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Assessment of the Nutritional Knowledge of Maltese Adults

Student Name: Manuel Attard
Student Number: 0907593
Supervisor: Prof. Christine Edwards

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Abstract

This study investigated nutritional knowledge of Maltese adults and is the first one of its kind locally. Subjects were recruited randomly by approaching individuals in streets all over Malta; some recruitment through friends was also carried out. Participants (402) completed a short questionnaire of 16 questions based on current nutritional guidelines. The mean score of nutritional knowledge was 17.89 ± 3.2 (6 - 25) out of a maximum of 25. Females scored better than males ($p=0.000$). Those 35 years and older scored better than younger participants ($p=0.000$). Higher education was associated with higher scores ($p=0.012$) and there was no difference in different districts of Malta ($p=0.586$). Most people rated their diets as healthy and these people obtained higher scores (had better nutritional knowledge) than those who rated their diets as unhealthy.

39% of participants were not aware of the 5-a day fruit and vegetable recommendation and knowledge about fibre was low. While most people were knowledgeable about fat, much lower scores were obtained in questions about cholesterol, with only 37% being aware that cholesterol is found only in animal products. Most people (79%) also failed to realize that butter and regular margarine contain the same amount of calories. Knowledge regarding salt in foods was poor, with only 40%, 65% and 67% knowing that bread, cheese and baked beans respectively are high in salt.

These results indicate that lack of knowledge may be at least partly to blame for the rising health problems in Malta and it is recommended that future educational campaigns address this lack of knowledge. It was also found that males and youths consistently scored worse than females and older adults respectively, and hence health campaigns need to be planned in a way to reach these groups effectively.

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Introduction

Malta: Some Background Information

The Republic of Malta is an archipelago made up of three main islands: Malta, Gozo and Comino. Malta is the largest island with a population of 364,040 persons, Gozo has a population of 31,432 and Comino is uninhabited (National Statistics Office, 2009). The Maltese archipelago is found in the central Mediterranean, 93km south of Sicily and 300km north of Libya.

Due to its strategic geographic position, the island has been in the spotlight throughout Mediterranean history and has been ruled, amongst others, by the Phoenicians, Greeks, Romans, Fatimids, Sicilians, Knights of St John, French and the British. Malta finally became independent in 1964, a republic in 1974 and a member of the European Union in 2004. Foreign occupations, especially the British, have left a profound impact on the culture and other aspects of society including food habits.

Maltese Food Habits

Although Mediterranean, the food habits of the Maltese are closer to a British Anglo-Saxon one (Tessier & Gerber, 2005). The Maltese diet can be described by a high consumption of cereals, mainly pasta and traditional Maltese bread, dairy products, eggs and sugar (especially from soft-drinks). Meat consumption is dominated by red meat with a high proportion of processed meats including corned beef and luncheon meat; fish consumption is low compared to meat (Mizzi, 1995).

A national survey carried out in 2003 has found that fresh milk is the type of milk most commonly consumed (46.06%); Maltese bread (white) is the most common kind of cereal consumed, with a mean of 2.2 slices per person per day; the type of fat used most often for food preparation at home is not olive oil (38.87%) but rather other vegetable oil (52.55%); 47% answered that they add salt to meals during cooking ‘almost always’

and 23.73% ‘almost always’ add salt to meals at the table (Department of Health Information, 2003). In a study comparing two generations (mothers and daughters), it was found that cheese consumption increased significantly in recent years (+49%), with cheddar being the most common cheese consumed (Tessier & Gerber, 2005).

Figure 1, taken from the First National Health Interview Survey (2003), provides a good idea of what the Maltese typically consume:

On how many days during the last week (7-day period) have you consumed the following foods and drinks?

	Never	1-2 days	3-5 days	6-7 days
a. cereals (cornflakes, etc.)	58.11%	13.33%	9.09%	18.96%
b. eggs	30.11%	54.08%	12.32%	3.12%
c. low fat cheese	39.74%	31.37%	15.28%	12.32%
d. cheese	35.36%	32.73%	16.94%	13.66%
e. rice/pasta	4.59%	65.16%	26.66%	3.02%
f. chicken/rabbit	12.18%	71.84%	13.89%	1.57%
g. fish	41.61%	51.76%	5.22%	0.87%
h. meat	14.15%	62.02%	21.09%	2.06%
i. meat products	27.25%	33.76%	22.54%	14.85%
j. fried potatoes (chips)	48.50%	40.51%	8.43%	1.66%
k. other potatoes	11.18%	55.46%	28.26%	4.17%
l. beans/pulses	39.85%	45.71%	11.01%	2.72%
m. vegetables	6.68%	27.60%	36.48%	28.75%
n. fresh fruit	8.43%	12.16%	15.07%	63.05%
o. dried/canned fruit	79.76%	11.90%	2.74%	3.33%
p. sweet pastries (includes biscuits, cakes, fancy cakes, gateaux, etc.)	31.21%	33.39%	15.96%	18.25%
q. sweets	37.98%	26.22%	14.43%	20.17%
r. sugar free soft drinks	64.85%	10.68%	7.05%	15.70%
s. soft drinks	57.36%	12.35%	8.06%	21.06%
t. water	12.23%	11.88%	7.73%	67.76%

Figure 1. Frequency of foodstuff consumption. Source: Department of Health Information, 2003. Reproduced with permission.

In March 2010 a national food consumption study was carried out, however the results were not available at the time of writing this dissertation (M.A. Cassar, personal communication, June 11, 2010).

Nutritional Status and Prevalence of Chronic Diseases in Malta

An unbalanced diet, together with a sedentary lifestyle, is believed to be the cause of the increasing incidence of non-communicable disease in the Maltese population. The leading causes of mortality in Malta are ischemic heart disease and cerebrovascular disease, which together comprised 37% of mortality causes in 2002 (World Health Organization, 2006). Risk factors for cardiovascular diseases are high: 22.1% of Maltese are hypertensive (Ministry for Social Policy, 2008), 8.88% have high cholesterol levels and 7.10% are diabetic (Department of Health Information, 2003). Recently it has been found that Malta has the highest rates of childhood obesity (10-16 year olds) in the world (25.4% pre-obese and 7.9% obese) (Janssen et al., 2005), that the Maltese have the highest average BMI (26.6) in Europe, and that among Europeans, Maltese were the least inclined to go for a ten minute walk (European Commission, 2008). Interestingly, the same study found that Maltese were also the likeliest to believe that they eat “very good” for their health (44%); with a further 43% believing that they eat “good”.

National Nutritional Recommendations

In 1986 the World Health Organization (WHO) identified the Maltese as a high-risk group and the following nutrient goals (Table 1) were agreed in a joint conference by the WHO and the Department of Health.

Table 1. National nutrient goals. Source: World Health Organization, 1986

Nutrient	Amount/Proportion of diet
Total Fats	30% of total energy intake
Saturated Fats	10% of total energy intake
P/S ratio	Not less than 0.5-1.0
Cholesterol	<100mg per 4.18MJ (1000Kcal)
Complex carbohydrates	>45% of total energy intake
Sugars	<10% of total energy intake
Dietary fibre	>30g per day
Salt	<5-8g per day
Proteins	12-15% of total energy
Flouride	0.7-1.3mg/l
Iodine	Not considered a problem
Alcohol	Not more than 2 units per day

To achieve these nutrient goals, it was recommended that the population should “*eat less meat and have fish and poultry in preference to beef; substitute high-fat dairy products with low-fat alternatives; and eat fewer eggs, more fresh fruit and vegetables and whole grain flour*” (World Health Organization, 1986).

Why Study Nutritional Knowledge?

It is generally believed that if people are provided with information on how to choose healthy foods and taught about the importance of a healthy diet, an improvement in eating habits will follow. Hence, approaches to improve health at a national level through a change in eating habits usually centre around education. However, studies in this area have reported conflicting results, with some finding no correlation between nutritional knowledge and dietary behaviour (Axelson et al., 1985). Others have reported a positive correlation and it has been postulated that the inconsistent associations between knowledge and dietary behaviour may be due to poorly designed tests of knowledge (Parmenter & Wardle, 1999).

Knowledge is, of course, only one of the determinants of dietary habits. Other important factors are food availability and economic circumstances, cultural and social habits, physiological and psychological attitudes and marketing exposure. The relative importance of these factors seems to vary with demographic characteristics; for example it has been found that for men, taste tends to be more important than eating healthy and price is more important for people with only primary education compared with those of tertiary education (Lennernas, et al., 1997).

Studies investigating nutritional knowledge usually find significant differences between socio-demographic groups: mainly that females are more knowledgeable than males and that better educational level and socio-economic status correlates with better nutritional knowledge (Parmenter et al., 2000). Middle aged persons usually are found to be more knowledgeable than either older or younger ones (Tate & Cade, 1990).

Locally, no population-wide study investigating nutritional knowledge has yet been carried out. Three studies have been carried out investigating nutritional knowledge in teenagers (Bugeja, 2001; Abdilla, 2003; Xuereb, 1997) and one in schoolchildren (Callus & Rachel, 2002). Three other studies have investigated nutrition knowledge in the hospital setting: in midwives (Wanjiku, 2003), in a multi-disciplinary team at an elderly assessment and rehabilitation hospital (Fiorini, 2007), and in patients with end stage renal disease on haemodialysis (Briffa, 2003). Another study asked students (16-20 year olds) on the kind of formal and informal nutritional education they had received (Mifsud, 1991).

Sources of Nutritional Knowledge in Malta

Locally, dieticians and nutritionist are not the main source of dietary information. In the First National Health Interview Survey, those people who said that they had changed their eating habits in the previous three years (26.85% of the respondents), were asked about who had advised them to do so. As one can see in figure 2 below, dieticians played a minor role.

106. Who advised you to change your eating habits?
(Please answer ALL questions)

	Yes
a. A doctor	7.22%
b. Other health care professional	3.21%
c. A dietician	1.59%
d. A family member	5.37%
e. Beautician	0.82%
f. Someone else	2.46%
g. Or was it of your own accord	18.96%

Figure 2. Who advised respondents to change their eating habits. Source: Department of Health Information, 2003. Reproduced with permission.

In Malta, it is the Education Department and the Health Promotion Department who are officially in charge of teaching nutrition to the population: the former to students and the latter to the general public. When in the First National Health Interview Survey

(2003) people were asked where they got information about health, the responses shown in figure 3 were obtained.

116. Where do you get your information about health?

(Please answer ALL questions)

	Yes
a. Your general practitioner/ Health Centre	69.31%
b. Other health care professionals	38.36%
c. Health Promotion Campaigns	52.41%
d. Workplace/school	21.88%
e. Local Council	10.52%
f. Family/friends	65.14%
g. Media (newspapers, radio, TV)	76.55%
h. Internet	19.24%
i. Books/magazines	51.24%

Figure 3. Sources of health information. Source: Department of Health Information, 2003. Reproduced with permission

It is also interesting that when asked what could improve their health, having better information about how to stay healthy was mentioned as the second most important factor, following “less pollution” (figure 4).

115. Given your present state of health and your lifestyle, do you think your own health would be better if you had ... ?

(Please answer ALL questions)

	Yes
a. A change in your weight	49.02%
b. Less alcohol	16.94%
c. Less stress	59.37%
d. More will power	62.02%
e. Less pollution	83.01%
f. Less time in smoky places	54.94%
g. Regular checks from your doctor	64.62%
h. Better information about how to stay healthy	73.43%
i. More money	59.42%
j. Employment / a different job	19.66%

Figure 4. Factors believed to lead to better health status. Source: Department of Health Information, 2003. Reproduced with permission

○ **The Health Promotion Department**

The Health Promotion Department within the Health Division was set up in 1994; however it had previously existed as the Health Education Unit and the Nutrition Unit. The Health Promotion Department offers the following services to the general public:

1. Provides on-line information where persons can call to ask about certain health issues such as smoking, sexual health and nutrition;
2. Runs smoking cessation clinics and weight reduction clinics (free of charge);
3. Distributes informative/educational material (Department for Health Promotion and Disease Prevention, 2010)

The Nutrition Unit was set up in 1986 and produced a nutrition policy in 1988. Thereafter it organised a major campaign called “Kul Ghal Qalbek” (a play on words meaning both “*Eat for Your Heart*” and “*Enjoy Your Food*”) and published four leaflets for this campaign. In preparation for the World Conference on Nutrition in 1992, the nutritional situation in Malta was extensively analyzed and it was found the Malta had two major nutrition problems: obesity and lack of breastfeeding. As from 1992 to date, the Department has been focusing on these areas while also dealing with other aspects of healthy lifestyles.

Asked about what has been their main area of focus throughout this year, Dr. Elaine C. Lautier, the nutritionist within the Health Promotion Department, said that it is currently obesity and the message that they are trying to convey to the public is to 1) promote healthy food choices; 2) promote the enjoyment of healthy foods prepared at home; 3) awareness of portion sizes and 4) promote physical activity. To achieve this they are airing infomercials on television and radio stations, hosting interviews with specialists, distributing informative leaflets to the public and organizing free-of-charge weight management classes and aerobics classes every evening. Last year they also started a campaign to inform the public about salt, for example by distributing salt-free bread (free of charge) (E.C. Lautier, personal communication, June 24, 2010). Another campaign launched last year, called ‘Haxix u Frott, 5 Trid Tghodd? ... Kul Izjed Frott u

Haxix.’ (“*Vegetables and Fruits, Is it 5 You have to Count ?... Eat More Fruit and Vegetables*”), was aimed to increase the consumption of fruits and vegetables amongst the general public through the use of posters and leaflets (Maltastar.com, 2009)

- **The Education Department**

Nutrition education is formally tackled at secondary school level in four subjects: Home Economics (optional in form 1 and 2 and/or forms 3-5) in which food, nutrition, diet and menu-planning are a very strong component; Personal and Social Development (PSD) which is compulsory in forms 1-5 with nutrition a minor component of the syllabus; Physical Education (PE) which is compulsory in forms 1-5 with nutrition a minor component but students have the option to sit for the SEC exam and if so, more nutrition is studied in forms 3-5; and Biology which is optional and which has a minor nutritional component in the syllabus (S. Piscopo, personal communication, June 19, 2010). While Home Economics has been in the national curriculum since early 1970’s, PSD and the PE SEC exam preparation have been introduced later (early 1990s and mid 2000s respectively) (S. Piscopo, personal communication, June 19, 2010). In addition, the state-run Home Economics Seminar Centre (HESC) offers a multitude of seminars to primary and secondary students, parents and the elderly on nutrition and healthy eating; the HESC has been doing this for the last 18 years. The HESC also reaches the community through participation in local events and through the media: its staff participates in a variety of programmes on local television and radio stations and writes articles promoting healthy lifestyles in local publications.

Aims

The Aims of this study was:

- To assess the nutritional knowledge of Maltese adults by asking questions mainly about fat, salt, fibre and cholesterol;
- To correlate the number of correct responses with gender, age, locality and educational level;
- To obtain an indication whether there is a link between rising health problems and nutritional knowledge;
- To test whether nutritional knowledge is lacking in particular areas;
- To test whether nutritional knowledge is lacking in specific sectors of the population;
- Ultimately, the findings will be an important tool when planning nutrition education campaigns.

Materials and Methods

The Questionnaire

Nutritional knowledge in Maltese adults was investigated using a short anonymous questionnaire. While similar studies carried out abroad have used long, detailed questionnaires, I opted for a short one in order to recruit as many people as possible in a limited timeframe. The questionnaire had a total of 16 questions and took about 5-10 minutes to complete, with most questions requiring only a tick next to the correct answer. The subject information and the questionnaire were available both in English and Maltese.

The first five questions collected data about the subject: gender, locality, age, level of education completed and how healthy they think their diet is. This data made it possible to check whether males and females, people from different age groups, different localities or different levels of education have better nutritional knowledge than others. This in itself will help target future education campaigns, for example if it is found that males have less knowledge about cholesterol than females, then an idea will be to post relevant billboards at sports stadiums. Similarly, if for example the elderly are found to have less knowledge regarding salt than younger people, then it would make sense to target salt campaigns at the elderly, for example by airing infomercials during programmes typically followed by this sector of the population.

The question about the people's perception on the healthiness of their diet ('How would you rate your diet?') should give an indication of whether people who believe their diets are healthy actually have better knowledge about foods than others. It should also indicate whether people are actually trying to eat healthy or not (if a person answers that his diet is 'very unhealthy' then there's a good chance that he's not really concerned about healthy eating).

Questions 6-16 tested nutrition knowledge. Locally, obesity and heart diseases (together with associated conditions such as hypertension and hypercholesterolemia) are widely prevalent. Hence the nutrition knowledge questions were focused on fat, cholesterol, salt and fibre, since consumption of these nutrient is strongly associated with the aforementioned conditions. The questions included are discussed below.

Question 6 asked about how many servings of fruit and vegetables a day should one eat and question 7 asked about what the respondent understands with ‘a serving’. While most people know they should eat five a day, it is important to check whether they are aware what a serving is. Questions 8, 9 and 10 queried about fat, salt and fibre. Rather than asking the respondents about the recommended daily amounts of these nutrients (knowledge which is useless if it cannot be translated into food choices), respondents were asked to rate food items (which were chosen due to their high local consumption) as high or low in fat, salt and fibre respectively. Questions 11 and 12 were about cholesterol since people tend not to be aware that cholesterol is found only in animal products and that in order to control blood cholesterol, it is more important to limit fat intake than actual cholesterol intake. Question 13 asked which one, butter or regular margarine, is highest in calories or whether they actually contain the same amounts: many people wrongly assume that regular margarine is lower in calories than butter. Question 14 queried whether people are aware that when nutritionist advise lowering fat intake, they are referring to saturated fat (found for e.g. in meat and whole milk dairy products); other types of fat (e.g. polyunsaturated fat in fish) is actually beneficial to the heart. Question 15 asked people to identify the meat product containing the least amount of fat while question 16 asked the respondents to identify which factors help prevent heart disease.

Pilot Study

A pilot study of the questionnaire was carried out with 12 individuals, including people from each age group. It was found that most of them were not familiar with the terms ‘monounsaturated’, ‘polyunsaturated’, and ‘saturated’ (in question 14), and hence

examples of the sources of each type of fat were then included in the final version. The average total score of the pilot study was 15 (out of 25) hence indicating that the questionnaire was neither too easy nor too hard.

Recruitment

Sample size was calculated using a power calculation based on Malta's population of over 18 years old (312,079 (National Statistics Office, 2007)), a 95% confidence level and a 5% confidence interval. The calculated sample size was 384. People aged 18 and over were recruited. Recruitment was initially planned to be random by approaching subjects in streets all over Malta and asking whether they would like to fill in a short questionnaire about nutrition and healthy eating. However, this approach proved to be very time-consuming and not enough people were being recruited. Hence some opportunistic recruitment, by distributing through friends, was also carried out (roughly 25% of the sample). Before giving the questionnaire to the subjects, the subject information sheet was given/read to them to explain the study. Ethics approval was obtained from the University Research Ethics Committee (UREC) Malta on the 11th May 2010, prior to the start of the research.

Data Analysis

Correct responses were given one mark, incorrect ones zero marks. For questions 8, 9 and 10, which were made up of five parts and question 16 which was made up of four parts, each part counted as one mark and then the total marks for each question was computed and statistical tests were carried out on the total mark. Questions left unanswered and questions where two answers were marked (e.g. both high and low or both true and false) were entered as 'not sure' (zero marks). As there were only 22 people in the 65-74y age group and 14 in the '>75y' group, these were combined into a '>64y' age group for statistical analysis using IBM SPSS Statistics 18. Moreover, the localities (62) were grouped into 5 districts.

Significant differences in nutritional knowledge among persons from different age groups, educational level, district and gender were investigated by a General Linear Model (GLM) Multivariate Analysis. Statistical tests were carried out on both the total score and on each individual question score. Gender, district, age group and educational level were inputted as fixed factors since they were categorical variables. Individual question scores and the total score were inputted as dependent variables. The custom model was specified, build terms used were 'main effects' for each fixed factor, and type III sum of squares was used.

To investigate whether the perception of the healthiness of one's own diet was associated with gender, district, age group and educational level and to test whether people who believed their diets to be healthy had better nutritional knowledge than others, a Univariate Analysis of Variance was carried out. 'Perception of own diet' was used as the dependent variable; gender, district, age group and education as fixed factors and total score as the covariate. The custom model was specified, the build terms used were 'main effects' for each fixed factor, and type III sum of squares was used.

Results

Sample Demographics

In total, 402 individuals were recruited, achieving the required power. Figures 5, 6 and 7 show the sample demographics compared with the Maltese population. Individuals from 62 out of the 68 villages in Malta and Gozo took part; these were then grouped by district and the percentage distribution of the sample compared to the population is shown in figure 8. As one can see from the following graphs, compared to the Maltese population, the sample was biased towards people with higher educational levels, younger people and people from Gozo and Comino.

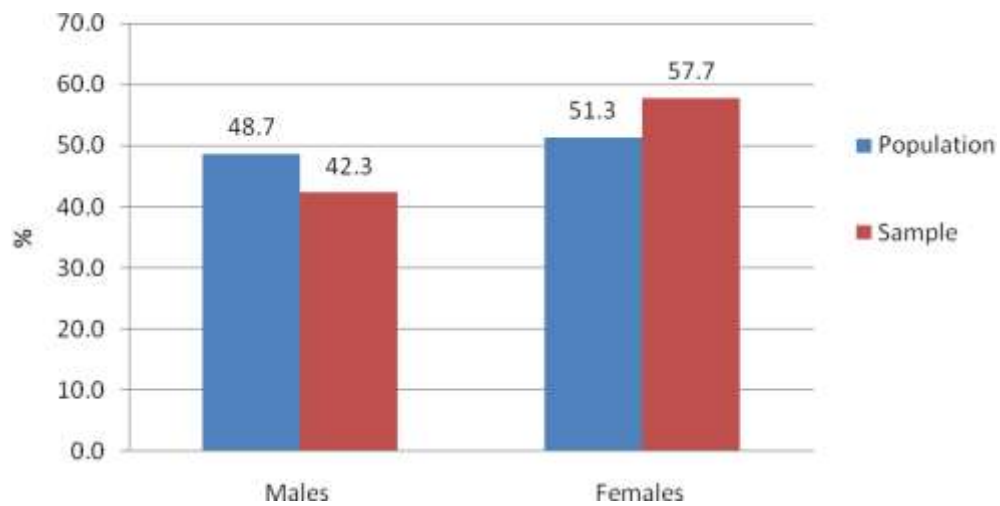


Figure 5. Percentage distribution by gender in population and sample.

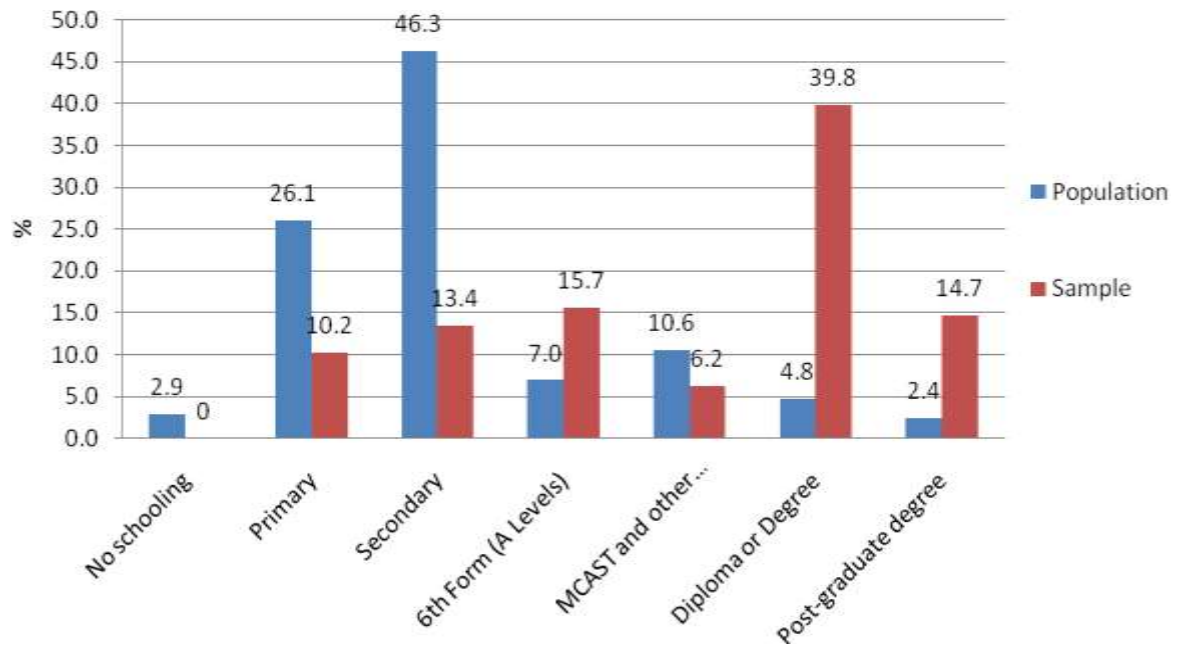


Figure 6. Percentage distribution by highest level of education attained in population and sample. MCAST: Malta College of Arts, Science and Technology

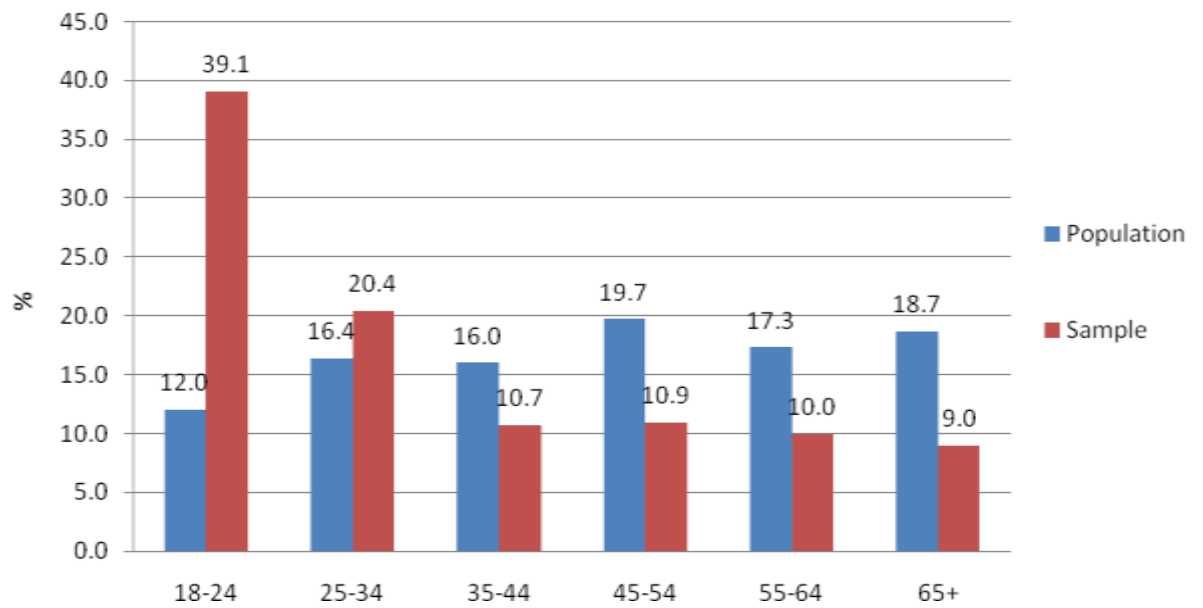


Figure 7. Percentage distribution by age group in population and sample.

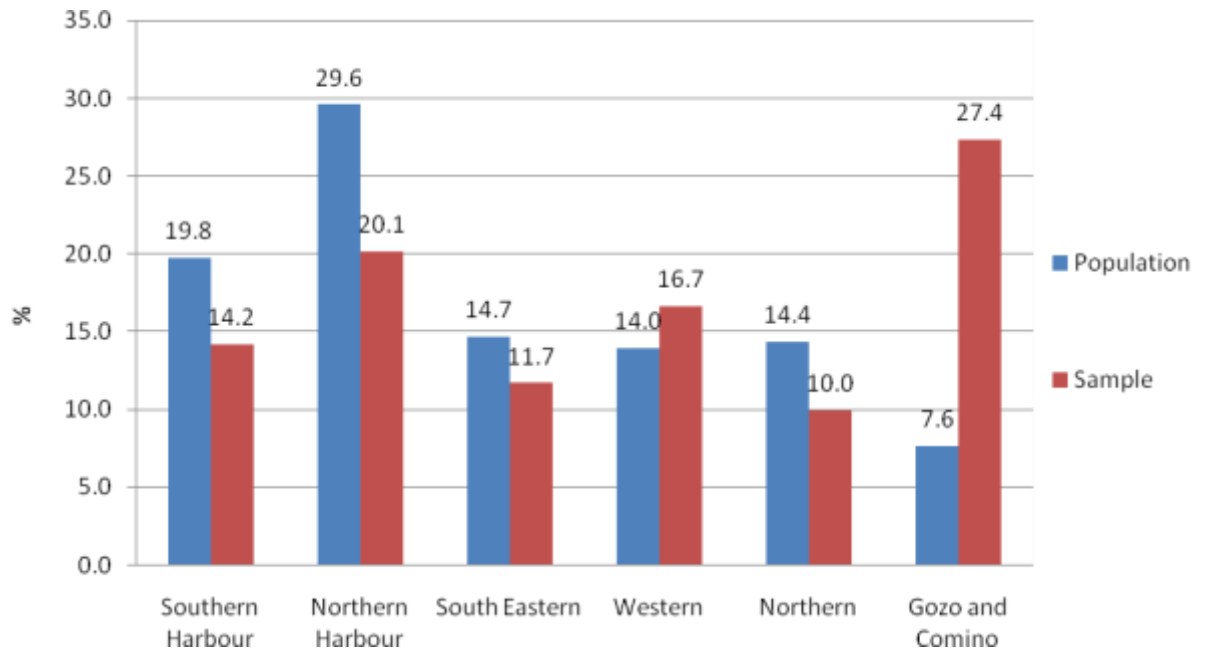


Figure 8. Percentage distribution by district in population and sample.

Outcomes:

When asked to rate their own diets, the majority believed they eat healthily (Fig. 9)

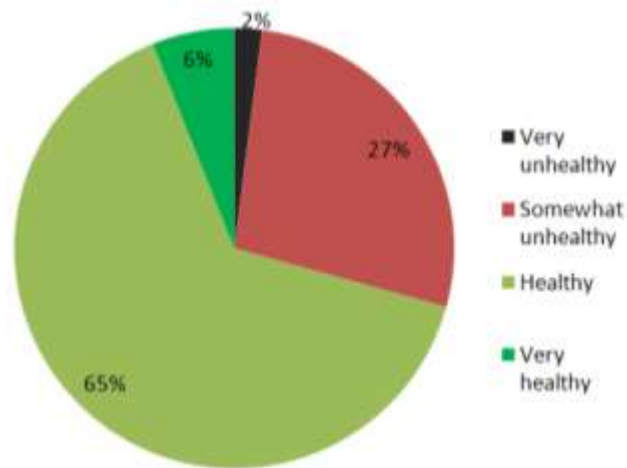


Figure 9. Respondents perceptions' of their own diets.

The total knowledge score was computed by summing the scores of each question: 25 marks would be obtained if all questions were answered correctly. The mean score was 17.8 ± 3.2 (SD). The lowest mark obtained was 6 (obtained by one person) while the highest was 25 (obtained by three persons) (Fig 10).

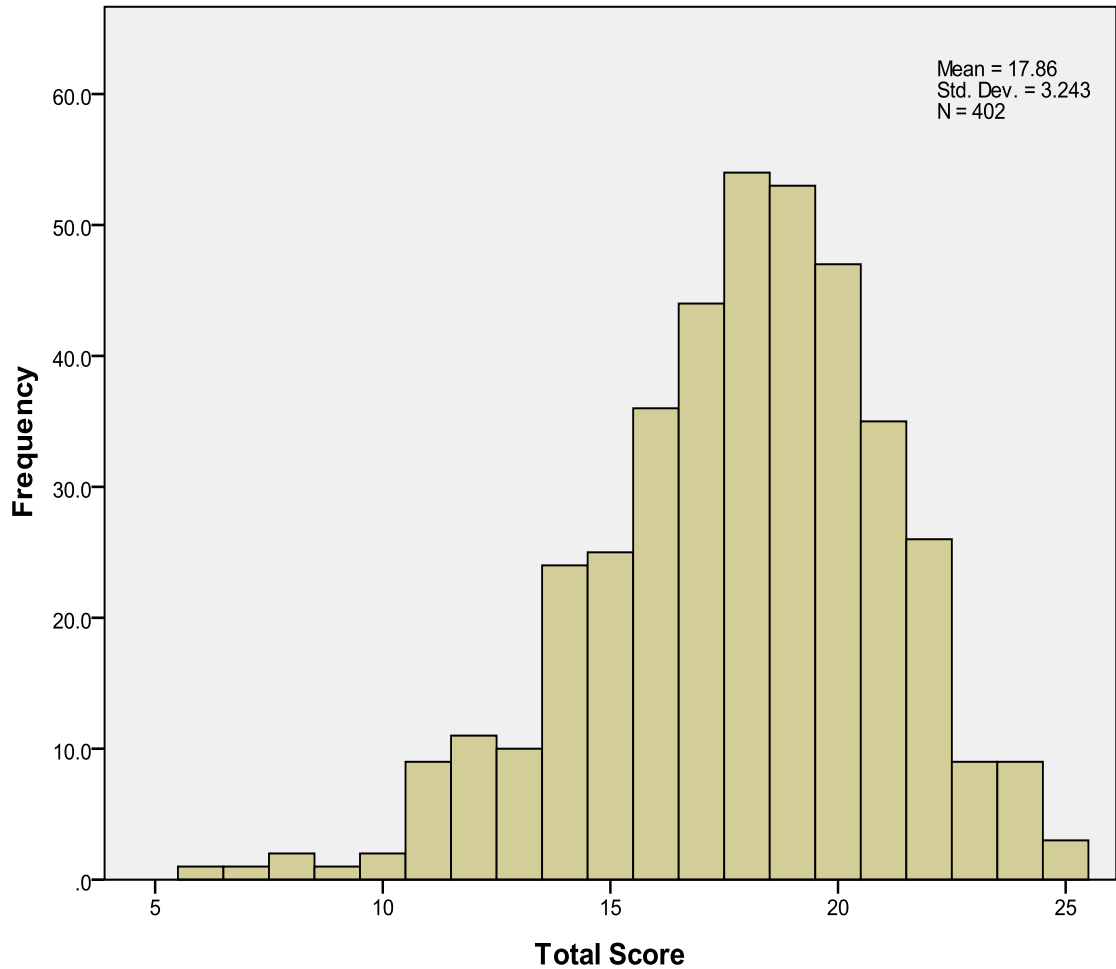


Figure 10. Histogram of total scores

When asked how many servings of fruits and vegetables a day should one eat (question 6), 61.2 % knew the recommendation; when asked to define what they understood by a serving, 82.6% described it correctly. The responses for questions 8-16 are shown in figures 11 & 12.

Percentage Correct/Incorrect Responses

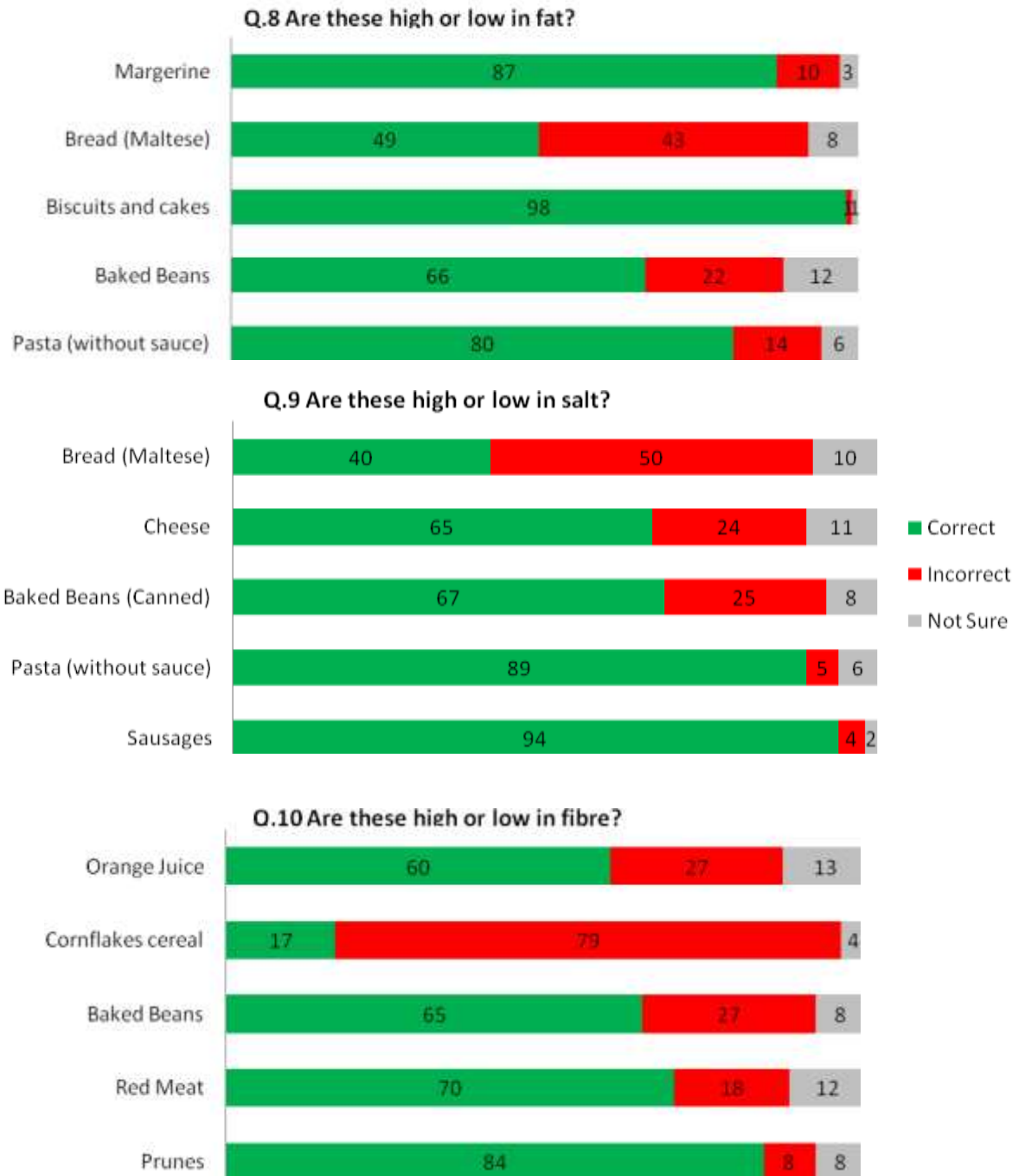


Figure 11. Responses for questions number 8-10.

Percentage Responses

11. Cholesterol is only found in animal products. True or False?



12. To reduce your cholesterol levels is it more important to eat less fat or less cholesterol?



13. Which do you think is higher in calories: butter or regular margarine?



14. Which type of fat do you think is most important



15. If a person wanted to reduce the amount of fat in their diet, which would be the best choice?



16. Do you think these help prevent heart disease; Yes or No?



Figure 12. Responses for questions 11-16. Green colour = correct, red = incorrect, grey = 'not sure'.

Determinants of Nutritional Knowledge

There was no association between gender, district, age group and educational level with self-reported healthiness of the respondents' diets (Table 2). However, those perceiving themselves to have a healthier diet achieved better scores than those who did not (Fig. 12).

Table 2. Tests for significant associations between self-reported healthiness of diet with gender, district, age group, educational level and total score

Source	Sig.
Gender	.856
District	.731
Age Group	.533
Education	.647
TOTAL SCORE	.000***

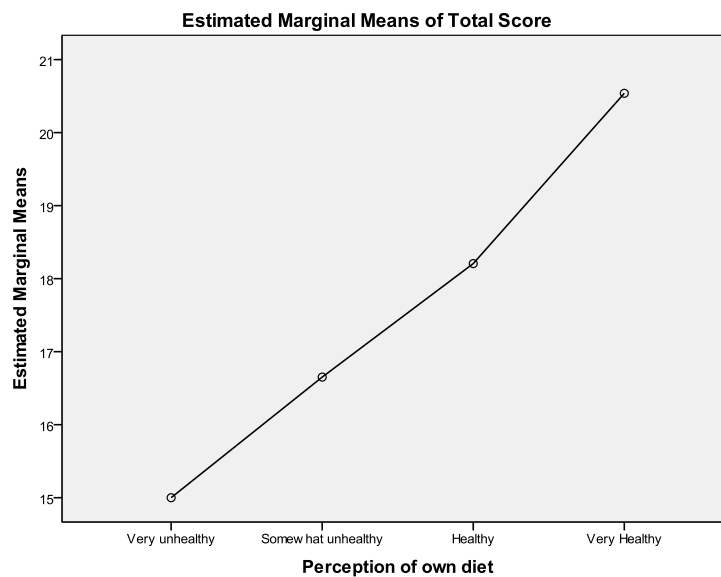


Figure 13. Relationship between people's perception of their own diets with the total knowledge score obtained.

The GLM multivariate analysis investigated correlations between gender, age group, district and educational level and the scores of individual questions and with the total score (Tables 3&4).

Table 3. Test for significant differences in total score and each individual question score among males vs. females and people from different districts

Source	Dependent Variable	Sig.	
Gender	Q6 Fruits and vegetables- no. of servings	0.000	
	Q7 Serving size	0.008	
	Q8 Fat	0.026	
	Q9 Salt	0.005	
	Q10 Fibre	0.000	
	Q11 Cholesterol source	0.006	
	Q12 Reducing cholesterol	0.083	
	Q13 Calories in butter and regular margarine	0.807	
	Q14 Types of fats	0.020	
	Q15 Healthiest meat	0.070	
	Q16 Diet and heart diseases	0.232	
	Total Score	0.000	
	District	Q6 Fruits and vegetables- no. of servings	0.421
		Q7 Serving size	0.587
		Q8 Fat	0.367
		Q9 Salt	0.095
Q10 Fibre		0.841	
Q11 Cholesterol source		0.067	
Q12 Reducing cholesterol		0.003	
Q13 Calories in butter and regular margarine		0.559	
Q14 Types of fats		0.770	
Q15 Healthiest meat		0.879	
Q16 Diet and heart diseases		0.942	
Total Score		0.586	

Table 4. Test for significant differences in total score and each individual question score among people from different age groups and educational levels

Source	Dependent Variable	Sig.	
Age Group	Q6 Fruits and vegetables- no. of servings	.706	
	Q7 Serving size	.178	
	Q8 Fat	.013*	
	Q9 Salt	.135	
	Q10 Fibre	.045*	
	Q11 Cholesterol source	.083	
	Q12 Reducing cholesterol	.203	
	Q13 Calories in butter and regular margarine	.054	
	Q14 Types of fats	.008**	
	Q15 Healthiest meat	.094	
	Q16 Diet and heart diseases	.458	
	Total Score	.000***	
	Education	Q6 Fruits and vegetables- no. of servings	.549
		Q7 Serving size	.031*
		Q8 Fat	.325
		Q9 Salt	.220
Q10 Fibre		.000***	
Q11 Cholesterol source		.064	
Q12 Reducing cholesterol		.057	
Q13 Calories in butter and regular margarine		.646	
Q14 Types of fats		.003**	
Q15 Healthiest meat		.136	
Q16 Diet and heart diseases		.348	
Total Score		.012*	

*P<0.05, **P<0.01, ***P<0.001

With regards to total score, females scored better than males ($p=0.000$), those 35 years and older scored better than younger participants ($p=0.000$), and higher education was associated with higher scores ($p=0.012$) (Tables 3&4). There was no difference in total score among people from different districts of Malta ($p=0.586$). Profile plots showing the mean total score in the different groups were plotted for age group and education level (Figs 13&14).

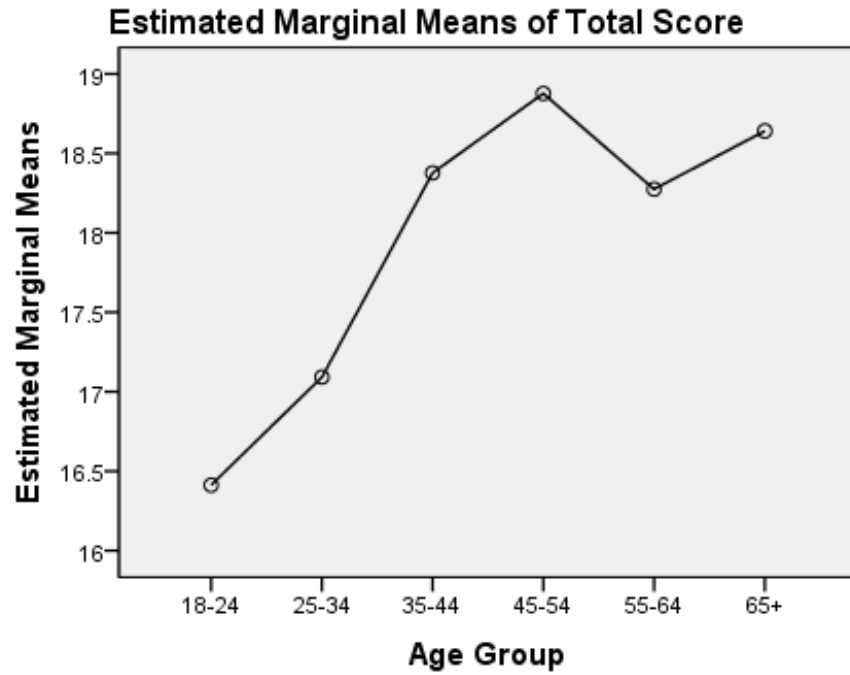


Figure 14. Variation in total score achieved ('nutritional knowledge') with age group.

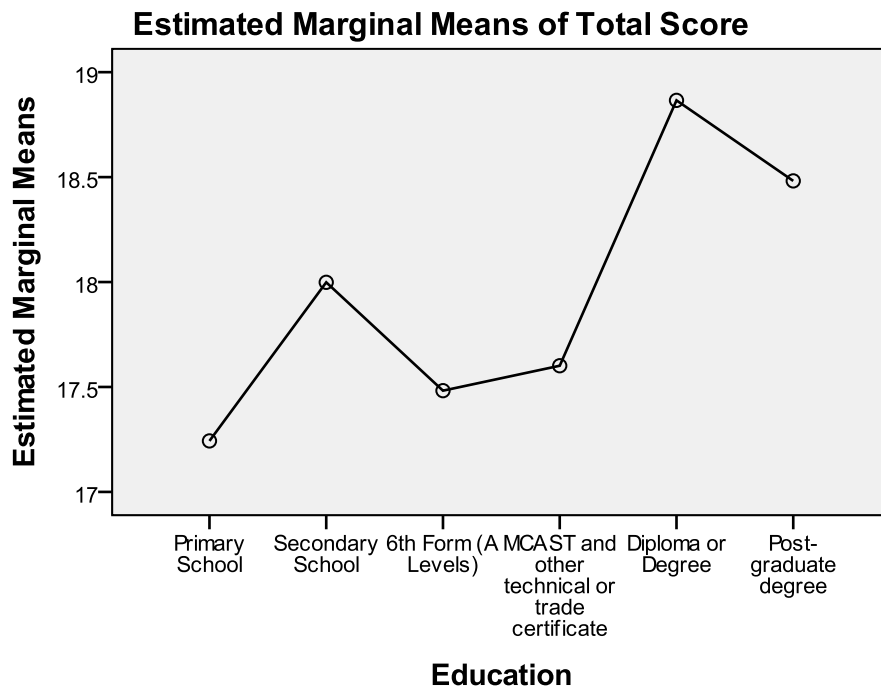


Figure 15. Variation in total score achieved ('nutritional knowledge') with educational level.

Discussion

In 1986 the WHO identified the Maltese as a high-risk group and national nutrient goals and recommendations were put forth. Two decades later, the Maltese are topping the charts of obesity rates and displaying alarming rates of chronic diseases. The government has recently starting giving more importance to prevention, and through the Health Promotion Department and the Education Department, has been working to inform the public about how to adopt a healthy lifestyle. However, while lifestyle and food habits surveys are periodically carried out, no study investigating the nutritional knowledge of Maltese adults has yet been done. Knowledge is obviously not the sole determinant of dietary behaviour; other important factors include sociodemographic characteristics, physiological factors, individual behaviour and attitudes. Nonetheless individuals cannot make the right food choices if they do not know how. Moreover, it is useful to know whether knowledge is regarding about particular topics or in particular demographic groups – such information would enable educational campaigns to be implemented and targeted more effectively. These were the aims that this study set out to achieve.

Demographic Differences

Due to the fact that this study was the first of its kind in Malta and that the questionnaire used was not identical to others used in similar studies, it is hard to comment on the total scores achieved (whether they are high or low). However, one can comment on differences in scores obtained by males compared to females; people from different age groups and educational levels.

Females were found to be more knowledgeable than males ($p=0.000$), having a mean total score of 18.92 compared to 16.97. This is in agreement with the findings of other similar studies carried out abroad (Parmenter et al., 2000; Tate & Cade, 1990). Gender was also associated with significant differences in the score of the following seven questions: knowledge about the recommended intake of fruits and vegetables;

description of serving size of fruits and vegetables; knowledge about fat-, salt- and fibre-content of foods; knowledge that cholesterol is found only in animal products and awareness that saturated fat is the worst kind of fat. In all cases females scored better than males. While traditionally, the husband worked and the wife was responsible for shopping and cooking, nowadays the roles have equalized and more men are cooking for themselves. Yet the disparity in nutritional knowledge remains, highlighting the need to target males in educational campaigns. Nutritional information needs to start being conveyed in media followed by men, for example by including it in newspaper sections read mostly by men, in sports programmes and making leaflets and informative material available in work environments (e.g. the army and police force) and places (e.g. sports stadiums) typically frequented by males.

With regards to age group, it was found that individuals in the 18-24 and 25-34 groups obtained lower total scores than the rest; the difference among the groups was significant ($p=0.000$) (Figure 14). Studies carried out in England usually find that the middle aged perform better than either younger or older adults (Parmenter et al., 2000; Tate & Cade, 1990; Anderson et al., 1988). Age group was also associated with significant differences in the score of the following three questions: fat content of foods (35 year olds and above scoring better than under 35); fibre content of foods (middle aged scoring better than elderly and elderly scoring better than young people); and awareness that saturated fat is the worst kind of fat – the elderly scored better than the middle aged which scored better than younger persons. Hence youths were that sector of the population least knowledgeable about nutrition. Since some nutrition education is given in school, the reason for this lack of knowledge is probably not lack of available information but simply because young persons are not as worried about health conditions and consequences of bad nutrition as are older persons. This has also been suggested by other authors (Larsson & Johansson, 2002; Venter & Winterbach, 2010). The only way around this is that when giving such information to youths, long term benefits of proper nutrition (such as reducing the risk of chronic diseases and better longevity) should not be emphasized but rather the focus should be on immediate benefits such as more energy, better performance in sports and better appearance. The

increase in knowledge as people reach middle age might also be associated with having children and seeking out nutrition information to ensure that they are eating healthy (Parmenter et al., 2000).

There were also significant differences in total score between people of different educational levels, with people with higher education tending to obtain higher scores ($p=0.012$) (Figure 15 in results). This is also similar to what has been reported in studies carried out in America and in England (Cremer & Kessler, 1992; Parmenter et al., 2000). Educational level was also responsible for significant differences in the score of the following three questions: knowledge about the serving size of fruits and vegetables; fibre content of foods and awareness that saturated fat is the worst kind of fat. In the case of serving size and fibre content of foods, higher educational levels were associated with better scores; however in the case of awareness that saturated fat is the worst kind of fat, all educational levels exhibited similar scores with the exception of people having an MCAST (Malta College of Arts, Science and Technology) or other trade and technical certificate- these performed significantly worse. However this might be simply due to the fact that this educational group was the smallest group in my sample (25) and hence a few outliers might have greatly influenced the group mean. The reason why higher educational levels were correlated with better total scores might be that 1) nutritional information is included in education; 2) more educated respondents are better able to make use of written materials such as leaflets and newspapers and hence have better access to information; 3) more educated respondents might be more able to understand complex information about diet-diseases relationships and 4) higher educational levels might be associated with better socioeconomic status, a factor which is usually found to be positively related to nutritional knowledge (Parmenter et al., 2000).

District was only associated with the score of one question, namely the one where people were asked whether to reduce one's cholesterol levels it was more important to eat less fat or less cholesterol. In this case, people from the Western district performed best and people from Gozo and Comino worst. However, since there was no

association between district and any other question score (and no association with total score), it can be concluded that there were no significant differences in nutritional knowledge in the different geographical areas of the Maltese islands. This result was expected considering the small size of the Maltese islands.

It is important to note that the r square value for the analysis between the four fixed factors and total score was low: 0.218; for the individual questions the r square values were even lower. This means that the four factors considered explain only 22% of the variability of the total score. Other factors which might be exerting effects on nutritional knowledge are socioeconomic status, health conditions (people on special diets will have better nutritional knowledge) and marital status. It might be interesting to note that a similar study carried out in England which considered education, gender, socioeconomic status, marital status and presence of children at home still obtained a low r square value (0.212) (Parmenter et al., 2000).

Perception of Own Diet

In view of the current rates of obesity and chronic diseases, it is very probable that Maltese people do not eat healthily. Yet a survey carried out locally in 2005 (European Health Interview Survey), found that when asked to rate their own diets, 44% replied that they eat 'very good' for their health with a further 43% answering 'good' (Ministry for Social Policy, 2008). In my study, it was found that when asked the same question, 6% believed they eat 'very healthy' with a further 65% choosing 'healthy'. 27% picked 'somewhat unhealthy' and 2% picked 'very unhealthy'. Hence compared to the European Health Interview Survey, while it is still the case that the majority of the respondents think they eat healthy, it seems that more of the Maltese people are now aware that their diets are not healthy. It was found that there was no association between gender, district, age group and education with the level of healthiness of the diet as self rated by the respondents. On the other hand it was found that nutritional knowledge (total score) was positively related with the healthiness of one's diet, with those people rating their diets as healthy having better nutritional knowledge than those rating it as

unhealthy. This thus indicates that there is an association between eating healthy and having better nutritional knowledge, though one cannot be certain that the latter is causing the former.

Knowledge of the five-a-day Recommendation

The recommendation to eat at least five portions (400g) of fruits and vegetables a day was developed based on a recommendation from the World Health Organization following evidence that populations consuming at least 400g of fruits and vegetables each day have significant reductions in the risk of chronic diseases such as heart diseases, stroke and certain cancers (World Health Organization, 1990). Last year the Health Promotion Department launched a campaign to increase fruit and vegetable consumption in Malta through posters and leaflets informing the public about the five-a-day recommendation and the benefits associated with such consumption. The message is also taught in schools and promulgated on TV and radio during health-related programmes, and thus it was expected that most people would be aware of the recommendation.

It was found that 61.2% knew the five-a-day recommendation. Thus while the majority answered correctly, 38.8% did not – quite a large proportion especially when one considers the ongoing efforts to educate the public about the five-a-day message. It is encouraging that 82.6% of the people were able to describe a serving correctly.

While 61.2% of the people were aware of the recommendation, a study carried out in 2008 found that only 44% of the Maltese population eats five or more portions of fruit a day and only 19% eats five or more portions of vegetables a day. Moreover an alarming 3% of the population never includes fruits and vegetables in their diet (Ministry for Social Policy, 2008). It might be that knowledge of the five-a-day recommendation improved greatly in the last two years, maybe as a result of the fruit and vegetable campaign launched last year by the Health Promotion Department. However, it is also possible that there is no correlation between awareness of the recommendation and

actual intake; other factors might be in play. In fact, while it has been found that people with higher education eat more fruit and vegetables and that young people aged between 15 to 24 years consume less fruit and vegetables than older adults (Department of Health Information, 2006), no such differences in knowledge of the recommendation were found in this study.

In a study carried out in England, it was found that only 30% of the respondents knew the recommended daily intake of fruits and vegetables with over 50% believing one to three portions to be adequate (Parmenter et al., 2000). However it must be borne in mind that this study was carried out 10 years ago. A study carried out in 2002, also in England but interviewing only people aged 55-64 years, found that only 47% were aware of the recommendation (Baker & Wardle, 2002). In another study done in Iran with elderly individuals, it was found that only 3% knew the recommended intake of fruits and vegetables; it was also found that knowledge about the recommendation and associated benefits were strongly correlated with actual intake (Salehi et al., 2010).

Knowledge about Fat and Cholesterol

Ischemic heart disease and cerebrovascular disease are the major cause of morbidity and mortality in Malta. Risk factors for cardiovascular diseases (CVD) are predominantly: elevated serum cholesterol, hypertension, smoking and sedentary lifestyle. Both serum cholesterol and blood pressure can be lowered by dietary changes and this has been shown to result in a reduction in CVD incidence. People are thus advised to lower their saturated fat intake (and limit their fat intake in general), and cut down on salt. The current national recommendation for total fat intake is 30% of the total energy intake while for saturated fat it is 10% of the total fat intake. Unfortunately the most recent information on actual intake of fat and saturated fat among the Maltese is estimated on data collected in the late 80's, when it was found that the Maltese were consuming 36% of the total energy intake from total fat and 13% from saturated fat (Bellizzi, 1993).

It was found that most people were aware which food products are high or low in fat: 98% and 87% correctly identified biscuits and cakes and margarine respectively as high in fat; 80% and 66% correctly identified pasta (without sauce) and baked beans respectively as low in fat. Confusion with regards to the fat content of bread (Maltese) – with 43% incorrectly believing that bread is high in fat- might be due to notion that bread is a ‘fattening’ food.

In question 14 people were asked to choose the type of fat that is most important to cut down on. From the pilot study it was found that most of the subjects were not familiar with the terms ‘saturated’, ‘monosaturated, and ‘polyunsaturated’, but were aware that for example, the fat found in red meat is a worse type than that found in fish. This is probably due to the fact that locally, information in the media is usually food-based and not nutrient based. Hence in the final questionnaire, I included examples of sources for each kind of fat: monosaturated (found in olive oil and peanut butter), polyunsaturated (found in sunflower oil and fish) and saturated (found in red meat and whole-milk dairy products). Most people (81%) were able to pick saturated fat as the type of fat most important to cut down on; 8% were not sure, 7% picked monosaturated fat and 4% chose polyunsaturated. Hence it appears that the majority of the people were able to differentiate between unhealthy and healthy fats.

Question 15 asked respondents which type of meat would be the best choice if a person wanted to reduce the amount of fat in his diet: steak grilled, sausages grilled, turkey grilled, or pork chop grilled. Most (78%) correctly picked turkey while 9% picked steak, a worrying 8% choose sausages and 5% choose pork chop. Meat consumption in Malta is high compared to the Mediterranean average (Tessier & Gerber, 2005) and it is thus extremely important that people are aware of the healthy and not-so-healthy meats. People are advised to switch to the healthier meats in order to help prevent heart diseases – the finding that some subjects’ idea of ‘healthy’ meats was steak and sausages is great cause for concern.

From question 13 it emerged that most people (56%) believe that butter is higher in calories than regular margarine, with only 21% knowing that they contain the same amount. There were no differences in score among people from different age groups, educational levels, district or gender. This finding is similar to what was reported in a study done in England, with over 70% of the respondents believing butter to be higher in calories than regular margarine or were unsure (Parmenter et al., 2000). An earlier study done in the UK had also found that 84% of the people believed that butter is higher in fat than sunflower margarine (Tate & Cade, 1990). A consequence of this might be that people trying to lose weight might switch from butter to margarine, without realising that this will have no impact with regards to fat loss. It must be pointed out however, that the wording of the question might have suggested that either margarine or butter is higher in calories than the other one. Maybe if the question was reworded as 'Butter and regular margarine contain the same amounts of calories. True or False?' different scores might have been obtained.

Knowledge about cholesterol was low: only 37% of the people were aware that it is found only in animal products. Furthermore, while the majority (62%) knew that in order to reduce your cholesterol levels it is more important to eat less fat than to eat less cholesterol, 26% believed that it was more important to eat less cholesterol and a further 12% were not sure. Thus lack of knowledge regarding cholesterol might be one of the causes of the high rates of hypercholesterolemia among the Maltese. Studies done abroad have also reported poor knowledge with regards to cholesterol. In a report analyzing data from the 1989-1990 USDA Diet Health Knowledge Survey, it was found that only 39% of Americans knew that cholesterol is found only in products of animal origin (Variyam & Blaylock, 1998). In a study carried out in Southampton it was found that only 34% were aware that in order to reduce blood cholesterol it is more important to reduce the intake of saturated fat than to reduce the intake of dietary cholesterol (Tate & Cade, 1990).

Knowledge about Salt

The prevalence of hypertension in Malta is high and hence health authorities have been working hard to inform the public about the need to reduce salt intake. The current national recommendation for salt intake is 5g daily, considerable lower than the actual intake (derived from the Intersalt study of 1986- unfortunately this being the most recent data) of 11g daily (men) and 9g daily (women) (Bellizzi, 1993). While everyone is aware of the amount of salt added at the table, people might still not realise that most of the salt we consume is found intrinsically in foodstuffs. In the question where people were asked to classify the five food items as high or low in salt, most (94%) knew that sausages are high in salt, fewer were aware that canned baked beans and cheese are also high in salt (67% and 65% respectively) and less than half the people (40%) were aware that bread (Maltese) is also high in salt. This is worrying since consumption of this bread is very high, with a mean of 2.2 slices per person per day (Department of Health Information, 2003). The fact that 35% of the people were not aware that cheese is high in salt is also cause for concern when one considers that cheese consumption is increasing rapidly (Tessier & Gerber, 2005). This lack of knowledge regarding salt in foodstuffs might be somewhat surprising when one considers that just last year the Health Promotion Department launched a salt campaign which is still ongoing and moreover, this year they have produced leaflets specifically about salt in bread. In view of these results, one can speculate that part of the problem contributing to the high blood pressure of the Maltese is lack of knowledge regarding salt in food; one might also suggest that stronger campaigns with better reach need to be implemented.

Knowledge about Fibre

From the results obtained, it seems that people are somewhat unsure about fibre. While most (84%) knew that prunes are rich in fibre, less (65%) were aware that baked beans are also a rich source of this nutrient. Moreover, while 70% knew that meat is not a source of fibre, 18% wrongly believed it to be high in fibre. With regards to orange juice, only 61% were aware that it is actually low in fibre and just a mere 17% knew

that cornflakes cereal is low in fibre; 79% believed it to be high. This might be the result of marketing which makes people believe that all kinds of ‘cereals’ are very healthy. This is similar to what was found by Parmenter et al. (2000), where most people incorrectly believed that a muesli bar is high in fibre. The authors comment that the pervasiveness of the error might indicate that for many people, advertising is regarded as a source of nutrient information and that people do not actually read the nutritional information labels on foods. The poor results with regards to knowledge about fibre obtained in my study are similar to what has been reported abroad: in the UK, Buttriss (1997) found that 35% of the respondents failed to correctly categorize as many as half of the foods presented as high or low in fibre.

Knowledge about Diet and Heart Disease Relationships

With regards to knowledge about diet and heart disease relationships, most people were aware that eating less saturated fat (92%), eating less salt (89%), and eating more fruits and vegetables (91%) help prevent heart disease. Less people (67%) were aware that eating more fibre also helps prevent heart diseases. A study carried out in the UK found that 90% were aware of the link between saturated fat and heart disease, 84% were aware of the link between a diet high in salt and heart disease, and only 47% knew that eating more fruit and vegetables could reduce the chances of getting heart diseases (Parmenter et al., 2000) – hence a poorer overall score than that obtain in my study.

Limitations

A limitation of this study is that the sample was biased in favour of younger people and people with high levels of education- a reason being that these were found to be more willing to participate. The questionnaire was also quite short, with only 11 nutrition questions. Moreover questions were kept as simple as possible, and one might thus argue, for example, that asking about the salt content of ‘cheese’ is too vague. Furthermore the only background information that was collected was gender, locality,

age group and educational level. This was a compromise that had to be made in order to recruit sufficient people in a short time period (one month).

Conclusion

This study indicates that lack of knowledge may be at least partly to blame for the high rates of chronic diseases among the Maltese. In fact, it was found that 39% of the people were still not aware of the five-a-day recommendation and that knowledge about fibre was low. A significant lack of knowledge was also found with regards to cholesterol and the salt content of foodstuffs. It was found that people reporting their diets to be healthy had better nutritional knowledge than others reporting it as unhealthy, thus strengthening the idea that knowledge *is* associated with dietary habits

Educational campaigns should thus focus on informing the public about the benefits of fibre and its sources; about the salt content of foodstuffs and about cholesterol (its sources and the relevant dietary recommendations). Lack of knowledge about the nutrient content of common food items indicates that people do not read food labels. Hence health authorities should therefore launch campaigns on how to interpret food labels and maybe implement a system, such as the traffic light system in the UK, which simplifies the information contained in these labels.

It was also found that males and youths consistently scored worse than females and older adults respectively, and hence health campaigns need to be planned in a way to reach these groups effectively. In the former case it might be simply a question of making available educational material in places and situations accessed mostly by men (for example by airing infomercials during sports programmes). In the latter case, it is probable that the young people's lack of knowledge is due to lack of interest, and hence health authorities should try to make nutritional information more relevant and more appealing to them.

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Appendix 1
Questionnaire in English

1. Are you male or female? Male Female

2. Your locality: _____

3. How old are you?

18-24

25-34

35-44

45-54

55-64

65-74

More than 75

4. What is the highest level of education you have completed?

Primary school

Secondary school

6th form (A levels)

MCAST and other technical or trade certificate

Diploma or Degree

Post-graduate degree

5. How would you rate your diet?

Very unhealthy

Somewhat unhealthy

Healthy

Very healthy

6. How many servings of fruits and vegetables a day should you eat?

7. Give an example of what you understand by one serving of fruit or vegetables?

8. Do you think these are high or low in fat? (tick one box per food)

	High	Low	Not sure
Pasta (without sauce)			
Baked Beans			
Biscuits and cakes			
Bread (Maltese)			
Margarine			

9. Do you think these are high or low in salt?

	High	Low	Not sure
Sausages			
Pasta (without sauce)			
Baked Beans (Canned)			
Cheese			
Bread (Maltese)			

10. Do you think these are high or low in fibre?

	High	Low	Not sure
Prunes			
Red Meat			
Baked Beans			
Cornflakes cereal			
Orange Juice			

11. Cholesterol is only found in animal products.

True

False

Not sure

12. To reduce your cholesterol level is it more important to eat less fat or less cholesterol?

Less Fat

Less Cholesterol

Not Sure

13. Which do you think is higher in calories: butter or regular margarine?

Butter

Regular Margarine

Both the same

Not sure

14. Which type of fat do you think is most important to cut down on?

Monounsaturated fat (*found in olive oil and peanut butter*)

Polyunsaturated fat (*found in sunflower oil and fish*)

Saturated Fat (*found in red meat and whole-milk dairy products*)

Not sure

15. If a person wanted to reduce the amount of fat in their diet, which would be the best choice?

Steak, grilled

Sausages, grilled

Turkey, grilled

Pork chop, grilled

16. Do you think these help prevent heart disease?

	Yes	No	Not sure
Eating more fibre			
Eating less saturated fat			
Eating less salt			
Eating more fruits and vegetables			

Appendix 2
Questionnaire in Maltese

1. Int ragel jew mara? Ragel Mara

2. Ir-rahhal jew belt fejn toqghod: _____

3. Kemm-il sena ghandek?

18-24

25-34

35-44

45-54

55-64

65-74

Aktar minn 75

4. Sa liema l-oghla livell ta' skola li hadt?

Skola Primarja

Skola Sekondarja

6th form (A levels)

MCAST u/jew certifikat iehor tekniku jew ta' xi sengha

Diploma or jew Grad Universitarju

Grad Universitarju oghla

5. Kemm tahseb li qed tiekol tajjeb ghal sahtek?

Niekol hazin hafna

Ma tantx niekol tajjeb

Niekol tajjeb

Niekol tajjeb hafna

6. Kemm-il porzjon ta' frott u haxix ghandek tiekol kuljum? _____

7. Aghti ezempju dwar x'tifhem b'porzjon frott jew haxix?

8. Tahseb li dawn li gejjin fihom hafna xaham jew ftit li xejn?

	Hafna	Ftit li xejn	Ma nafx
Ghagin (bla zalza)			
Fazola tal-landa			
Gallettini u kejkijiet			
Hobz (tal-Malti)			
Margerina			

9. Tahseb li dawn li gejjin fihom hafna melh jew ftit li xejn?

	Hafna	Ftit li xejn	Ma nafx
Zalzett			
Ghagin (bla zalza)			
Fazola tal-landa			
Gobon			
Hobz (tal-Malti)			

10. Tahseb li dawn li gejjin fihom hafna *fibre* jew ftit li xejn?

	Hafna	Ftit li xejn	Ma nafx
Pruna			
Laham ahmar			
Fazola tal-landa			
Cornflakes			
Meraq tal-laring (tal-kaxxa)			

11. Il-cholesterol jinsab biss fi prodotti mill-animali.

Vera

Falz

Ma nafx

12. Biex tnaqqas il-livell tal-cholesterol tieghek, aktar mportanti li tiekol anqas grass jew inqas kolesterol?

- Inqas grass Inqas kolesterol Ma nafx

13. Liema tahseb li fih l-aktar kaloriġi: il-butir jew il-margerina normali?

- Butir
 Margerina normali
 L-istess it-tnejn
 Ma nafx

14. Liema tip ta' xaham tahseb int li hu l-izjed importanti li tnaqqas?

- Xaham monosaturat (*li jinsab fiz-zejt taz-zebbuga u l-butir tal-karawett*)
 Xaham polisaturat (*li jinsab fiz-zejt tal-ward tax-xemx u l-hut*)
 Xaham saturat (*li jinsab fil-laham ahmar u prodotti maghmulin mill-halib*)
 Ma nafx

15. Jekk persuna trid tnaqqas l-ammont ta' xaham fid-dieta, liema hi l-ahjar ghazla?

- Bicca canga mixwija
 Zalzett mixwi
 Dundjan mixwi
 Kustilja tal-majjal mixwija

16. Tahseb li dawn li gejjin jghinu biex tevita l-mard tal-qalb?

	Iva	Le	Ma nafx
Tiekol iktar <i>fibre</i>			
Tiekol inqas grass saturat			
Tiekol inqas melh			
Tiekol izjed frott u haxix			

Appendix 3

Subject information sheet in English

Subject Information Sheet

Assessment of the Nutritional Knowledge of Maltese Adults

One of the factors which determines our dietary habits is how knowledgeable we are with regards to healthy eating. This study aims to investigate the nutritional knowledge of the Maltese population. From the results we will identify which aspects of healthy eating Maltese adults are unsure of, and thus the results will be an important tool when planning education campaigns. This study is being carried out as part of my (Manuel Attard) MSc degree from the department of Human Nutrition at the University of Glasgow.

We invite you to take part in this study. Your decision whether or not to partake is entirely your own, and you will not lose any benefits if you decide not to. Participation in this study is entirely voluntary.

This is a short explanation of what will be expected of you if you decide to take part in the study:

- You will be asked to fill in a short questionnaire containing questions about food and healthy eating. You will also be asked about your gender, locality, age and highest level of education completed. You will not be asked your name or any other forms of identification. The questionnaire should only take about 10 minutes to complete.
- Note that by filling in the questionnaire, you will be giving your consent to participate in the study.
- The results will be passed on to the Department of Health (Malta) and may be reported in professional publications.
- A copy of the findings will be made available upon request by contacting the investigator, Manuel Attard (contact details below).

Manuel Attard
'Fleur'
Sir Arturo Mericieca street,
Victoria, Gozo
VCT2024
Malta
Tel: (+356)21552881/ (+356)99268240/ (+44) 7769582799
Email: 0907593A@student.gla.ac.uk

Appendix 4

Subject information sheet in Maltese

Informazzjoni Ghall-Partecipanti

Ricerka Dwar l-Gharfien tal-Adulti Maltin fuq kif Tiekol Tajjed Ghal Sahhitek

Wiehed mill-fatturi li jiddeterminaw x'tip ta' ikel naghzlu hu l-gharfien taghna dwar kif tiekol tajjed ghal sahhitek. Dan l-istudju ha jistharreg l-gharfien tal-Maltin dwar id-dieta. Mir-rizultati ta' dan l-istudju, se nkunu nistghu nidentifikaw liema aspetti dwar dieta tajba l-Maltin huma dubju jew ma jafux. Ghalhekk ir-rizultati ta' dan l-istudju se jkunu ghodda mportanti ghal meta wiehed jigi biex jippjana attivitajiet edukattivi. Din ir-ricerka tiffurma parti mill-istudju (MSc) tieghi (Manuel Attard) fid-dipartiment tan-Nutrizzjoni Umana fl-Universita ta' Glasgow.

Inti mistieden biex tiehu sehem f'dan l-istudju. Id-decizjoni dwar jekk tiehux sehem jew le hija tieghek, u jekk tiddeciedi li ma tiehux sehem, ma inti ser tiflew xejn. Il-partecipazzjoni f'dan l-istudju hija volontarja.

Jekk tiddeciedi li tiehu sehem f'din ir-ricerka:

- Int se tkun mitlub li twiegeb sett ta mistoqsijiet dwar l-ikel u kif tiekol tajjed ghal sahhitek. Int se tkun mistoqsi ukoll il-lokalita' tieghek, is-sess, l-eta' u x'inhu l-ghola livell ta' edukazzjoni li ghandek. Int m'intix se tigi mistoqsi ismek jew xi forma ohra ta' identifikazzjoni. Il-mistoqsijiet ghandhom jehdulek biss madwar ghaxar minuti biex twegibhom.
- Jekk twiegeb il-mistoqsijiet int tkun qed taccetta li tiehu sehem f'dan l-istudju.
- Kopja tar-rizultati se tinghata lid-Dipartiment tas-Sahha (Malta) u jistghu jigu rrapportati f'xi pubblikazzjonijiet professjonali.
- Jekk tixtieq li tinghata kopja tar-rizultati, int mitlub tikkuntatja lili, Manuel Attard.

Manuel Attard

'Fleur'

Sir Arturo Mercieca Street,

Victoria, Gozo

VCT2024

Malta

Tel: (+356)21552881/ (+356)99268240/ (+44) 7769582799

Email: 0907593A@student.gla.ac.uk

Appendix 5

Means (scores) by gender, district, age group and educational level

Table 5. Grand means

Dependent Variable	1. Grand Mean			
	Mean	Std. Error	Lower Bound	Upper Bound
Q6 Fruits and vegetables- no. of servings	.585	.030	.525	.645
Q7 Serving size	.794	.025	.745	.842
Q8 Fat	3.858	.069	3.721	3.994
Q9 Salt	3.483	.065	3.355	3.611
Q10 Fibre	2.941	.075	2.794	3.089
Q11 Cholesterol source	.371	.031	.310	.432
Q12 Reducing cholesterol	.654	.031	.593	.715
Q13 Calories in butter and regular margarine	.238	.027	.185	.291
Q14 Types of fats	.816	.025	.767	.864
Q15 Healthiest meat	.800	.027	.747	.854
Q16 Diet and heart diseases	3.407	.055	3.299	3.514
Total Score	17.945	.194	17.564	18.327

Table 6. Means by gender

Dependent Variable	Gender	2. Gender			
		Mean	Std. Error	Lower Bound	Upper Bound
Q6 Fruits and vegetables- no. of servings	Male	.407	.041	.326	.489
	Female	.762	.035	.693	.832
Q7 Serving size	Male	.741	.034	.675	.808
	Female	.846	.029	.789	.903
Q8 Fat	Male	3.736	.095	3.550	3.922
	Female	3.980	.081	3.820	4.140
Q9 Salt	Male	3.339	.089	3.165	3.514
	Female	3.626	.076	3.476	3.776
Q10 Fibre	Male	2.701	.103	2.499	2.902
	Female	3.182	.088	3.009	3.355
Q11 Cholesterol source	Male	.303	.042	.220	.386
	Female	.439	.036	.367	.510
Q12 Reducing cholesterol	Male	.612	.042	.528	.695
	Female	.696	.036	.625	.767
Q13 Calories in butter and regular margarine	Male	.243	.037	.171	.315
	Female	.233	.031	.171	.295
Q14 Types of fats	Male	.770	.034	.703	.837
	Female	.861	.029	.804	.918
Q15 Healthiest meat	Male	.762	.037	.689	.834
	Female	.839	.032	.777	.901
Q16 Diet and heart diseases	Male	3.355	.075	3.208	3.502
	Female	3.458	.064	3.332	3.585
Total Score	Male	16.969	.265	16.448	17.491
	Female	18.922	.227	18.475	19.369

Table 7. Means by district

3. District					
Dependent Variable	District	95% Confidence Interval			
		Mean	Std. Error	Lower Bound	Upper Bound
Q6 Fruits and vegetables- no. of servings	Southern Harbour	.672	.064	.545	.798
	Northern Harbour	.587	.053	.482	.692
	South Eastern	.644	.070	.505	.782
	Western	.529	.060	.411	.647
	Northern	.538	.075	.391	.686
	Gozo and Comino	.540	.049	.444	.637
Q7 Serving size	Southern Harbour	.870	.053	.766	.973
	Northern Harbour	.807	.044	.721	.893
	South Eastern	.767	.058	.653	.880
	Western	.791	.049	.695	.888
	Northern	.770	.061	.650	.891
	Gozo and Comino	.756	.040	.677	.835
Q8 Fat	Southern Harbour	3.924	.147	3.634	4.213
	Northern Harbour	3.889	.122	3.648	4.130
	South Eastern	3.929	.161	3.612	4.246
	Western	3.728	.138	3.457	3.998
	Northern	3.650	.172	3.313	3.988
	Gozo and Comino	4.027	.112	3.806	4.248
Q9 Salt	Southern Harbour	3.570	.138	3.299	3.842
	Northern Harbour	3.710	.115	3.484	3.935
	South Eastern	3.382	.151	3.085	3.679
	Western	3.344	.129	3.091	3.598
	Northern	3.274	.161	2.958	3.590
	Gozo and Comino	3.616	.105	3.409	3.823
Q10 Fibre	Southern Harbour	2.968	.159	2.655	3.281
	Northern Harbour	2.992	.132	2.732	3.252
	South Eastern	2.949	.174	2.606	3.292
	Western	3.062	.149	2.769	3.355
	Northern	2.830	.186	2.465	3.195
	Gozo and Comino	2.846	.122	2.607	3.084
Q11 Cholesterol source	Southern Harbour	.290	.066	.161	.419
	Northern Harbour	.426	.055	.318	.533
	South Eastern	.480	.072	.339	.621

	Western	.248	.061	.128	.369
	Northern	.428	.076	.277	.578
	Gozo and Comino	.353	.050	.255	.452
Q12 Reducing cholesterol	Southern Harbour	.675	.066	.546	.804
	Northern Harbour	.684	.055	.577	.791
	South Eastern	.572	.072	.431	.713
	Western	.822	.061	.701	.942
	Northern	.645	.076	.495	.795
	Gozo and Comino	.526	.050	.427	.624
Q13 Calories in butter and regular margarine	Southern Harbour	.270	.057	.158	.382
	Northern Harbour	.234	.047	.141	.327
	South Eastern	.199	.062	.077	.322
	Western	.211	.053	.106	.315
	Northern	.209	.066	.079	.340
	Gozo and Comino	.306	.043	.220	.391
Q14 Types of fats	Southern Harbour	.823	.053	.719	.927
	Northern Harbour	.845	.044	.759	.932
	South Eastern	.860	.058	.746	.973
	Western	.812	.049	.715	.909
	Northern	.770	.061	.649	.891
	Gozo and Comino	.783	.040	.704	.862
Q15 Healthiest meat	Southern Harbour	.818	.057	.705	.931
	Northern Harbour	.758	.048	.664	.851
	South Eastern	.832	.063	.708	.956
	Western	.829	.054	.724	.935
	Northern	.781	.067	.649	.912
	Gozo and Comino	.784	.044	.698	.870
Q16 Diet and heart diseases	Southern Harbour	3.408	.116	3.179	3.637
	Northern Harbour	3.375	.097	3.185	3.565
	South Eastern	3.438	.127	3.188	3.689
	Western	3.329	.109	3.115	3.543
	Northern	3.500	.136	3.234	3.767
	Gozo and Comino	3.389	.089	3.214	3.564
Total Score	Southern Harbour	18.288	.412	17.478	19.098
	Northern Harbour	18.306	.343	17.633	18.980
	South Eastern	18.051	.451	17.165	18.938
	Western	17.706	.385	16.949	18.463

Northern	17.396	.480	16.452	18.340
Gozo and Comino	17.925	.314	17.307	18.543

Table 8. Means by age group

Dependent Variable	Age Group	4. Age Group			
		Mean	Std. Error	Lower Bound	Upper Bound
Q6 Fruits and vegetables- no. of servings	18-24	.599	.048	.505	.693
	25-34	.564	.058	.451	.678
	35-44	.659	.074	.513	.804
	45-54	.571	.074	.426	.715
	55-64	.500	.076	.350	.650
	65+	.617	.091	.439	.795
Q7 Serving size	18-24	.800	.039	.723	.877
	25-34	.725	.047	.633	.818
	35-44	.761	.060	.642	.879
	45-54	.838	.060	.719	.956
	55-64	.719	.063	.596	.842
	65+	.918	.074	.773	1.064
Q8 Fat	18-24	3.436	.109	3.221	3.651
	25-34	3.741	.132	3.481	4.000
	35-44	4.010	.169	3.677	4.342
	45-54	3.951	.169	3.619	4.282
	55-64	3.988	.175	3.644	4.332
	65+	4.022	.208	3.614	4.430
Q9 Salt	18-24	3.270	.102	3.068	3.471
	25-34	3.631	.124	3.388	3.874
	35-44	3.522	.158	3.211	3.834
	45-54	3.627	.158	3.316	3.938
	55-64	3.428	.164	3.105	3.750
	65+	3.418	.194	3.036	3.801
Q10 Fibre	18-24	2.590	.118	2.357	2.822
	25-34	2.738	.143	2.458	3.019
	35-44	3.049	.183	2.689	3.409
	45-54	3.184	.182	2.825	3.542
	55-64	3.151	.189	2.779	3.523
	65+	2.935	.224	2.494	3.376
Q11 Cholesterol source	18-24	.343	.049	.247	.439
	25-34	.321	.059	.206	.437
	35-44	.431	.075	.283	.579
	45-54	.357	.075	.209	.505
	55-64	.538	.078	.385	.692
	65+	.234	.092	.052	.416
Q12 Reducing cholesterol	18-24	.583	.049	.487	.678

	25-34	.640	.059	.524	.755
	35-44	.641	.075	.493	.789
	45-54	.754	.075	.606	.902
	55-64	.542	.078	.389	.695
	65+	.764	.092	.582	.946
Q13 Calories in butter and regular margarine	18-24	.139	.042	.056	.222
	25-34	.101	.051	.001	.202
	35-44	.287	.065	.159	.416
	45-54	.281	.065	.153	.410
	55-64	.267	.068	.134	.400
	65+	.353	.080	.195	.511
Q14 Types of fats	18-24	.684	.039	.607	.761
	25-34	.688	.047	.595	.781
	35-44	.866	.061	.747	.985
	45-54	.876	.060	.757	.995
	55-64	.838	.063	.715	.962
	65+	.941	.074	.795	1.087
Q15 Healthiest meat	18-24	.718	.043	.634	.801
	25-34	.695	.052	.593	.796
	35-44	.787	.066	.657	.917
	45-54	.937	.066	.807	1.066
	55-64	.817	.068	.682	.951
	65+	.850	.081	.690	1.009
Q16 Diet and heart diseases	18-24	3.251	.086	3.081	3.421
	25-34	3.247	.104	3.042	3.452
	35-44	3.364	.134	3.102	3.627
	45-54	3.502	.133	3.240	3.764
	55-64	3.487	.138	3.215	3.759
	65+	3.588	.164	3.266	3.911
Total Score	18-24	16.412	.306	15.810	17.014
	25-34	17.092	.369	16.366	17.818
	35-44	18.377	.473	17.447	19.308
	45-54	18.876	.472	17.948	19.805
	55-64	18.274	.490	17.311	19.237
	65+	18.641	.581	17.499	19.782

Table 9. Means by educational level

5. Education					
Dependent Variable	Education	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Q6 Fruits and vegetables- no. of servings	Primary School	.530	.084	.366	.695
	Secondary School	.636	.065	.507	.764
	6th Form (A Levels)	.571	.069	.435	.707
	MCAST and other technical or trade certificate	.517	.095	.331	.703
	Diploma or Degree	.576	.049	.480	.672
	Post-graduate degree	.680	.065	.552	.808
Q7 Serving size	Primary School	.761	.069	.626	.895
	Secondary School	.688	.053	.583	.793
	6th Form (A Levels)	.795	.057	.684	.907
	MCAST and other technical or trade certificate	.745	.077	.593	.897
	Diploma or Degree	.895	.040	.817	.973
	Post-graduate degree	.877	.053	.773	.982
Q8 Fat	Primary School	3.664	.192	3.287	4.041
	Secondary School	3.891	.149	3.598	4.185
	6th Form (A Levels)	3.645	.159	3.333	3.957
	MCAST and other technical or trade certificate	4.019	.217	3.592	4.445
	Diploma or Degree	3.962	.111	3.743	4.181
	Post-graduate degree	3.966	.149	3.673	4.260
Q9 Salt	Primary School	3.492	.180	3.138	3.845
	Secondary School	3.513	.140	3.238	3.789
	6th Form (A Levels)	3.243	.149	2.950	3.535
	MCAST and other technical or trade certificate	3.400	.203	3.001	3.800
	Diploma or Degree	3.600	.104	3.395	3.806
	Post-graduate degree	3.648	.140	3.373	3.923
Q10 Fibre	Primary School	2.243	.208	1.835	2.651
	Secondary School	2.835	.162	2.517	3.153
	6th Form (A Levels)	2.794	.172	2.457	3.132
	MCAST and other technical or trade certificate	3.462	.234	3.001	3.924
	Diploma or Degree	3.372	.121	3.134	3.609
	Post-graduate degree	2.940	.161	2.623	3.258
Q11 Cholesterol source	Primary School	.574	.085	.406	.742

	Secondary School	.432	.067	.301	.563
	6th Form (A Levels)	.255	.071	.116	.394
	MCAST and other technical or trade certificate	.262	.097	.072	.452
	Diploma or Degree	.392	.050	.295	.490
	Post-graduate degree	.309	.067	.179	.440
Q12 Reducing cholesterol	Primary School	.732	.085	.564	.900
	Secondary School	.809	.067	.678	.939
	6th Form (A Levels)	.684	.071	.545	.823
	MCAST and other technical or trade certificate	.555	.097	.365	.745
	Diploma or Degree	.628	.050	.530	.725
	Post-graduate degree	.516	.067	.385	.647
Q13 Calories in butter and regular margarine	Primary School	.140	.074	-.006	.285
	Secondary School	.236	.058	.122	.349
	6th Form (A Levels)	.314	.061	.194	.435
	MCAST and other technical or trade certificate	.269	.084	.104	.434
	Diploma or Degree	.244	.043	.160	.329
	Post-graduate degree	.225	.058	.112	.339
Q14 Types of fats	Primary School	.806	.069	.671	.941
	Secondary School	.857	.054	.752	.962
	6th Form (A Levels)	.909	.057	.797	1.021
	MCAST and other technical or trade certificate	.563	.078	.410	.716
	Diploma or Degree	.902	.040	.823	.981
	Post-graduate degree	.857	.053	.752	.962
Q15 Healthiest meat	Primary School	.817	.075	.670	.965
	Secondary School	.699	.058	.585	.814
	6th Form (A Levels)	.843	.062	.721	.964
	MCAST and other technical or trade certificate	.708	.085	.542	.875
	Diploma or Degree	.824	.043	.738	.909
	Post-graduate degree	.910	.058	.796	1.025
Q16 Diet and heart diseases	Primary School	3.485	.152	3.186	3.783
	Secondary School	3.402	.118	3.170	3.634
	6th Form (A Levels)	3.429	.125	3.182	3.676
	MCAST and other technical or trade certificate	3.100	.171	2.763	3.437
	Diploma or Degree	3.471	.088	3.298	3.644
	Post-graduate degree	3.553	.118	3.321	3.785

Total Score	Primary School	17.243	.537	16.187	18.299
	Secondary School	17.999	.418	17.177	18.821
	6th Form (A Levels)	17.482	.444	16.609	18.356
	MCAST and other technical or trade certificate	17.601	.607	16.408	18.794
	Diploma or Degree	18.866	.312	18.252	19.479
	Post-graduate degree	18.482	.418	17.660	19.303
