>
<tr>
<td>Consumption of butter, margarine or cream (≤1 per day)</td>
<td>3,828 (68.09%)</td>
<td>2,811 (67.62%)</td>
<td>1,017 (70.03%)</td>
</tr>
<tr>
<td>Carbonated and/or sugar-sweetened beverages consumption (&lt;1 per day)</td>
<td>4,722 (82.41%)</td>
<td>3,562 (82.59%)</td>
<td>1,160 (81.68%)</td>
</tr>
<tr>
<td>Wine consumption (≥7 cups per week)</td>
<td>1,249 (23.66%)</td>
<td>1,004 (24.36%)</td>
<td>245 (20.75%)</td>
</tr>
<tr>
<td>Pulses consumption (≥3 servings per week)</td>
<td>1,353 (24.78%)</td>
<td>1,071 (25.88%)</td>
<td>282 (20.16%)</td>
</tr>
<tr>
<td>Fish/seafood consumption (≥3 servings per week)</td>
<td>3,107 (57.84%)</td>
<td>2,494 (60.07%)</td>
<td>613 (48.55%)</td>
</tr>
<tr>
<td>Consumption of commercial (not homemade) pastry (&lt;2 servings per week)</td>
<td>3,476 (59.67%)</td>
<td>2,546 (58.95%)</td>
<td>930 (62.70%)</td>
</tr>
<tr>
<td>Nuts consumption (≥3 servings per week)</td>
<td>757 (15.48%)</td>
<td>658 (17.47%)</td>
<td>99 (7.19%)</td>
</tr>
<tr>
<td>Preference to eat chicken, turkey or rabbit instead of beef, pork, hamburgers or sausages</td>
<td>3,441 (61.15%)</td>
<td>2,581 (60.23%)</td>
<td>860 (64.94%)</td>
</tr>
<tr>
<td>Consumption of boiled vegetables, pasta, rice or other dishes with a sauce of tomato, garlic, onion or leeks sauted in olive oil (≥2 servings per week)</td>
<td>2,351 (47.79%)</td>
<td>1,825 (50.03%)</td>
<td>526 (38.41%)</td>
</tr>
</tbody>
</table>

Sample size is not constant due to missing data:

Promoting Food Security – PREDIMED (n=5,531)
Food Secure - PREDIMED (n=4,151)
Food Insecure - PREDIMED (n=1,380)

3.3 COMPARATIVE ANALYSIS OF FOOD INSECURE WITH FOOD SECURE HOUSEHOLDS

3.3.1 Socioeconomic and Lifestyle Factors Associated with Household Food Insecurity

Regarding the socioeconomic factors associated with food insecurity, we observed that women (OR=1.73; 95% IC: 1.37-2.18), less educated (10-12 years vs <12 years: OR=3.10; 95% IC 1.89-5.07; 5-9 years vs <12 years: OR=4.35; 95% IC 2.75-6.90; 0-4 years vs <12 years: OR=7.11; 95% IC 4.49-11.26) and individuals aged between 40-49 years (OR=2.28; 95% IC 1.05-4.97) and individuals aged between 50-59 years (OR=2.42; 95% IC 1.10-5.33) had a higher risk to be food insecure.

When comparing to individuals in a situation of full-time employment, households of the individuals part-time employed, domestic workers and unemployed were more likely to be food insecure (OR=1.68; 95% IC 1.23-2.30). Households living in Azores (OR=1.57; 95% IC 1.12-
2.20) and Madeira (OR=1.94; 95% IC 1.32-2.85) had also higher odds of being classified as food insecure.

Difficulties in living with the present income reported by the participants were independently associated with food insecurity (finding difficult in the present income vs living comfortably in the present income (OR=14.17; 95% IC 7.15-25.91) and (finding it very difficult in the present income vs living comfortably in the present income (OR=45.35; 95% IC 23.98-85.76) (Table 11).

Table 11. Sociodemographic variables associated with household food insecurity in Portuguese population.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Food Secure n=4,151</th>
<th>Food Insecure n=1,380</th>
<th>Crude OR (95% IC)</th>
<th>Adjusted OR (95% IC)*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Female</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-29</td>
<td>320 (17.31%)</td>
<td>35 (8.02%)</td>
<td>1.79 (1.40-2.28)</td>
<td>1.73 (1.37-2.18)</td>
</tr>
<tr>
<td>30-39</td>
<td>492 (20.7%)</td>
<td>113 (12.87%)</td>
<td>1.47 (0.60-3.58)</td>
<td>1.67 (0.73-3.82)</td>
</tr>
<tr>
<td>40-49</td>
<td>782 (18.0%)</td>
<td>267 (19.28%)</td>
<td>2.49 (1.06-5.88)</td>
<td>2.28 (1.05-4.97)</td>
</tr>
<tr>
<td>50-59</td>
<td>785 (14.28%)</td>
<td>358 (22.09%)</td>
<td>3.64 (1.54-8.60)</td>
<td>2.42 (1.10-5.33)</td>
</tr>
<tr>
<td>60-69</td>
<td>805 (13.61%)</td>
<td>307 (14.15%)</td>
<td>2.40 (1.01-5.67)</td>
<td>1.23 (0.56-2.69)</td>
</tr>
<tr>
<td>70-74</td>
<td>347 (6.04%)</td>
<td>144 (9.26%)</td>
<td>3.30 (1.23-8.82)</td>
<td>1.67 (0.69-4.01)</td>
</tr>
<tr>
<td>≥75</td>
<td>620 (10.07%)</td>
<td>273 (14.32%)</td>
<td>2.91 (1.23-6.88)</td>
<td>1.30 (0.61-2.81)</td>
</tr>
<tr>
<td><strong>Education level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 12 years</td>
<td>966 (28.04%)</td>
<td>86 (8.31%)</td>
<td>1.79 (1.40-2.28)</td>
<td>1.73 (1.37-2.18)</td>
</tr>
<tr>
<td>10-12 years</td>
<td>862 (27.01%)</td>
<td>187 (20.15%)</td>
<td>2.84 (1.64-4.93)</td>
<td>3.10 (1.89-5.07)</td>
</tr>
<tr>
<td>5-9 years</td>
<td>795 (18.61%)</td>
<td>327 (23.2%)</td>
<td>4.75 (2.98-7.57)</td>
<td>4.35 (2.75-6.90)</td>
</tr>
<tr>
<td>0-4 years</td>
<td>1,513 (26.35%)</td>
<td>879 (48.34%)</td>
<td>6.74 (4.33-10.49)</td>
<td>7.11 (4.49-11.26)</td>
</tr>
<tr>
<td><strong>NUTS II</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norte</td>
<td>1,243 (36.44%)</td>
<td>416 (36.49%)</td>
<td>1.79 (1.40-2.28)</td>
<td>1.73 (1.37-2.18)</td>
</tr>
<tr>
<td>Lisboa</td>
<td>908 (25.67%)</td>
<td>223 (21.58%)</td>
<td>0.81 (0.57-1.16)</td>
<td>1.03 (0.67-1.57)</td>
</tr>
<tr>
<td>Alentejo</td>
<td>243 (7.13%)</td>
<td>77 (7.58%)</td>
<td>1.07 (0.73-1.56)</td>
<td>1.06 (0.72-1.56)</td>
</tr>
<tr>
<td>Algarve</td>
<td>127 (3.53%)</td>
<td>56 (4.55%)</td>
<td>1.19 (0.75-1.87)</td>
<td>1.27 (0.79-2.02)</td>
</tr>
<tr>
<td>Azores</td>
<td>430 (1.91%)</td>
<td>227 (3.1%)</td>
<td>1.66 (1.23-2.25)</td>
<td>1.57 (1.12-2.20)</td>
</tr>
<tr>
<td>Madeira</td>
<td>381 (2.10%)</td>
<td>230 (3.54%)</td>
<td>1.68 (1.20-2.35)</td>
<td>1.94 (1.32-2.85)</td>
</tr>
<tr>
<td><strong>Single-parent family</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>183 (4.58%)</td>
<td>104 (6.45%)</td>
<td>1.24 (1.04-1.48)</td>
<td>1.16 (0.96-1.40)</td>
<td></td>
</tr>
<tr>
<td><strong>Employment status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed full-time</td>
<td>1,870 (53.27%)</td>
<td>384 (32.56%)</td>
<td>1.24 (1.04-1.48)</td>
<td>1.16 (0.96-1.40)</td>
</tr>
<tr>
<td>Employed part-time</td>
<td>134 (4.09%)</td>
<td>56 (3.52%)</td>
<td>1.46 (0.91-2.34)</td>
<td>-</td>
</tr>
<tr>
<td>Domestic worker</td>
<td>265 (3.95%)</td>
<td>185 (7.72%)</td>
<td>3.41 (2.46-4.72)</td>
<td>-</td>
</tr>
<tr>
<td>Unemployed</td>
<td>299 (9.43%)</td>
<td>205 (17.93%)</td>
<td>3.28 (1.98-5.45)</td>
<td>-</td>
</tr>
<tr>
<td>Student</td>
<td>79 (3.63%)</td>
<td>9 (1.21%)</td>
<td>0.43 (0.19-1.01)</td>
<td>-</td>
</tr>
<tr>
<td>Temporarily work disabled</td>
<td>64 (1.19%)</td>
<td>50 (3.12%)</td>
<td>4.63 (2.71-7.89)</td>
<td>-</td>
</tr>
<tr>
<td>Retired</td>
<td>1,434 (24.44%)</td>
<td>574 (33.95%)</td>
<td>2.24 (1.74-2.88)</td>
<td>-</td>
</tr>
</tbody>
</table>
Regarding anthropometric data, a higher proportion of overweight and obesity was found in the individuals of food insecure households (39.59% of overweight and 21.66% of obesity vs 37.20% of overweight and 14.29% of obesity in individuals from food secure households).

Although, after adjustment for age group, gender, educational level, employment status and Nuts II, our results showed that overweight and obesity were not independently associated with household food insecurity (Table 12).

Table 12. Anthropometric data and its association with household food insecurity in Portuguese population.

<table>
<thead>
<tr>
<th></th>
<th>Food Secure n=4,151</th>
<th>Food Insecure n=1,380</th>
<th>Crude OR (95% IC)</th>
<th>Adjusted OR (95% IC)*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body Mass Index (kg/m²)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>71 (2.28%)</td>
<td>17 (1.41%)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Normal weight</td>
<td>1,611 (46.23%)</td>
<td>398 (37.34%)</td>
<td>1.27 (0.57-2.84)</td>
<td>1.30 (0.52-3.23)</td>
</tr>
<tr>
<td>Overweight</td>
<td>1,583 (37.20%)</td>
<td>515 (39.59%)</td>
<td>1.69 (0.77-3.72)</td>
<td>1.42 (0.57-3.56)</td>
</tr>
<tr>
<td>Obesity</td>
<td>668 (14.29%)</td>
<td>311 (21.66%)</td>
<td>2.43 (1.10-5.40)</td>
<td>1.73 (0.70-4.31)</td>
</tr>
</tbody>
</table>

*Adjusted for age group, gender, educational level, employment status and Nuts II

Sample size is not constant due to missing data.
The individuals from the food insecure households were less commonly to have a daily consumption of alcohol (OR=0.60; 95% IC 0.43-0.82). Furthermore, physical inactivity was not independently associated with household food insecurity (Table 13).

Table 13. Lifestyle characteristics associated with household food insecurity in Portuguese population.

<table>
<thead>
<tr>
<th></th>
<th>Food Secure n=4,151</th>
<th>Food Insecure n=1,380</th>
<th>Crude OR (95% IC)</th>
<th>Adjusted OR (95% IC)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol intake</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily</td>
<td>1,259 (30.82%)</td>
<td>306 (25.36%)</td>
<td>0.53 (0.39-0.72)</td>
<td>0.60 (0.43-0.82)</td>
</tr>
<tr>
<td>Occasionally</td>
<td>1,575 (41.3%)</td>
<td>445 (32.86%)</td>
<td>0.53 (0.40-0.70)</td>
<td>0.77 (0.56-1.05)</td>
</tr>
<tr>
<td>Never</td>
<td>1,305 (27.88%)</td>
<td>640 (41.78%)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Alcohol intake profile</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 3 alcohol units vs less</td>
<td>151 (14.45%)</td>
<td>36 (14.28%)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Smoking habits</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Past smoker</td>
<td>653 (21.28%)</td>
<td>223 (22.51%)</td>
<td>1.03 (0.78-1.35)</td>
<td>1.47 (1.01-2.13)</td>
</tr>
<tr>
<td>Current smoker</td>
<td>900 (21.11%)</td>
<td>249 (21.29%)</td>
<td>1.13 (0.77-1.65)</td>
<td>1.69 (1.13-2.54)</td>
</tr>
<tr>
<td>Occasionally</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>2,590 (57.6%)</td>
<td>920 (56.21%)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Physical activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular</td>
<td>1,895 (46.67%)</td>
<td>466 (37.16%)</td>
<td>0.28 (0.24-0.32)</td>
<td>0.85 (0.64-1.13)</td>
</tr>
</tbody>
</table>

*Adjusted for age group, gender, educational level, employment status and Nuts II

Sample size is not constant due to missing data:
Promoting Food Security- Alcohol intake (n=5,530); Smoking habits (n=5,535); Physical activity (n=5,648)
Food Secure - Alcohol intake (n=4,139); Smoking habits (n=4,143); Physical activity (n=4,151)
Food Insecure - Alcohol intake (n=1,391); Smoking habits (n=1,392); Physical activity (n=1,497)

The adherence to MD was inversely associated with household food insecurity (OR=0.44; 95% IC 0.31-0.62), even after the adjustment for age, gender, educational level, employment status and Nuts II. Household food insecurity was inversely associated with the consumption of some typical food or food groups of the MD, in particularly olive oil, vegetables and fruit, fish/seafood, nuts. Individuals from the food insecure households had a lower tendency to use olive oil as principal source of fat for cooking (OR=0.63; 95% IC 0.46-0.87), to have a consumption of vegetables ≥2 servings per day (OR=0.77; 95% IC 0.61-0.97), a consumption of fruit ≥3 servings per day (OR=0.68; 95% IC 0.47-1.00), a consumption of fish/seafood ≥3 servings per week (OR=0.71; 95% IC 0.54-0.93) and a consumption of nuts ≥3 servings per week (OR=0.48; 95% IC 0.34-0.68). However, household food insecurity seems to be positively associated with other some characteristics of the MD, in particular to a higher tendency to have a consumption of red meat, hamburger or sausages <1 per day (OR=1.91; 95% IC 1.45-2.53) and to have a consumption of butter, margarine or cream <1 per day (OR=1.10; 95% IC 0.85-1.42) (Table 14).
Table 14. Mediterranean diet association with household food insecurity in Portuguese population.

<table>
<thead>
<tr>
<th></th>
<th>Food Secure n=4,151</th>
<th>Food Insecure n=1,380</th>
<th>Crude OR (95% IC)</th>
<th>Adjusted OR (95% IC)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low adherence to MD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use olive oil as principal source of fat for cooking</td>
<td>3,720 (89.86%)</td>
<td>1,166 (84.74%)</td>
<td>0.70 (0.53-0.93)</td>
<td>0.63 (0.46-0.87)</td>
</tr>
<tr>
<td>Olive oil consumption (&gt; 4 Tbsp)</td>
<td>927 (22.33%)</td>
<td>208 (15.07%)</td>
<td>0.55 (0.43-0.70)</td>
<td>0.60 (0.46-0.78)</td>
</tr>
<tr>
<td>Vegetables consumption (≥2 servings per day)</td>
<td>1,006 (24.24%)</td>
<td>271 (19.64%)</td>
<td>0.80 (0.64-0.99)</td>
<td>0.77 (0.61-0.97)</td>
</tr>
<tr>
<td>Fruit consumption (≥3 servings per day)</td>
<td>1,450 (34.93%)</td>
<td>323 (23.41%)</td>
<td>0.71 (0.52-0.96)</td>
<td>0.68 (0.47-1.00)</td>
</tr>
<tr>
<td>Consumption of red meat, hamburger or sausages (&lt;1 per day)</td>
<td>2,985 (71.91%)</td>
<td>1,130 (81.88%)</td>
<td>2.07 (1.63-2.64)</td>
<td>1.91 (1.45-2.53)</td>
</tr>
<tr>
<td>Consumption of butter, margarine or cream (&lt;1 per day)</td>
<td>2,811 (67.72%)</td>
<td>1,017 (73.70%)</td>
<td>1.12 (0.87-1.44)</td>
<td>1.10 (0.85-1.42)</td>
</tr>
<tr>
<td>Carbonated and/or sugar-sweetened beverages consumption (&lt;1 per day)</td>
<td>3,562 (85.81%)</td>
<td>1,160 (84.06%)</td>
<td>0.94 (0.73-1.22)</td>
<td>0.80 (0.61-1.06)</td>
</tr>
<tr>
<td>Wine consumption (≥7 cups per week)</td>
<td>1,004 (24.19%)</td>
<td>245 (17.75%)</td>
<td>0.81 (0.62-1.07)</td>
<td>0.72 (0.54-0.96)</td>
</tr>
<tr>
<td>Pulses consumption (≥3 servings per week)</td>
<td>1,071 (25.80%)</td>
<td>282 (20.43%)</td>
<td>0.72 (0.56-0.93)</td>
<td>0.76 (0.58-1.01)</td>
</tr>
<tr>
<td>Fish/seafood consumption (≥3 servings per week)</td>
<td>2,494 (60.08%)</td>
<td>613 (44.42%)</td>
<td>0.63 (0.49-0.80)</td>
<td>0.71 (0.54-0.93)</td>
</tr>
<tr>
<td>Consumption of commercial (not homemade) pastry (&lt;2 servings per week)</td>
<td>2,546 (61.33%)</td>
<td>930 (67.39%)</td>
<td>1.17 (0.93-1.48)</td>
<td>1.03 (0.78-1.35)</td>
</tr>
<tr>
<td>Nuts consumption (≥3 servings per week)</td>
<td>658 (15.85%)</td>
<td>99 (7.17%)</td>
<td>0.37 (0.27-0.50)</td>
<td>0.48 (0.34-0.68)</td>
</tr>
<tr>
<td>Preference to eat chicken, turkey or rabbit instead of beef, pork, hamburgers or sausages</td>
<td>2,581 (62.57%)</td>
<td>860 (62.45%)</td>
<td>1.22 (0.99-1.51)</td>
<td>1.22 (0.98-1.52)</td>
</tr>
<tr>
<td>Consumption of boiled vegetables, pasta, rice or other dishes with a sauce of tomato, garlic, onion or leeks sautéed in olive oil (≥2 servings per week)</td>
<td>1,825 (43.97%)</td>
<td>526 (38.12%)</td>
<td>0.62 (0.50-0.77)</td>
<td>0.71 (0.55-0.93)</td>
</tr>
</tbody>
</table>

*Adjusted for age group, gender, educational level, employment status and NUTII

Sample size is not constant due to missing data:
Promoting Food Security – PREDIMED (n=5,531)
Food Secure- PREDIMED (n=4,151)
Food Insecure - PREDIMED (n=1,380)

3.3.2 The Impact of Food Insecurity on Health and Health resources Consumption

Regarding the self-reported noncommunicable diseases, after adjustment for age, gender, educational level, employment status and NUTII, diabetes (OR=1.69; 95% IC 1.20-2.40) and pulmonary disease (OR=1.67; 95% IC 1.14-2.45) is independently associated with household...
food insecurity. Diagnosed rheumatic disease is also independently associated with household food insecurity (OR= 1.67; 95% IC 1.07-2.60).

The individuals of the food insecure households had on average a lower quality of life EQ5D score (OR=0.18; 95% IC 0.11-0.31) and a higher physical disability HAQ score (OR=2.59; 95% IC 2.04-3.29). Individuals of the food insecure households showed a higher risk of having depression symptoms (OR=1.50; 95% IC 1.09-2.06) (Table 15).

Table 15. Health status variables associated with household food insecurity in Portuguese population.

<table>
<thead>
<tr>
<th>Number of non-communicable diseases (self-reported)</th>
<th>Food Secure n=4,151</th>
<th>Food Insecure n=1,380</th>
<th>Crude OR (95% IC)</th>
<th>Adjusted OR (95% IC)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>High blood pressure</td>
<td>1,263 (22.47%)</td>
<td>567 (34.07%)</td>
<td>1.78 (1.43-2.23)</td>
<td>1.23 (0.94-1.62)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>433 (7.53%)</td>
<td>234 (15.18%)</td>
<td>2.20 (1.56-3.10)</td>
<td>1.69 (1.20-2.40)</td>
</tr>
<tr>
<td>Pulmonary disease</td>
<td>1,444 (23.27%)</td>
<td>546 (33.56%)</td>
<td>1.67 (1.33-2.08)</td>
<td>1.19 (0.93-1.52)</td>
</tr>
<tr>
<td>Hyperuricemia</td>
<td>94 (1.84%)</td>
<td>31 (2.24%)</td>
<td>1.23 (0.75-2.00)</td>
<td>1.16 (0.71-1.91)</td>
</tr>
<tr>
<td>Cardiac disease</td>
<td>135 (5.03%)</td>
<td>71 (2.78%)</td>
<td>2.32 (1.59-3.36)</td>
<td>1.67 (1.14-2.45)</td>
</tr>
<tr>
<td>Gastrointestinal disease</td>
<td>369 (8.25%)</td>
<td>168 (11.63%)</td>
<td>1.46 (1.07-2.01)</td>
<td>1.21 (0.87-1.68)</td>
</tr>
<tr>
<td>Neoplasic disease</td>
<td>219 (22.47%)</td>
<td>93 (34.07%)</td>
<td>1.28 (0.89-1.84)</td>
<td>1.06 (0.73-1.55)</td>
</tr>
<tr>
<td>Depression</td>
<td>285 (4.96%)</td>
<td>165 (10.89%)</td>
<td>2.34 (1.77-3.11)</td>
<td>1.50 (1.09-2.06) **</td>
</tr>
<tr>
<td>Anxiety</td>
<td>190 (3.68%)</td>
<td>78 (4.22%)</td>
<td>1.15 (0.80-1.66)</td>
<td>0.79 (0.52-1.21) **</td>
</tr>
</tbody>
</table>

*Adjusted for age group, gender, educational level, employment status and Nuts II

**Adjusted for age group, gender, educational level, employment status, Nuts II, number of non-communicable and diagnosis of rheumatic disease.

Table 15. Health status variables associated with household food insecurity in Portuguese population.

<table>
<thead>
<tr>
<th>Diagnosis of rheumatic disease</th>
<th>Food Secure n=4,151</th>
<th>Food Insecure n=1,380</th>
<th>Crude OR (95% IC)</th>
<th>Adjusted OR (95% IC)**</th>
</tr>
</thead>
<tbody>
<tr>
<td>High blood pressure</td>
<td>1,263 (22.47%)</td>
<td>567 (34.07%)</td>
<td>1.78 (1.43-2.23)</td>
<td>1.23 (0.94-1.62)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>433 (7.53%)</td>
<td>234 (15.18%)</td>
<td>2.20 (1.56-3.10)</td>
<td>1.69 (1.20-2.40)</td>
</tr>
<tr>
<td>Pulmonary disease</td>
<td>1,444 (23.27%)</td>
<td>546 (33.56%)</td>
<td>1.67 (1.33-2.08)</td>
<td>1.19 (0.93-1.52)</td>
</tr>
<tr>
<td>Hyperuricemia</td>
<td>94 (1.84%)</td>
<td>31 (2.24%)</td>
<td>1.23 (0.75-2.00)</td>
<td>1.16 (0.71-1.91)</td>
</tr>
<tr>
<td>Cardiac disease</td>
<td>135 (5.03%)</td>
<td>71 (2.78%)</td>
<td>2.32 (1.59-3.36)</td>
<td>1.67 (1.14-2.45)</td>
</tr>
<tr>
<td>Gastrointestinal disease</td>
<td>369 (8.25%)</td>
<td>168 (11.63%)</td>
<td>1.46 (1.07-2.01)</td>
<td>1.21 (0.87-1.68)</td>
</tr>
<tr>
<td>Neoplasic disease</td>
<td>219 (22.47%)</td>
<td>93 (34.07%)</td>
<td>1.28 (0.89-1.84)</td>
<td>1.06 (0.73-1.55)</td>
</tr>
<tr>
<td>Depression</td>
<td>285 (4.96%)</td>
<td>165 (10.89%)</td>
<td>2.34 (1.77-3.11)</td>
<td>1.50 (1.09-2.06) **</td>
</tr>
<tr>
<td>Anxiety</td>
<td>190 (3.68%)</td>
<td>78 (4.22%)</td>
<td>1.15 (0.80-1.66)</td>
<td>0.79 (0.52-1.21) **</td>
</tr>
</tbody>
</table>

*Adjusted for age group, gender, educational level, employment status and Nuts II

**Adjusted for age group, gender, educational level, employment status, Nuts II, number of non-communicable and diagnosis of rheumatic disease.

Table 15. Health status variables associated with household food insecurity in Portuguese population.

<table>
<thead>
<tr>
<th>Quality of Life</th>
<th>Food Secure n=4,151</th>
<th>Food Insecure n=1,380</th>
<th>Crude OR (95% IC)</th>
<th>Adjusted OR (95% IC)**</th>
</tr>
</thead>
<tbody>
<tr>
<td>EQ5D score</td>
<td>0.83 (0.25)</td>
<td>0.60 (0.40)</td>
<td>0.11 (0.08-0.17)</td>
<td>0.18 (0.11-0.31) **</td>
</tr>
</tbody>
</table>

*Adjusted for age group, gender, educational level, employment status and Nuts II

**Adjusted for age group, gender, educational level, employment status, Nuts II, number of non-communicable and diagnosis of rheumatic disease.

Table 15. Health status variables associated with household food insecurity in Portuguese population.

<table>
<thead>
<tr>
<th>Physical Function</th>
<th>Food Secure n=4,151</th>
<th>Food Insecure n=1,380</th>
<th>Crude OR (95% IC)</th>
<th>Adjusted OR (95% IC)**</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAQ score (0-3)</td>
<td>0.27 (0.46)</td>
<td>0.66 (0.81)</td>
<td>2.99 (2.47-3.62)</td>
<td>2.59 (2.04-3.29) **</td>
</tr>
</tbody>
</table>

*Adjusted for age group, gender, educational level, employment status and Nuts II

**Adjusted for age group, gender, educational level, employment status, Nuts II, number of non-communicable and diagnosis of rheumatic disease.
Considering healthcare resource consumption, individuals from the food insecure households had been more often hospitalised (OR=1.57; 95% IC 1.18-2.07) and had gone more often to medical appointments (OR=1.48; 95% IC 1.12-1.94) since the last contact and presented a higher number of medical appointments (OR=1.07; 95% IC 1.04-1.11).

Individuals of the food insecure households were also more likely to have reported that stop medication due to economic constrains (OR=5.13; 95% IC 3.86-6.82), as well as, that reduced the doctor visits due to economic constrains (OR=4.23; 95% IC 3.09-5.78) (Table 16).

Table 16. Healthcare resource consumption variables associated with household food insecurity in Portuguese population.

<table>
<thead>
<tr>
<th></th>
<th>Food Secure n=4,151</th>
<th>Food Insecure n=1,380</th>
<th>Crude OR (95% IC)</th>
<th>Adjusted OR (95% IC)*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Was hospitalized since last contact</strong></td>
<td>498 (9.86%)</td>
<td>223 (15.91%)</td>
<td>1.73 (1.35-2.21)</td>
<td>1.57 (1.18-2.07)</td>
</tr>
<tr>
<td><strong>Went to medical appointments since last contact</strong></td>
<td>3,796 (90.43%)</td>
<td>1,283 (92.40%)</td>
<td>1.29 (0.91-1.81)</td>
<td>1.11 (0.75-1.64)</td>
</tr>
<tr>
<td><strong>Went to medical appointments in hospitals since last contact</strong></td>
<td>1,375 (36.17%)</td>
<td>636 (48.62%)</td>
<td>1.67 (1.31-2.13)</td>
<td>1.48 (1.12-1.94)</td>
</tr>
<tr>
<td><strong>Went to medical appointments in primary health care centers since last contact</strong></td>
<td>2,940 (81.65%)</td>
<td>1,119 (86.22%)</td>
<td>1.41 (1.07-1.85)</td>
<td>1.27 (0.92-1.76)</td>
</tr>
<tr>
<td><strong>Number of medical appointments in public sector since last contact</strong></td>
<td>2.87 (±3.48)</td>
<td>4.80 (±5.87)</td>
<td>1.11 (1.08-1.13)</td>
<td>1.07 (1.04-1.11)</td>
</tr>
<tr>
<td><strong>Number of medical appointments in private sector since last contact</strong></td>
<td>1.27 (±3.77)</td>
<td>0.99 (±3.77)</td>
<td>0.97 (0.92-1.02)</td>
<td>1.00 (0.95-1.05)</td>
</tr>
</tbody>
</table>

**Chronic disease management difficulties**

| Medication non-adherence due to economic constrains | 168 (3.07%) | 324 (18.67%) | 7.26 (5.53-9.54) | 5.13 (3.86-6.82) |
| Reduction in visits to medical appointments due to economic constrains | 223 (3.89%) | 285 (16.99%) | 5.06 (3.86-6.62) | 4.23 (3.09-5.78) |

**Adjusted for age group, gender, educational level, employment status, Nuts II, number of non-communicable and diagnosis of rheumatic disease.**

Sample size is not constant due to missing data:

Promoting Food Security - Was hospitalized since last contact (n=5,530); Went to medical appointments since last contact (n=4,079); Went to medical appointments in hospitals since last contact (n=4,869); Went to medical appointments in primary health care centers since last contact (n=4,874); Medication reduction due to economic constrains (n=5,517); Doctor visits reduction due to economic constrains (n=5,525)

Food Secure- Was hospitalized since last contact (n=4,150); Went to medical appointments since last contact (n=3,796); Went to medical appointments in hospitals since last contact (n=3,565); Went to medical appointments in primary health care centers since last contact (n=3,565); Medication reduction due to economic constrains (n=4,142); Doctor visits reduction due to economic constrains (n=4,147)

Food Insecure - Was hospitalized since last contact (n=1,380); Went to medical appointments since last contact (n=1,283); Went to medical appointments in hospitals since last contact (n=1,304); Went to medical appointments in primary health care centers since last contact (n=1,309); Medication reduction due to economic constrains (n=1,375); Doctor visits reduction due to economic constrains (n=1,378)
4 DISCUSSION AND CONCLUSION

In Work package 2 of Promoting Food Security project, we have performed the first large-scale epidemiological population-based study that evaluated Food Insecurity in Portugal. In this study we determined the prevalence of food insecurity and its socioeconomic determinants. Moreover, we aimed to determine the impact of Food Insecurity on health and healthcare resources consumption.

We found that Food insecurity is highly prevalent in Portugal (19.3%) in particularly Azores and Madeira Islands are the two most affected regions by food insecurity.

As we know, few studies have been conducted in Portugal on food insecurity. Data from the last Portuguese National Health Survey estimated a prevalence of 16.7% for household food insecurity between 2005 and 2006 (27). Comparing to these results, our study suggested an increasing trend in the prevalence of food insecurity during the last 10 years. These results may reflect the impact of economic crisis in the Portuguese population.

In fact, our results are in line with the last European Union Statistics on Income and Living Conditions (EU-SILC) results. EU-SILC 2015 data showed that 19.0% of Portuguese population was at-risk-of-poverty. With regards to income inequalities indicators, Portugal has seen increases in their income inequality (S80/S20) of almost 0.4 percentage points during 2009-12. The 20% of the population with the highest equalised disposable income received 5.9 times as much income as the 20% of the population with the lowest equivalent disposable income. Moreover, the Gini coefficient for Portugal was 33.9% in 2015 (28). The median equalised disposable income also suffered a reduction in Portugal during the economic crisis, it fell by 4.4% between 2009 and 2010 (29).

Portuguese prevalence of food insecurity is higher to the one reported in other countries, such as USA, Canada and France. For the USA, a prevalence of 12.7% of food insecurity was found in 2015 (30), 12.0% in Canada in 2014 (31) and 12.0% in Paris, France in 2006-2007 (32). The highest prevalence of food insecurity observed in Portugal, comparing with prevalence observed in the other countries above described can be associated with the great economic depression and social instability that Portugal was experiencing during the period of data collection.

Food insecurity has shown to be influenced by different socio-demographic characteristics. In fact, females and older adults (over 50 years old) reported more frequently food insecurity. Moreover, been unemployed or having a precarious employment condition, being single parent family, having low education and reporting insufficient household income perception revealed to be major determinants of food insecurity in Portugal.

In Promoting Food Security work package 2, food insecurity was significantly associated to low adherence to Mediterranean food, obesity and lower levels of physical activity. These results are in agreement with findings of other countries where social inequalities have been associated with some determinants of obesity (33-37) and other diet-related noncommunicable diseases, such as unhealthy dietary habits and lower levels of physical activity, which also seem to be more common in lower socioeconomic groups (38-40).
Regarding the impact of food insecurity on health and health related issues; we found that subjects with food insecurity reported worse QoL and more disability when compared to subjects without food security. Moreover, higher proportion of subjects with food insecurity has diabetes and rheumatic diseases when compared with subjects with food security. However, we did not found significant differences among other self-reported chronic diseases such as high blood pressure, cardiovascular diseases and cancer. Diet-related noncommunicable diseases became the leading cause of death and disease in Western societies, during the last decades, representing around 77% of the total burden of disease in Europe. In fact, our results are in agreement with the ones provided by other countries were they found a strong evidence that underprivileged people, who commonly live in food insecurity conditions, have a higher risk of poor health ([41-46]). Different studies have found an association between socioeconomic status and health, in which socioeconomically vulnerable groups experience higher mortality and morbidity rates for coronary heart disease ([47]), atherosclerosis, Type 2 diabetes mellitus ([48, 49]) and some cancers ([50, 51]).

In our work we also have verified that higher proportion of subjects with food insecurity reported mental illness in particular depression symptoms. Moreover, citizens with food insecurity reported more often difficulties in chronic diseases management because they refer more often medication non-adherence and medical appointments reduction due to economic constrains. These findings will for sure lead to worsen their health status and decreased disease control.

We also found that Food Insecurity in Portugal is associated with higher proportion of hospitalizations and hospital clinical appointments. Strengthening the fact that the poor disease control in food insecurity subjects leads to higher health resources consumption.

In conclusion, Work package 2 of Promoting Food Security project provided strong and robust evidence that Food Insecurity is a public health problem that leads to obesity, chronic diseases and poor disease control and monitoring. Moreover, food insecurity leads to higher health resources consumption and hospitalizations. Work package 2 of Promoting Food Security project provided valuable data to increase awareness to the Food insecurity problem in Portugal, being a strong argument to encourage policy makers to increase the resources allocated to reduce social inequalities and poverty. Actually, at international level, the guarantee of food security, which is defined as a situation that exists “when all people at all times have access to sufficient, safe and nutritious food to maintain a healthy and active life” ([52]), becomes a priority action for food and nutrition policies. The most recent WHO European Region Food and Nutrition Action Plan 2015-2020, pointed for the first time, at the importance of the food security guarantee in its mission – “to guarantee universal access to food equity and gender equality for the nutrition of all citizens of the WHO European Region through intersectorial nutrition policies” ([53]).
5 REFERENCES

41. Mackenbach JP. Health inequalities: Europe in profile. UK Presidency of the EU. 2005
52. World Food Summit. Declaração de Roma Sobre a Segurança Alimentar e Plano de Ação da Cimeira Mundial de Alimentação. Roma; 1996.