Changes in eating patterns with a short and long term migration - A case study of Portuguese university students in London.

Sofia Vilela[a,b], Susana Santos[a,b], Patricia Padrão[b], Martin Caraher[a*]

[a] Centre for Food Policy, City University London, Northampton Square, EC1V0HB, London, United Kingdom;

[b] Faculty of Nutrition and Food Sciences at University of Porto, Rua Dr. Roberto Frias, 4200-465 Porto, Portugal;

[*] Corresponding author.

E-mail address: m.caraher@city.ac.uk (Martin Caraher)

"Not for publication"
+44 (0) 20 7040 4161 London

Abstract

Objective: To gauge the effect of different migration periods on the eating pattern of Portuguese university students.

Methods/subjects: Fifty-five Portuguese students participated in a survey of food practices before and after moving from Portugal to London. The students were divided into two groups, the short term migration group, living in London less than one year, and the long term migration group, living in London more than one year. Forty-six English university students were used as a comparison to the Portuguese students. A questionnaire was administrated to assess the frequency of eating selected food, factors which may influence food choice and food preparation and purchasing behaviours.

Results: After moving to London, the long term migration group adopted more dietary changes and seems to become more acculturated. Both Portuguese groups reported significant decrease in the weekly frequency of consumption of raw vegetables, fish, vegetable soup and red meat. The frequency of the consumption of savoury snacks, fast food and ready prepared meal increased and was similar to the English students' consumption.

Conclusion: These findings highlight the difficulties that Portuguese students faced in maintaining a traditional Mediterranean diet after moving to a Northern European environment.

Keywords: University students; Migration; Food practices; Mediterranean diet

Introduction

Dietary habits are established in early life and can have a significant effect on the health of individuals in the long term (Birch, 1998; Blane et al., Abraham, 2003; Cooke, 2007). As mentioned by World Health Organization most of type 2 diabetes cases, 80% of cases of cardiovascular diseases and 30% of all the cases of cancers can be avoided with healthy lifestyle practice, such as, healthier diet, regular physic activity and stopping smoking (Waxman, 2003). A greater adherence to a Mediterranean diet is associated with a significant reduction in overall mortality, mortality from cardiovascular diseases, incidence of or mortality from neoplastic and neurodegenerative diseases (de Lorgeril and Salen, 2007; Sofi et al., 2009; Sofi et al 2008). Southern European countries are characterized by a Mediterranean food pattern, rich in monounsaturated fatty acids (high consumption of olive oil), low consumption of saturated fatty acids and a high intake of carbohydrates (Cruz, 2000). Portugal is a good example regarding this lifestyle practices, characterized by a diet rich in fish, fruit, vegetables and olive oil, privileged added fat (Nestle, 1995). Although, it seems that Portugal is decreasing adherence to Mediterranean food patterns towards a more industrialized diet, relatively faster than others Mediterranean countries (Rodrigues et al., 2008; Chen and Marques-Vidal, 2007).

The affect of long term migration on diet is well documented in many studies (Gregory-Mercado et al., 2006; Sharma et al.,1999; Wahlqvist, 2002). There are a fewer studies investigating the effect of temporary migration on eating habits. Studies of international students, among others, suggest that even a short term migration can result in significant and often undesirable changes in eating patterns (Kremmyda et al., 2008; Papadaki and

Scott, 2002; Perez-Cueto et al., 2009; Wandel et al., 2008). The process which a minority group adopts the dietary practice of the host country is called dietary acculturation and can be multidimensional, dynamic and complex (Satia-Abouta et al., 2002). Dietary acculturation can be observed on migration to another country and might be detrimental for health when it associated with changes, such as, less healthy diet (Lassetter and Callister, 2009). Satia-About a et al. (2002) found that highly educated immigrants and those with similar cultural or physical characteristics with the host country, are more likely to acculturate with considerable facility, which may mean adopting of some unhealthy practices. Many studies pointed out the difficulties that the immigrants have in maintaining their traditional eating habits (Ayala et al., 2008; Lv and Cason, 2004; Pan et al., 1999; Sukalakamala and Brittin, 2006; Yang et al., 2007). It has also been described that younger immigrants tend to change their food habits more quickly than older immigrants (Lee et al., 1999; Pan et al., 1999; Roshania et al., 2008).

The aim of this study was to distinguish the changes that occur in the eating patterns of students Portuguese at London universities, with a short or long length of residence. To the knowledge of the authors, this is the first study to investigate the effect of length of migration on the eating patterns of Portuguese university students.

Materials and Methods

Participants

Portuguese and English students (n= 101) enrolled at universities in London were invited to participated in this study during the period February-march, 2009. The criteria for inclusion were Portuguese nationality; Portuguese students were required to have lived in London for less than ten years and more than one month. Recruitment strategies, for the Portuguese sample (n=55), included a flyer on the London universities´ student union and on the notice letter to the international students. They were also recruited sending an email with the flyer to universities in London and in Portugal and to the Portuguese students. The students interested in to participate in the study were invited to a face-to-face interview. The Portuguese students were asked to invite an English student from their university to participate in the study (n=28). The English sample was supplemented by recruitment in the library or student union of their universities (n=18). Twelve London Universities were represented in this study. All participants gave informed consent prior to their participation in the study. Data were collected anonymously and stored in a non-identifiable format. The study was approved by the Ethics Committee of University of Porto, Portugal and was conducted between April and May of 2009.

Questionnaire development

A questionnaire administered by the researchers was used to obtain data about socio-demographic characteristics, consumption frequency of selected food items, food choice determinants and food preparation and purchasing behaviours. The questionnaire language was English to the English students and Portuguese to the Portuguese students. For purposes of this study, the data related to food choice determinants was not

analyzed. The focus was on weekly frequency consumption of selected foods and food preparation and purchasing behaviours. Socio-demographic information included information about age, sex, living arrangement in London, field of study, conditions that requires a special diet as well weight and height (those anthropometric measures were self reported and Body Mass Index - BMI was then calculated). The Portuguese sample also had questions about their living arrangement in Portugal and their weight and height immediately before coming to London.

The first part of the questionnaire included a food frequency questionnaire adapted from a previously validated one used locally to assess the eating habits of Portuguese adults (Lopes, 2000). The questionnaire was modified from an eighty-six item semi-quantitative food frequency questionnaire to a sixty-eight item qualitative food frequency questionnaire. The alterations included were to join some food items in the same item and inclusion of some typical English food, such as, porridge, fish fingers, flavoured milk and tea with milk, based on the report by Scientific Advisory Committee on Nutrition (SACN, 2008), a survey analysis of British dietary practices. Consumption frequency for each food item was measured by the response 'Never or less than once a month', '1-3 per month', '1 per week', '2–4 per week', '5–6 per week', '1 per day', '2–3 per day', '4–5 per day' and '6+ per day'. Subjects were asked the number of times each day, week or month specific food item were consumed. The Portuguese sample rated twice each food item; the fist rating reflected frequency of consumption of the last year while living in Portugal and the second rating reflected consumption after arrival in London regarding their last year in London or since they were in London. The English

sample only had to fill the questionnaire regarding their usual diet in the last year in London.

The last part of the questionnaire was based on the work of Papadaki and Scott (2002), Larson et al (2006) and Pettinger et al (2006). It included a question which only applied to Portuguese students. They were asked their opinion about the availability of food in London, compared to Portugal. The other two questions were applied to the Portuguese and English students. The first question of those two, evaluated how often the subject perform some behaviours on a typical month in London (the whole sample) and in Portugal (only Portuguese sample). The behaviours included how often they write a grocery list, prepare a soup, use ready prepared meals or eat fast food/take away and were evaluated by the responses 'never', '1–3 per month', '2–4 per week', '5–6 per week' and 'every day'. The last question is related to the perception concerning cooking skills, resources and factors that influence the food preparation and purchasing behaviors. The degree of adequacy perceived was evaluated with the response options 'adequate' and 'inadequate'. The Portuguese students had to answer regarding the situation in Portugal and in London.

Statistical analysis

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS for Windows, release 14.0, 2005) software. Weekly consumption frequencies of selected food items and performances frequency of certain behaviours were calculated in order to conduct within group and between group comparisons. Data for individual food items in the food frequency questionnaire and behaviours in the food preparation

and purchasing behaviours questionnaire were transformed into weekly frequencies. For this purpose, '6+ per day' became 6 times per day, '4–5 times per day' became 4.5 times per day, '2–3 times per day' became 2.5 times per day and so on. Daily grouped frequency values were multiplied by seven (days/week) and monthly grouped frequency values were divided by four (weeks/month) to calculate weekly frequencies. The frequency value 'never or less than once per month' was considered 0 times per week. The consumption frequency of seasonal foods (appointed by the participants) was also multiplied by seasonal variation factor (0.25). Because the majority of the variables were non-parametric, evaluated with the kolmogorov-Sminorv test, non-parametric test were used in the statistical analyze. The Mann-whitney test was used to detected differences on eating patterns between the two Portuguese group and English group. The wilcoxon signed ranks test was used to compare eating patterns before and after moving to London. The coefficient of Spearman was calculated to compare correlation between Portuguese and English groups. Descriptive statistics (percentages) were calculated to examine the frequency of each food preparation and purchasing behaviour, attitudes towards food availability and the degree of adequacy perceived in skills and for food preparation. The significance was defined as $p < 0.05$ (two-sided).

Results

Sample characteristics

Fifty-five Portuguese students were identified in London universities and completed a usable questionnaire. The age mean of the students was 24.5 ± 3.8 years and the majority (52.7%) was females. The mean period/time of residency was 25.65 ± 26.26 months. Forty-six English university students participated in this study. The age mean

was 22.7 ± 3.0 years and females were the majority (67.4%). No student related having a disease that requires a special diet. There were no statistically significant differences in gender distribution between students with a short or long term migration (p=0.683) and between Portuguese and English students (p=0.137). The majority of Portuguese (91%) and English (96%) students were studying non-nutrition/food/agriculture related courses. The short term migration group (living in London less than one year) had a mean age of 23.3 ± 3.15 years and a length of stay of 4.48 ± 2.65 months. The long term migration group (living in London more than one year) had a mean age of 25.6 ± 4.0 years and a length of stay of 46.07 ± 22.16 months. Table 1 show that Portuguese students changed their living arrangements with the migration. The majority of Portuguese students before coming to London lived at family home and in London the majority lived with friends. The majority of English students lived with friends.

There were no statistical significant differences in reported BMI after and before London in the short term migration group. In the long term migration group, the BMI increased significantly (22.84 ± 3.21 kg/m^2 in Portugal v. 23.84 ± 3.53 kg/m^2 in London, p=0.026). It was not possible calculate the BMI of English student because almost half of the participants refused to report or did not know their weight and height.

Within group (short term migration) comparison of mean weekly frequencies of eating selected foods before and after moving to London

As can be observed in table 2 (first 3 columns) students living less than one year in London had changed some of their eating habits, compared with the eating habits they had developed in Portugal. Some of the dietary changes can be considered less

desirable changes. For example, they reported to have decreased significantly the weekly consumption of white fish, cod fish, shellfish, cooked and raw vegetables, vegetable soup and olive oil. They seem have substituted the homemade fried potatoes and others potatoes (boiled, roasted, stewed) for chips (take away/processed/oven ready) and crisps, they also had increased the consumption of hamburger and pizza. Others changes can be considered positive, for example, decreases in the consumption of ice creams and red meat, namely beef, pork, mutton and kid goat.

Within group (long term migration) comparison of mean weekly frequencies of eating selected foods before and after moving to London

Students living more than one year in London also had changed their weekly consumption of some foods (middle columns of table 2). Less desirable changes occurred in this group, such as, statistically significant decreases in the consumption per week of fresh fruit, vegetable soup, raw vegetable and all of the seafood types, except oily fish. They had increased hamburger and bacon consumption. Although not statistically significant, they tended to report a decrease in the consumption of cooked vegetables. Healthy changes can also be described, including statistically significant decreases in the consumption of coffee, red meat, ice cream, croissant, liver/heart/kidney and white bread. They also reported significantly increases in the consumption of tea, tea with milk and porridge, characteristic of the English diet.

Between group comparison (short and long term) of mean in weekly frequencies of eating selected foods

There were few statistically significant differences in the diets of the two Portuguese groups when they lived in Portugal. Students living less than one year in London had higher baseline frequency of consumption of cod fish (1.68 v. 1.07 servings/wk, p=0.011) and hamburger (0.59 v. 0.35 servings/wk, p=0.08) and lower baseline consumption of liver/heart/kidney (0.056 v. 0.35 servings/wk, p=0.08), nuts (0.22 v. 1.02 servings/wk, p=0.006) and fruit juice or nectars (1.10 v. 1.81 servings/wk, p=0.022). Table 3 shows that the statistical significant difference between the eating habits of the two Portuguese groups increased in London. Both groups reported decreases in the frequencies of consuming typical foods, like "broa" (one type of bread) and "Croquetes, rissois, bolinhos de bacalhau" (fried foods).

The two Portuguese groups reported changing their consumption of some foods in different directions; this can be seen in the example of milk and bread (table 2). The long term migration group had decreased significantly the consumption of semi skimmed milk and reported a trend to have decreased whole milk consumption while the short term migration group reported a trend to have increased the whole milk consumption. In the case of bread, the short term migration group tended to have increased white bread consumption. In the long term migration group, the consumption of white bread decreased significantly and they also reported increased consumption of whole meal bread.

Comparing Diets- Portuguese and English

The current diet of short term migration group had a stronger Spearman correlation with their diet in Portugal (0.802) than with the English diet (0.771). On the other hand, the long term migration group had a stronger Spearman correlation with the English diet (0,851) than with their diet in Portugal (0,795). The short term migration group had more statistical significant difference with the English group, than the long term migration group (table 2, last columns).

Comparing the eating habits of the English students and the eating habits of the Portuguese students before coming to London, we detected a trend among the long term migration group to that of the English group (Spearman correlation 0.749), than with the short term migration (0.682). However the increase of the Spearman correlation in the long term migration (0.749 to 0.851) is greater than the increase in the short term migration group (0.682 to 0.771). It was detected a trend in the two Portuguese groups to reduce the Spearman correlation between them (0.918 in Portugal to 0.857 in London) and to increase the Spearman correlation between the Portuguese and English groups in London, mainly the long term migration group.

Skills and resources for food preparation

Table 4 illustrates differences perception concerning skills and resources for food preparation by Portuguese and English students in London. The majority of both Portuguese groups considered that the time they have to prepare food, in London, is not adequate. The appliances for preparing food were reported as not being adequate for

the majority of short term migration group. Most of the English subject considered their skills and resources for food preparation to be adequate.

Attitudes towards food availability in London

Figure 1 and 2 illustrates the different attitudes of Portuguese students towards food availability in London. More students in the short term migration group considered that they had problems finding Portuguese food (74% v. 50%). Both groups had a similar percentage (59%) that didn´t agree with the statement "fresh fruit and vegetables are easy to find". More students in the long term migration group (43%) agree that the food in London is tastier against only 18% in the short term migration group. This could demonstrate a possible adaptation to the English food over the years. However more percentage in the long term migration reported facing problems to find good quality meat (78% v. 67%) and fresh fish (96% v. 82%). Almost all the subjects in the long term migration group (96%) and 89% in the short term migration group agreed that there was greater availability of fast food and take away in London. This greater availability of fast food and take away is reflected in the increase of consumption of this type of the food in both groups while living in London (table 5).

Discussion

After moving to London, the students in the long term migration group showed more dietary changes and seem to be more acculturated. The short term migration group showed some immediate changes to their dietary behaviors, whether this was due to changes in circumstances, like living away from home, lack of skills and knowledge (eg where to access food) or material circumstances (eg the demands of being a student) are

not clear. Both Portuguese groups reported significant decrease in the weekly frequency of consumption of raw vegetables, fish, vegetable soup and red meat. The frequency of the consumption of savoury snacks, fast food and ready prepared meal increased and was similar to the English students' consumption and may reflect issues of lifestyle and habit where snacks are consumed as part of the social exchange.

Mobile populations, where the international students are included, can move from their country to another country or migrate within a country. Some studies have focused on migrants who are generally poor and manual workers (Arah et al., 2008; Wandel et al., 2008) or on population groups after a couple of generations in the host country (Ayala et al., 2008; Franzen and Smith, 2009; Hawkins et al., 2008). International students constitute a specific group of talented people that move temporarily from their country to pursue higher education (Baruch et al., 2007). They have to develop specific strategies, including food procurement and purchasing strategies, to cope with different food and dietary changes (Perez-Cueto et al., 2009). A previous study with Greek students who moved to Glasgow reported unfavorable changes in the eating habits of the sample (Papadaki and Scott, 2002). This resonates with the findings of this study which indicate that Portuguese university students modified their diets after migration, in a generally undesirable direction. The dietary changes that occurred can be induced by moving away from home for the first time, (Papadaki et al., 2007). Changes in living arrangements was one of the most common reasons, suggested by Brevard and Ricketts (1996), to affect food choice in university students, who had responsibility for food preparation for the first time. Most of the Portuguese students, prior to moving to London, had lived in a family home. However, the subjects in the long term migration

group were living in London more than one year, so they may have gained some "survival skills" and local knowledge. In a previous study with Greek university students (Kremmyda et al., 2008), the authors separated the effect of dietary acculturation, with a translocation to Glasgow, on the eating habits of the students, from the effect of living away from home for the first time. Other factors that they reported was the astonishment of the students that supermarkets dominated the shopping experiences and the availability of out of season food all year round. They observed that the majority of dietary changes of Greek students in Glasgow were related, in part or exclusively, to their translocation from a Mediterranean to a Northern European environment. The current data suggest that the changes in the dietary habits of Portuguese students were, to a greater extent, related to their translocation to London. The comparison of Portuguese students' eating habits in Portugal and in London revealed a shift away from the Mediterranean diet (reflected in a decline in fruit and vegetables, legumes, vegetable soup and fish) towards a less healthy western style diet (reflected in an increase in chips (take-away/processed/oven ready), crisps and hamburger). A key facture of the Mediterranean diet is the relatively high intake of fruit and vegetables and a moderate intake of fish (Farah and Glick, 2008). The majority of Portuguese students reported having troubles finding fresh fruit and fish and vegetables; this can be one reason for such a pronounced decline in the weekly consumption of those foods. The consumption of oily fish did not decrease in either group; this can be due to the greater availability the oily fish in London, mainly salmon because since the mid-1990s oily fish like salmon has become cheaper and more available (SACN, 2008).

Red meat consumption decreased significantly in both Portuguese groups and this could be a consequence of the difficulty reported by the majority of the Portuguese students to find good quality meat in London; although, this alteration may be considered desirable for a health perspective (World Cancer Research Fund International, 2008).

Another important aspect of the Mediterranean diet is the use of olive oil, rich in monounsaturated fat, in preference to more saturated varieties of fats and oils (Farah and Glick, 2008). Although the consumption of fat spreads was only measured from the fat added to the plate and not the used to cook, a decrease in the use of olive oil was reported in the interviews with the short term migration group. This decrease in the consumption of olive oil and increase in consumption of processed snacks (such as crisps) and/or fast foods reported by Portuguese students is likely to result in an undesirable increase in the ratio of saturated fat to unsaturated fat in the diets of these students.

The undesirable changes in eating patterns of Portuguese students did not happen in the same way in short and long term migration groups; however, especially in the case of the students of long term migration group ,the eating habits reported could have had an effect of memory bias and no to be a directly effect of migration. For example, the short term migration group reported an initial increased in the consumption of chips (take-away/processed/oven ready), crisps and pizza who substitute other types of potatoes. In the long term migration group this increase in the consumption of chips (take-away/processed/oven ready), crisps and pizza was not verified, although the decrease in the consumption of other potatoes types remained. In both groups the

consumption of hamburger increased significantly, maybe because is a food easy to prepared, but the increased in the consumption of bacon only occurred in the long term migration group. The increased in the consumption of bacon in the long term migration group can be considered an acculturation effect, because this consumption is similar to the English students´ consumption. The decreased in the consumption of typical Portuguese foods by the Portuguese students can be explained by the difficulty that the majority of the students had to find Portuguese food in London.

Both Portuguese groups reported increases in the consumption of ready prepared meals and fast food/ take away, especially the short term migration group. The majority of Portuguese students agreed that there was greater availability of fast and take away food in London. In an earlier study in central England (Pettinger et al., 2006) more than half of the participants reported purchasing at least once a week a ready prepared meal and one fourth reported purchasing a take away meal at least once a week. These finding concur with those of our study where the mean of purchasing this type of meals was once a week, by the English students. The Portuguese groups, mainly the short term migration, increased in the consumption of processed food overtaking the English consumption. This increase could be related to the students eating at university, however in our study no attempt was made to evaluated how many times they eat in the university campus, especially in the canteens. This increase in the consumption of convenience food, by the Portuguese students, can be related to pressures on time, reported by the majority of Portuguese subjects, and because of its availability. In a previous study (Larson et al., 2006) important barriers were perceived by young adults to preparation of meal at home, such as cooking skills, money to buy food and time

available for food preparation. The increase of these types of food appears to be a stronger market of dietary acculturation once there is greater availability in London. In the case of the short term migration group, this increase could also be an effect of living away from home for the first time.

Longer residency in the host country, high education and fluency in the host languages are among the factors, appointed by Satia Abouta (2002), that increased exposure to mainstream culture and consequently, acculturation. Exposure to host culture may lead to changes in diet- and disease-related knowledge, attitudes, and belifes (Satia-Abouta et al., 2002). The long term migration group reported to have increased the consumption of English typical food such as, porridge and tea with milk, and also reported trend to increase in the consumption of flavored milk and fish fingers. Using more English foods reflect an acculturation process that may leave to some adverse dietary effects (Wandel et al., 2008). Length of time in the United States has been shown negatively impact on dietary behaviours (Barcenas et al., 2007) and also related to increase of obesity (Roshania et al., 2008). In this study the group with a higher length of migration, although with a normal weight, increased the BMI towards the class "overweight", as defined by the World Health organization (World Health Organization, 2000). This can be a negatively effect of acculturation in the health of the students with longer length of migration.

The effect of acculturation in the long term migration group can also be seen by comparing the Portuguese and English groups. The long term migration group is the Portuguese group with stronger correlation with the diet of English students. The

results of this study showed that, over the years, exits a trend to the Portuguese students to have a similar diet with the English students. These results agree with the postulation by Satia-Abouta (2002) that with the length of migration the acculturation effect increase. The short term migration group was the group with less change regarding the diet they had before moving to London, this can suggest some holding on to traditional models of food behaviours.

The Portuguese students also reported desirable changes in diet with migration. Both groups related a decrease in the consumption of ice creams and red meat. The decreased in the consumption of ice creams can be related with the translocation from a country often sunny to a northern climate country like England. The long term migration group also reported to have decreased the consumption of liver/heart/kidney, croissants and coffee. In the case of milk and bread, the long term migration group had a trend to do healthier alterations. No attempt was made to assess how these occurred. Future health promotion campaigns, such as dietary interventions and education programs, should take these changes into account.

The long term migration group although more acculturated seems be the group who made healthier changes. The students of the long term migration group were on average three years older than students with a short term migration. The diets of students in the first year of living away from home are likely to be worse than the diets of those who have lived away from home for several years. This can be observed in our results, the percentage of students of the long term migration that considered that their skills and

resources to preparation food and also knowledge to select food are adequate, was higher than the percentage in the short term migration group.

There are a number of limitations to this study, which limit the generalisability of the results. The mean of length of residency in the long term migration group was almost 4 years. This group could have memory problems regarding dietary habits prior moving to London who might have resulted in inaccurate self-reporting data. However, previous studies (Willet and Stampfer,1998) showed correlations 0,5 to 0,7 between recalled diets and originally measured after a period of 1 to 10 years. In this study there was no attempt to know the curricular year that the students were enrolled, this can be one limitation of this study because several studies related the first year in the university with the increased in the weight, which could be a result of a poorer diet (Hoffman et al., 2006; Delinsky and Wilson, 2008; Lowe et al., 2006; Anderson et al., 2003). One limitation of this study is that it is possible that the data about weekly intake of foods may be underestimated/ overestimated. The food frequency questionnaire is a list that records numbers of servings per day or week and may not had accounted for 'hidden' foods, for example vegetables added to meat stews (Cox et al., 1997). Although this error is through all three groups. To assume that 'times' were equal to 'portions' can also underestimated/overestimated the consumption of fruit and vegetables if the subjects have eaten more than one 'portion' each time they consumed these foods. Nevertheless, it is probable that this error was consistent in both questionnaires (English and Portuguese sample) and unlikely to affect the statistically significant decreases in the consumption by Portuguese students since living in London. Changes in eating patterns were evaluated qualitatively. Portions sizes were not included in the

questionnaires used and because of that it was not possible to calculate, assess and compare the nutrient content of students' diets. Another limitation of this study was the relatively small number of Portuguese students enrolled at London Universities and therefore the small size of the Portuguese sample. The English sample was also relatively small due to the survey being carried out in the examination period, when most of the students were either away from campus or busy studying.

Conclusion

Although the results of this study should be interpreted with caution, due to the limitations discussed above, they show that the both Portuguese groups changed their eating habits. Even though the long term migration group tended to have a healthier diet, both groups were losing the typical characteristics of a Mediterranean diet. The students, even with a short term migration, made relatively large dietary changes, generally in undesirable directions. Because the subjects were young adult students in a special situation, such as living in another country, these changes may be temporary and may not be comparable to population generally. Both groups showed influence of dietary acculturation that often leaved them to not so healthy eating patterns. The main factors perceived to the difficulty to maintaining traditional eating habits were the greater availability of convenience food, the lack of time, the poor quality of fresh produce and the difficulty to find Portuguese food. Cleary, more research is needed to assess the effect of integration in a host country- acculturation- on processes of change in food habits and consequences in the health. Understanding the process of acculturation, even in a short term migration, might help the migrant population to retain their traditional healthful eating patterns while adopting healthful dietary habits of their host country.

Bibliography

Anderson, D.A., Shapiro, J.R. & Lundgren, J.D. (2003). The freshman year of college as a critical period for weight gain: an initial evaluation. *Eating Behaviors*, 4(4), 363-7.

Arah, O. A., Ogbu, U. C., & Okeke, C. E. (2008). Too poor to leave, too rich to stay: developmental and global health correlates of physician migration to the United States, Canada, Australia, and the United kingdom. *American journal in Public health*, 98(1), 148-154.

Ayala, G. X., Baquero, B., & Klinger, S. (2008). A systematic review of the relationship between acculturation and diet among Latinos in the United States: implications for future research. *Journal of American Dietetic Association,* 108(8), 1330-1344.

Barcenas, C. H., Wilkinson, A. V., Strom, S. S., Cao, Y., Saunders, K. C., Mahabir, S., et al. (2007). Birthplace, years of residence in the United States, and obesity among Mexican-American adults. *Obesity (Silver Spring)*, 15(4), 1043-1052.

Baruch Budhwar, Y. et al., (2007). Brain drain: inclinations to stay abroad after studies. *Journal of World Business*, 42, 99-112.

Birch, L. L. (1998). Development of food acceptance patterns in the first years of life. *The Proceedings of the Nutrition Society,* 57(4), 617-624.

Blane, D., Abraham, L., Gunnell, D., Maynard, M., & Ness, A. (2003). Background influences on dietary choice in early old age. The *Journal of the Royal Society for the Promotion of Health*, 123(4), 204-209.

Brevard, P. B., & Ricketts, C. D. (1996). Residence of college students affects dietary intake, physical activity, and serum lipid levels. *Journal of American Dietetic Association,* 96(1), 35-38.

Chen, Q., & Marques-Vidal, P. (2007). Trends in food availability in Portugal in 1966-2003: comparison with other Mediterranean countries. *European Journal of Nutrition,* 46(7), 418-427.

Cooke, L. (2007). The importance of exposure for healthy eating in childhood: a review. *Journal of Human Nutrition and Dietetics,* 20(4), 294-301.

Cox, D. N., Anderson, A. S., Reynolds, J., McKellar, S., Mela, D. J., & Lean, M. E. (1997). Measuring fruit and vegetable intake: is five-a-day enough? *European Journal of Clinical Nutrition,* 51(3), 177-180.

Cruz, J. A. (2000). Dietary habits and nutritional status in adolescents over Europe--Southern Europe. *European Journal of Clinical Nutrition,* 54 Suppl 1, S29-35.

Delinsky, S.S., & Wilson, G.T. (2008) Weight gain, dietary restraint, and disordered eating in the freshman year of college. *Eating Behaviors*, 9(1), 82-90.

de Lorgeril, M., & Salen, P. (2007). Mediterranean diet and n-3 fatty acids in the prevention and treatment of cardiovascular disease. *Journal of cardiovascular medicine (Hagerstown, Md.),* 8 Suppl 1, S38-41.

Farah, R., & Glick, Y. (2008). Secrets of the Mediterranean diet. *Harefuah,* 147(5), 422-427, 477.

Franzen, L., & Smith, C. (2009). Acculturation and environmental change impacts dietary habits among adult Hmong. *Appetite,* 52(1), 173-183.

Gregory-Mercado, K. Y., Staten, L. K., Ranger-Moore, J., Thomson, C. A., Will, J. C., Ford, E. S., et al. (2006). Fruit and vegetable consumption of older Mexican-

American women is associated with their acculturation level. *Ethnicity & disease,* 16(1), 89-95.

Hawkins, S. S., Lamb, K., Cole, T. J., & Law, C. (2008). Influence of moving to the UK on maternal health behaviours: prospective cohort study. *BMJ,* 336(7652), 1052-1055.

Hoffman, D.J., Policastro, P., Quick, V. & Lee SK. (2006) Changes in body weight and fat mass of men and women in the first year of college: A study of the "freshman 15. *Journal of American college health*, 55(1), 41-5.

Kremmyda, L. S., Papadaki, A., Hondros, G., Kapsokefalou, M., & Scott, J. A. (2008). Differentiating between the effect of rapid dietary acculturation and the effect of living away from home for the first time, on the diets of Greek students studying in Glasgow. *Appetite,* 50(2-3), 455-463.

Larson, N. I., Perry, C. L., Story, M., & Neumark-Sztainer, D. (2006). Food preparation by young adults is associated with better diet quality. *Journal of American Dietetic Association,* 106(12), 2001-2007.

Lassetter, J. H., & Callister, L. C. (2009). The impact of migration on the health of voluntary migrants in western societies. *Journal of transcultural nursing,* 20(1), 93-104.

Lee, S. K., Sobal, J., & Frongillo, E. A., Jr. (1999). Acculturation and dietary practices among Korean Americans. *Journal of American Dietetic Association,* 99(9), 1084-1089.

Lopes, C. (2000). Alimentação e enfarte agudo do miocárdio: Estudo caso-controlo de base comunitária. *Dissertação de doutoramento apresentada à Faculdade de Medicina da Universidade do Porto.* Porto.

Lowe, M.R., et al. (2006). Multiple types of dieting prospectively predict weight gain during the freshman year of college. *Appetite,* 47(1), 83-90.

Lv, N., & Cason, K. L. (2004). Dietary pattern change and acculturation of Chinese Americans in Pennsylvania. *Journal of American Dietetic Association,*, 104(5), 771-778.

Nestle, M. (1995). Mediterranean diets: historical and research overview. *The American journal of clinical nutrition,* 61(6 Suppl), 1313S-1320S.

Pan, Y. L., Dixon, Z., Himburg, S., & Huffman, F. (1999). Asian students change their eating patterns after living in the United States. J*ournal of American Dietetic Association*, 99(1), 54-57.

Papadaki, A., Hondros, G., J, A. S., & Kapsokefalou, M. (2007). Eating habits of university students living at, or away from home in Greece. *Appetite,* 49(1), 169-176.

Papadaki, A., & Scott, J. A. (2002). The impact on eating habits of temporary translocation from a Mediterranean to a Northern European environment. *European journal of Clinical Nutrition,* 56(5), 455-461.

Perez-Cueto, F., Verbeke, W., Lachat, C., & Remaut-De Winter, A. M. (2009). Changes in dietary habits following temporal migration. The case of international students in Belgium. *Appetite,* 52(1), 83-88.

Pettinger, C., Holdsworth, M., & Gerber, M. (2006). Meal patterns and cooking practices in Southern France and Central England. *Public Health Nutrition,* 9(8), 1020-1026.

Rodrigues, S.S.P., Caraher, M., Trichopoulou, A., & de Almeida, M.D.V. (2008). Portuguese households' diet quality (adherence to Mediterranean food paterns and compliance with WHO population dietary goals): trends, regional disparities and socioeconomic determinants. *European Journal of Clinical Nutrition,* 62, 1263-1272

Roshania, R., Narayan, K. M., & Oza-Frank, R. (2008). Age at arrival and risk of obesity among US immigrants. *Obesity (Silver Spring),* 16(12), 2669-2675.

SACN: Scientific Advisory Committee on Nutrition. (2008) *The Nutritional Wellbeing of the British Population.* London: The Stationery Office;

Satia-Abouta, J., Patterson, R. E., Neuhouser, M. L., & Elder, J. (2002). Dietary acculturation: applications to nutrition research and dietetics. J*ournal of American Dietetic Association,* 102(8), 1105-1118.

Sharma, S., Cade, J., Riste, L., & Cruickshank, K. (1999). Nutrient intake trends among African-Caribbeans in Britain: a migrant population and its second generation. *Public Health Nutrition,* 2(4), 469-476.

Sofi, F., Abbate, R., Gensini, G. F., & Casini, A. (2009). Evidences on the relationship between Mediterranean diet and health status. *Recenti Progressi in Medicina,* 100(3), 127-131.

Sofi, F., Cesari, F., Abbate, R., Gensini, G. F., & Casini, A. (2008). Adherence to Mediterranean diet and health status: meta-analysis. *BMJ,* 337, a1344.

Sukalakamala, S., & Brittin, H. C. (2006). Food practices, changes, preferences, and acculturation of Thais in the United States. J*ournal of American Dietetic Association,* 106(1), 103-108.

Wahlqvist, M. L. (2002). Asian migration to Australia: food and health consequences. *Asia Pacific journal of clinical nutrition*, 11 Suppl 3, S562-568.

Wandel, M., Raberg, M., Kumar, B., & Holmboe-Ottesen, G. (2008). Changes in food habits after migration among South Asians settled in Oslo: the effect of demographic, socio-economic and integration factors. *Appetite,* 50(2-3), 376-385.

Waxman, A. (2003). Prevention of chronic diseases: WHO global strategy on diet, physical activity and health. *Food and Nutrition Bulletin,* 24(3), 281-284.

World Cancer Research Fund International. (2008). Food, nutrition, physical activity, and the prevention of cancer: a global perspective. *The Proceedings of the Nutrition Society*, 67(3), 253-6

World Health Organization. (2000). Obesity: preventing and managing the global epidemic. *World Health Organization of Technical Report Series*, 894, i-xii, 1-253. FAO/WHO, Geneva

Willett, W and Stampfer, M. (1998) Reproducibility and validity of food frequency questionnaire. In W. Willett, *Nutritional epidemiology* (2nd ed., pp. 101-147). New York: Oxford University Press.

Yang, E. J., Chung, H. K., Kim, W. Y., Bianchi, L., & Song, W. O. (2007). Chronic diseases and dietary changes in relation to Korean Americans' length of residence in the United States. J*ournal of American Dietetic Association,* 107(6), 942-950.

Table 1 – Percentage of living arrangements of the subjects in Portugal and in London

	Short term		Long term		English group
	In Portugal	In London	In Portugal	In London	In London
In Family home	59.3%	0%	74.1%	18.5%	30.2%
Lived with friends	18.5%	51.9%	14.8%	63.0%	55.8%
Lived alone	22.2%	11%	11.1%	14.8%	2.3%
In a student residence	0%	37.0%	0%	3.7%	11.6%

Table 2 - Within group analysis comparing the mean weekly frequencies of consuming selected food items before and after moving to London. And comparing the two Portuguese groups with the English group regarding eating habits in London.

	Mean (S.D.) weekly consumption frequencies of selected food items								
	Short-term migration			*Long-term migration*			*English students*		
	Before[a]	After[a]	p-value[c]	before[b]	After[b]	p-value[c]	In London	p-value Short[g]	p-value Long[g]
Fresh fruit	9.6(8.4)	7.8(7.7)	0.221	12.8(9.3)	9.0(8.7)	0.005	11.5(9.5)	0.091	0.312
Cooked vegetables	3.9(3.7)	2.3(3.7)	0.009	6.1(5.4)	4.1(4.5)	0.083	8.0(6.9)	**<0.001**	**0.002**
Raw vegetables	3.4(2.4)	2.1(2.1)	0.009	6.2(5.9)	4.9(5.8)	0.045	5.3(5.3)	**0.007**	0.416
Vegetable soup	4.2(2.4)	1.0(1.2)	<0.001	4.4(5.2)	1.9(2.5)	0.003	1.3(1.6)	0.376	0.699
Fresh fruit juice	3.3(6.1)	1.7(2.4)	0.112	1.9(1.7)	1.8(2.2)	0.494	5.6(5.3)	**<0.001**	**<0.001**
White fish	2.5(1.6)	0.5(0.8)	<0.001	2.0(1.6)	0.6(0.9)	<0.001	0.9(1.3)	0.158	0.416
Oily fish	1.2(1.4)	0.6(1.0)	0.051	1.2(1.1)	1.0(1.0)	0.357	0.8(1.2)	0.162	0.249
Cod fish	1.7(1.1)	0.2(0.4)	<0.001	1.1(1.3)	0.3(0.3)	0.001	0.8(1.3)	**0.030**	0.076
Shellfish	0.6(0.3)	0.1(0.3)	<0.001	0.7(0.7)	0.2(0.3)	<0.001	0.4(0.8)	0.067	0.419
Red meat	4.1(3.3)	2.1(1.6)	0.001	3.0(1.8)	2.3(2.1)	0.026	1.9(2.0)	0.493	0.370
White meat	2.5(1.8)	3.5(3.4)	0.281	3.1(1.9)	3.1(1.9)	0.918	3.3(6.1)	0.265	0.143
Bacon	0.2(0.6)	0.7(1.3)	0.056	0.2(0.3)	0.8(1.3)	0.006	0.8(1.1)	0.066	0.431
Hamburger	0.6(0.4)	1.4(1.3)	0.005	0.3(0.3)	0.6(0.8)	0.021	0.4(0.6)	**<0.001**	0.090
Liver. heart. kidney	0.06(0.2)	0.0(0.0)	0.083	0.3(0.6)	0.1(0.6)	0.005	0.1(0.5)	0.118	0.893
Fish fingers	0.1(0.3)	0.1(0.3)	1.000	0.1(0.2)	0.2(0.4)	0.107	0.4(0.7)	0.114	0.217
Olive oil	5.6(5.5)	3.3(3.9)	0.010	5.8(5.5)	5.3(5.8)	0.125	2.1(2.3)	0.361	**0.011**
White bread	4.7(4.7)	5.8(5.0)	0.155	5.1(6.6)	3.0(3.8)	0.009	3.1(4.5)	0.003	0.814
Wholemeal Bread	3.7(3.9)	3.0(4.0)	0.204	3.0(3.9)	3.7(3.8)	0.197	4.2(3.7)	**0.032**	0.399
Wholemeal breakfast	2.5(2.9)	2.6(3.1)	0.720	1.2(2.4)	1.8(2.5)	0.121	2.9(2.6)	0.341	0.051
Others breakfast cereals	1.7(3.9)	2.5(4.2)	0.041	1.9(2.6)	1.2(2.1)	0.096	1.7(2.4)	0.736	0.315
"Broa"	0.6(1.3)	0.2(1.3)	<0.001	0.8(1.4)	0.0(0.1)	<0.001	0.0(0.0)	0.192	0.063
Rice	4.2(3.3)	3.4(3.5)	0.087	4.4(1.8)	3.3(2.2)	0.011	2.0(1.6)	0.066	**0.020**
Pasta	3.6(3.4)	4.2(3.2)	0.225	2.7(1.9)	3.1(1.8)	0.490	2.7(1.6)	**0.008**	0.350
Chips (take-away/processed/oven	0.4(0.4)	1.2(1.4)	0.001	0.5(0.8)	0.6(0.8)	0.437	0.9(1.1)	0.205	0.125
Fried potatoes homemade	0.8(1.0)	0.2(0.6)	0.003	1.03(1.1)	0.5(0.9)	0.012	0.7(1.5)	0.053	0.588
Crisps	0.2(0.4)	0.9(1.4)	0.014	0.5(0.8)	0.6(0.8)	0.399	1.3(1.6)	0.139	**0.021**
Pizza	0.5(0.6)	1.0(1.2)	0.039	0.4(0.6)	0.6(0.4)	0.066	0.9(1.1)	0.543	0.678
Potatoes	1.9(1.8)	0.9(1.1)	0.008	2.2(1.3)	1.4(1.2)	0.026	1.7(1.5)	**0.008**	0.728
Tea	2.5(3.7)	3.0(6.2)	0.850	2.3(2.4)	7.0(8.2)	<0.001	11.0(11.2)	**0.002**	0.342
Tea with milk	0.7(3.4)	1.3(3.6)	0.011	0.7(1.6)	3.1(4.2)	0.003	10.2(11.3)	**<0.001**	**0.004**
Porridge	0.0(0.0)	0.0(0.1)	0.317	0.0(0.0)	0.6(1.3)	0.007	0.4(1.1)	**0.023**	0.440
Flavoured milk	0.0(0.0)	0.0(0.0)	0.317	0.0(0.0)	0.2(0.6)	0.414	0.2(0.5)	**0.010**	0.154
Whole milk	0.0(0.0)	0.9(3.6)	0.180	0.7(3.4)	0.3(1.4)	0.180	1.1(3.8)	0.468	0.468
Semi skimmed milk	4.6(5.5)	5.2(7.3)	0.529	6.0(5.8)	4.1(6.3)	0.012	6.6(7.9)	0.324	0.051
Skimmed milk	1.7(2.6)	1.6(2.7)	0.859	1.7(4.0)	2.5(3.2)	0.281	1.6(3.3)	0.848	0.148
Ice-cream	0.8(1.5)	0.3(0.6)	0.026	0.8(1.0)	0.4(0.2)	0.010	0.7(1.0)	**0.004**	0.539
Dairy desserts	0.7(1.0)	0.3(0.6)	0.093	1.1(1.9)	0.5(0.8)	0.007	1.1(1.2)	**<0.001**	**0.003**
Croissant. pastries or homemade cake	1.8(2.1)	1.6(3.5)	0.054	2.0(1.7)	0.5(0.4)	<0.001	1.2(1.3)	0.406	**0.023**
Coffee	7.8(7.5)	7.0(8.0)	0.575	11.2(10.1)	7.8(8.4)	0.009	5.5(7.2)	0.695	0.211
Beer	1.5(1.8)	1.9(1.7)	0.154	0.8(1.2)	1.2(1.4)	0.157	1.0(1.5)	**0.003**	0.143
Wine	0.7(0.9)	0.9(1.3)	0.702	1.8(6.0)	0.7(1.2)	0.683	1.6(1.7)	**0.031**	**0.007**
Soft drinks	1.3(1.8)	2.2(3.6)	0.149	3.6(6.2)	2.9(5.6)	0.307	3.1(4.4)	0.355	0.078
"Croquetes/rissois/ bolinhos de bacalhau"	1.0(1.2)	0.0(0.2)	<0.001	1.5(1.6)	0.1(0.2)	<0.001	0.0(0.0)	0.183	0.063

group.

[g] Mann witney test (level of significance 0.05), comparing mean weekly consumption of selected food of long term migration group in London and English group.

S.D. – standard deviation.

[i] Statistically significant differences between students Portuguese in the short term and long term migration group, in London.

[j] Short term migration group´s frequency of consuming.

[k] Long term migration group´s frequency of consuming.

Table 3- Between short and long term groups comparing the mean weekly frequencies of consuming selected food items in London

Short v. long term in London			
	Short[b]	**Long[c]**	**p- value[d]**
Cooked vegetables[a]	2.3(3.7)	4.1(4.5)	0.014
Oily fish[a]	0.6(1.0)	1.0(1.0)	0.023
Hamburger[a]	1.4(1.3)	0.6(0.8)	0.003
White bread[a]	5.8(5.0)	3.0(3.8)	0.010
Potatoes[a]	0.9(1.1)	1.4(1.2)	0.023
Chips (take-away/ processed/oven ready)[a]	1.2(1.4)	0.6(0.8)	0.025
Tea[a]	3.0(6.2)	7.0(8.2)	0.002
Porridge[a]	0.0(0.1)	0.6(1.3)	0.005
Ice-cream[a]	0.3(0.6)	0.4(0.2)	0.017
Nuts[a]	0.1(0.2)	0.7(1.4)	<0.001
Water[a]	21.0(12.1)	30.9(12.3)	0.006

[l] Mann-Whitney test (level of significance 0,05).

Table 4- Percentages of students who reported the adequacy of their skills and resources for food preparation were inadequate and adequate.

Skills and resources for food preparation (in London)					
	Cooking skills	***Money to buy food***	***Appliances for preparing food***	***Knowledge for selecting food***	***Time available to prepare food***
Inadequate					
Short term migration	29.6 %	18.5 %	59.3 %	25.9 %	55.6 %
Long term migration	3.6 %	7.1 %	21.4 %	7.1 %	57.1 %
English students	18.2 %	18.2 %	11.4 %	15.9 %	45.5 %

Table 5- Within group analyze comparing the mean (S.D) weekly frequencies of intake selected types of meals before and after moving to London and comparing Portuguese and English regarding intake in London.

	Short term migration			Long term migration			English		
	before[a]	*after*[a]	*p-value*[c]	*before*[b]	*after*[b]	*p-value*[c]	Mean[d]	*p-value short*[e]	*p-value Long*[f]
Use ready prepared meals	0.8(1.5)	1.7(2.1)	0.008	0.4(1.0)	0.9(1.4)	0.005	1.0(1.2)	0.596	0.618
Eat fast food or take away	0.5(0.3)	1.5(1.4)	<0.001	0.4(0.4)	0.8(0.9)	0.002	0.8(0.9)	0.022	0.782

[m] Short term migration group before and after moving to London.

[n] Long term migration group before and after moving to London.

[o] Wilcox test (level of significance 0,05).

[p] Weekly frequency of consumption of English students.

[q] Mann witney test(level of significance 0,05), comparing mean weekly consumption of selected meal of short term migration group in London and English group.

[r] Mann witney test(level of significance 0,05), comparing mean weekly consumption of selected meal of long term migration group in London and English group.

S.D – standard deviation

Figure 1 – Attitudes of Short term migration group regarding food availability in London.

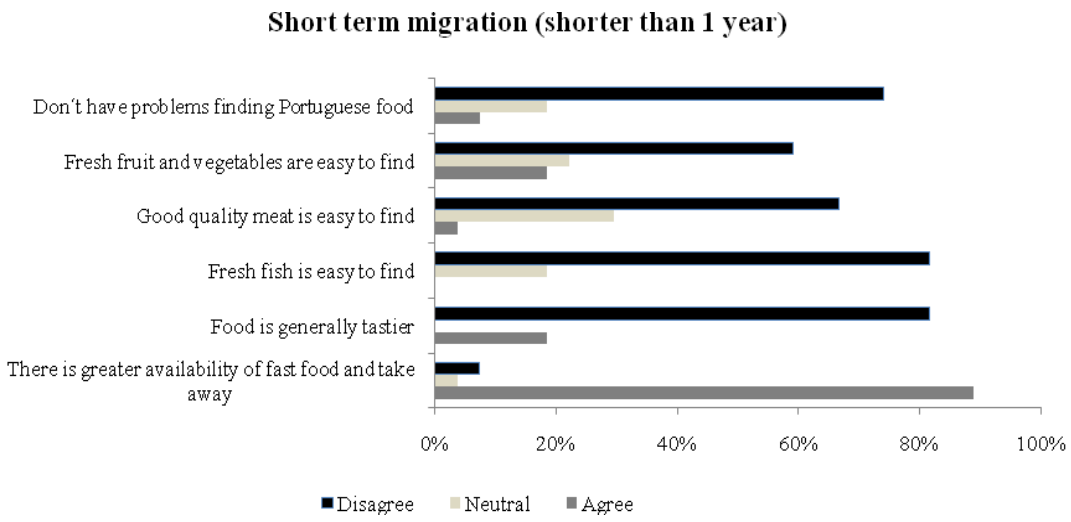

Figure 2 – Attitudes of long term migration group regarding food availability in London