The Economic and Social Review, Vol. 42, No. 4, Winter, 2011, pp. 407–436

Determinants of Vegetarianism and Meat Consumption Frequency in Ireland

EIMEAR LEAHY*
Economic and Social Research Institute, Dublin

SEÁN LYONS
Economic and Social Research Institute, Dublin
Trinity College Dublin

RICHARD S. J. TOL
Economic and Social Research Institute, Dublin
Trinity College Dublin
Institute for Environmental Studies, Vrije Universiteit, Amsterdam
Department of Spatial Economics, Vrije Universiteit, Amsterdam

Abstract: Vegetarianism is increasing in the western world. This trend can be attributed to heightened health, environmental and animal welfare concerns. In this paper we investigate the factors associated with vegetarianism and pescetarianism among adults in Ireland. Using the *2007 Survey of Lifestyles, Attitudes and Nutrition (SLÁN)*, we use logit models to assess the relationship between vegetarianism and the socio-economic and personal characteristics of the respondents. We also analyse the factors associated with varying levels of meat and fish consumption using ordinary least squares. We find that household size, age, income and education explain meat and fish consumption; and that marital status, health indicators, and lifestyle are associated with meat and fish consumption.

Acknowledgements: The Energy Policy Research Centre of the Economic and Social Research Institute and the EPA STRIVE programme provided financial support. Two anonymous referees had excellent comments on a previous version.

I INTRODUCTION

Meat production is set to double by 2050 due to an increase in the world population and increased wealth in developing countries (FAO, 2010). At present, in less developed countries, low income levels leave many people with no choice but to follow vegetarian diets. In developed countries, where people are vegetarians by choice, vegetarianism is increasing (Leahy, Lyons and Tol, 2010a). The notion of partial vegetarianism is also becoming increasingly popular in developed nations. Catholics have long been urged to abstain from meat consumption on Fridays. However, the heightened interest in the avoidance of meat on some days of the week has been driven mainly by celebrity endorsed movements such as the Meatless Monday campaign which began in 2003. Concern for animal welfare and the environment are among the factors driving this trend. The relationship between meat consumption, especially red meat, and global environmental change has been acknowledged (FAO, 2006). Ruminant livestock are major emitters of methane, the second-most important anthropogenic greenhouse gas.

Meat consumption also has implications for an individual's health. In developed countries, excessive meat consumption can be a health concern (Giovannucci *et al.*, 1994; Drewnowski and Specter, 2004; Hu *et al.*, 2000; Rose, Boyar, and Wynder, 1986; James *et al.*, 1997). Barnard, Nicholson and Howard (1995) studied the medical costs associated with meat consumption in the USA. The authors estimated that costs of between $30-60 billion per year result due to the higher prevalence of hypertension, heart disease, cancer, diabetes, gallstones, obesity and food-borne illness among omnivores compared with vegetarians.

In this paper, we investigate the factors associated with vegetarianism, pescetarianism and the frequency of meat and combined meat and fish consumption among adults in Ireland. Leahy, Lyons and Tol (2010c) examined the determinants of vegetarianism at an aggregate level. They find that there is a Kuznets-like relationship between income and meat expenditure. For the poor, an increase in income results in higher meat expenditure. However, at the global average income, meat consumption levels off and at very high levels of per capita income vegetarianism increases. Higher levels of education are also associated with increased vegetarianism and, in poor countries, vegetarianism is negatively associated with the per capita level of meat production.

Previous papers which aim to establish the motivations of vegetarians have usually been carried out on small or unrepresentative samples (Beardsworth and Bryman, 1999; Fox and Ward, 2008; Jabs, Devine and Sobal, 1998). To our knowledge, the most comprehensive study of the deter-

minants of meat consumption was carried out by Leahy, Lyons and Tol (2010b). This analysis was carried out using the 2008 Health Survey for England which is a large representative sample of adults and children in England. Results show that gender, ethnic origin, the region in which a person lives and their level of education are all significantly associated with vegetarianism. Consistent across both the adult and child analyses are the findings that both vegetarians and partial vegetarians are more likely to be female as opposed to male and Asian as opposed to White. Results also show that the larger the household, the more often meat is consumed.

While research on the determinants of vegetarianism is scarce, research into meat consumption has been extensive. The factors affecting meat demand have been studied at a micro level for example in the USA by Nayga (1995), in the UK by Burton *et al.* (1994), in Japan by Chern *et al.* (2002) and in Mexico by Gould *et al.* (2002). Results suggest that the demand for meat is affected by factors such as income, household size, education level and professional status. Changing socio-economic patterns have also resulted in changing the pattern of meat demand (Newman *et al.*, 2002; Meat and Livestock Commission, 1996). The factors affecting meat expenditure have been studied in Ireland by Newman *et al.* (2001). This, like the majority of meat demand studies to date, uses data from a household expenditure survey. It is difficult to predict individual consumption patterns from such data because data is collected at the household level. Also, such surveys do not usually contain detailed information about eating out. Household expenditure surveys are also problematic because expenditure does not necessary equal consumption (e.g., someone may buy meat for her dog). Expenditure surveys cannot distinguish between people who eat a lot of cheap meat and people who eat a little bit of expensive meat. There can also be problems with the accuracy of purchase recall and the frequency of purchase. All this makes expenditure surveys less suitable for studying the patterns of vegetarianism. The advantage of this paper is that the data we use is collected at the individual level and respondents are asked about general meat eating patterns as opposed to expenditure on meat at a point in time.

Leahy, Lyons and Tol (2010a) find that the proportion of the population avoiding meat in Ireland is increasing (see Figure A1). To our knowledge, this is the first empirical analysis of the determinants of vegetarianism and pescetarianism using Irish data. This should be of benefit to those forecasting future numbers of vegetarians and the associated environmental or health benefits. Because partial vegetarianism is becoming increasingly popular and can lead to important environmental and health benefits, we also assess the personal and household characteristics associated with varying frequencies of

meat and fish consumption. To our knowledge this is the first paper to analyse the determinants of meat and fish consumption frequency in Ireland using individual consumption data. The paper continues as follows. Section II describes the data and Section III the methods used. Section IV discusses the results. Section V provides a discussion and conclusion.

II DATA

We analyse the determinants of vegetarianism and meat consumption frequency among Irish adults. According to the online Oxford dictionary a vegetarian is defined as a person who does not eat meat or fish, and sometimes other animal products, especially for moral, religious, or health reasons (*Oxford Dictionaries*, 2011). The Vegetarian Society of the United Kingdom defines a vegetarian as someone that does not eat meat, poultry, game, fish, shellfish or crustacea, or by-products of slaughter (Vegetarian Society, 2011). Because the motivation for this paper is based on the environmental and health related damages associated with meat consumption we analyse the determinants of pescetarianism, i.e. those who do not consume meat but do consume fish. We also examine the determinants of vegetarianism, i.e. those who do not consume any meat or fish. Because the avoidance of meat on 1 or more days of the week can have important health and environmental benefits, we also analyse the frequency of meat and fish consumption.

The data we use is the *2007 Survey of Lifestyles, Attitudes and Nutrition (SLÁN)* in Ireland (Department of Health and Children, 2008). This is a nationally representative sample of 10,364 adults aged 18 and over. A response rate of 62 per cent was achieved. Participants were asked a range of questions about general health; fruit and vegetable consumption; alcohol consumption; smoking; and physical activity. The survey includes additional anthropometric and other physical examination data from two sub-samples: 967 adults aged 18-44 years and 1,207 adults aged 45 years and over. *SLÁN* also contains information on income and other socio-economic variables which we use as explanatory variables in our models.

Of our sample 9,223 adults (89 per cent) completed a food frequency questionnaire. Respondents are asked about average food consumption over the past year. There are 9 categories of food included in the questionnaire: cereals; meat, fish and poultry; bread and savoury biscuits; potatoes, rice and pasta; dairy products and fats; fruits; vegetables; sweets and snacks; soups, sauces and spreads. A number of items are listed under each of the category headings. A question about the frequency of consumption of various alcoholic and non-alcoholic drinks is also included.

We constructed a variable that represents the number of servings of different foods consumed each day, i.e. a total food consumption variable.[1] Some respondents report incredibly high and low levels of food consumption. In order to remove outliers, we omit observations that are greater than the standard deviation plus the mean and less than the mean minus the standard deviation on the total food consumption variable. This reduces the number of observations to 7,531. We still have many respondents who consume very little and very large amounts of food. The total food consumption variable in the restricted sample is plausible, ranging between 11.6 and 34.9 servings a day.[2] We also tried omitting observations that are two times the standard deviation above and below the mean of the total food consumption variable, but with this method implausible meat consumption and food consumption observations remained. The implausible responses do not appear to have been correlated with gender. The percentage of respondents that are female is 58 per cent in both the full and restricted samples.

Respondents report how often they consume medium sized portions[3] of 21 meat items; less than once a month or never, 1-3 times per month, once a week, 2-4 times per week, 5-6 times per week, once a day, 2-3 times per day, 4-5 times per day or 6 or more times per day. The same questions are asked in relation to 7 categories of fish. We classify those who identify themselves as consuming 21 meat items and 7 fish items "less than once a month or never" as vegetarians. Those who consume 21 meat items "less than once a month or never" but who do consume fish are classified as pescetarians.[4] We find that in the restricted sample 1.6 per cent of the sample do not eat meat but may or may not eat fish. This was equivalent to 51,261 adults in Ireland in 2007. Pescetarians account for 0.7 per cent of the sample or roughly 22,427 adults in Ireland in 2007. Of adults in the sample 0.9 per cent are vegetarian. This equalled 28,834 adults in Ireland in 2007. Average daily meat consumption in

[1] The definition of a serving differs with different types of food. For example a serving of bread is defined as one medium sized slice of bread, a serving of rice is defined as a cupful of cooked rice and a serving of fruit equals 1 medium sized banana/apple/pear.

[2] We then cross-checked the total food consumption variable with a variable specifying the daily calorie intake. In the restricted sample, the minimum calorie intake is now 500 calories per day. Thus, we feel that we have been conservative in deleting outliers.

[3] A medium sized portion of meat is defined as being the size of a deck of cards. If a person eats a portion about half the size of this, it is reported that they eat half a portion. If a person eats a portion that is about double the size of a deck of cards, it is reported that they eat 2 portions. So, if a respondent only eats very small portions of meat they are not classified as vegetarians.

[4] The Appendix shows that the list of meat and fish items included in the study is very comprehensive. Respondents are asked about consumption of 21 meat items and the 7 fish categories take in all possible varieties of fish and seafood. Thus, the possibility of misclassifying vegetarians is small.

the restricted sample is 1.59 portions. The average daily intake of combined meat and fish is 2.[5]

Also contained in the dataset is a variable which specifies the average daily portions of dairy products consumed by the respondent. We compute a variable which specifies whether the respondent is a vegan or not based on this variable along with the meat and fish consumption variables. We attempt to analyse the determinants of veganism, however, due to few observations[6] the model does not run successfully.

III METHODS

The method we use is similar to that of Leahy, Lyons and Tol (2010b) where the analysis is made up of two parts. In the first part we use logit regression models to separately analyse the factors associated with pescetarianism and vegetarianism. A logit model is suitable for the analysis because the dependent variable is binary, equalling 1 if the respondent meets certain criteria and 0 otherwise. The models are specified as follows:

$$y_i^* = \beta x_i + u_i$$

where $y_i = 1$ if $y_i^* = \beta x_i + u_i > 0$ and $y_i^* = 0$ otherwise

In the model of the determinants of pescetarianism y_i^* is the probability that the respondent is a pescetarian. y_i equals 1 if the respondent consumes fish but not meat and 0 otherwise. In the model of the determinants of vegetarianism y_i^* is the probability that the respondent is a vegetarian. y_i equals 1 if the respondent does not consume meat or fish and 0 otherwise. x is the vector of independent variables for respondent i, and β is the vector of regression coefficients. These independent variables consist mostly of individual characteristics but also some household characteristics. One of the variables we control for is the location of the household in which the respondent lives. Respondents are asked whether they live in open country, in a village, in a town (more than 1,500 residents) in a city (other than Dublin) or in Dublin city or county. We are interested in household location because the characteristics and eating patterns of Dublin residents may be very different to those of rural dwellers. We expect to find that vegetarians are more prevalent in urban areas (and in particular big cities) than in rural areas or small towns. Leahy, Lyons and Tol (2010b) found this to be the case among

[5] In the full sample, 0.98 per cent are vegetarian while 0.7 per cent are pescetarian. The average meat consumption frequency is 1.66 (1.42) portions per day. Daily consumption of meat and fish combined is 2.1 (1.68) portions.

[6] Only 2 respondents are classified as vegan.

vegetarians in England. Another household characteristic that is controlled for is tenure. We include this as an explanatory variable because we are interested to see whether the dietary patterns of renters are different to those of homeowners, for example.

Also included in the model is the age and gender of the respondent. Leahy, Lyons and Tol (2010b) found that in England females were two and a half times more likely to be vegetarians than males and the relationship between age and vegetarianism was negative. We wish to ascertain whether there is a link between vegetarians and the health conscious. The respondent's body mass index (BMI) is measured and the number of portions of fruit and vegetables consumed daily are counted. Respondents are also asked if they are physically active on a regular basis and whether they watch their weight or not. We expect to find a positive relationship between being weight conscious, having a relatively low BMI, and being physically active and vegetarianism. Other control variables include having any medical problems, because this may mean respondents are obliged to follow restricted diets. We also control for the respondents own assessment of their health status and quality of life.

The explanatory variables also include smoking and alcohol intake. We expect to find that vegetarians are more health conscious and that their alcohol intake might be lower than that of non-vegetarians. Similarly, we expect to find that non-smokers are more likely to be vegetarians than smokers.

We control for the social class and work status of the respondent. We expect to find that the rate of vegetarianism is higher among those who are employed compared to those who are out of work and, for those who are working, we expect that those in higher social class positions are more likely to be vegetarians than lower social class individuals. We include the education level of the individual in addition. Higher education was positively associated with vegetarianism at the aggregate level (Leahy, Lyons and Tol, 2010c) and also at the individual level in England (Leahy, Lyons and Tol, 2010b).

We control for the marital status of the individual. Pribis, Sabate and Fraser (1999) find no differences in marital status between vegetarians and non-vegetarians. However, the sample used was small (158 adults) and unrepresentative of the population. Leahy, Lyons and Tol (2010b) found that English respondents who are divorced and cohabiting are more likely to be vegetarians than respondents that are married.

The household income level is included as an explanatory variable and enables us to establish whether vegetarians are more likely to be found in higher income or lower income households. The income variable provided in the *SLÁN* dataset is not continuous; rather it is divided into 6 binary

categories. A graph of the relationship between household income and the percentage of vegetarians is shown in Figure A2 of the Appendix. Leahy, Lyons and Tol (2010c) found that at the aggregate level there is a Kuznets-like relationship between income and vegetarianism. It appears that in Ireland, at relatively low levels of household income, the U-shaped relationship also exists. We would be interested to know the relationship between vegetarianism and relatively high levels of household income. Unfortunately, however, *SLÁN* does not disaggregate income levels above €50,000.[7]

Finally, we include a variable which specifies whether respondents were born in Ireland, Northern Ireland, Great Britain or elsewhere. We would like to control for ethnic origin because this may influence meat eating patterns, particularly those of red meat. A question on ethnic origin was asked in the *SLÁN* questionnaire but the variable is not significant in any of the models we run. We would also like to control for the number of other vegetarians in the household but this information is not provided in the dataset. Leahy, Lyons and Tol (2010b) found that household size was an important variable in both the vegetarian and partial vegetarian models. However, this information is not available in *SLÁN*. Also, questions regarding environmental or animal welfare concern would be useful in explaining vegetarian status but *SLÁN* does not include any such questions.

In the second part of the analysis we examine the factors associated with the frequency of meat consumption and combined meat and fish consumption. Variables specifying the equivalent daily servings of each of the 21 meat items and 7 fish items are computed and examined. 0 indicates that the item is consumed less than once a month or never, 0.067 indicates that the item is consumed 1-3 times a month, 0.143 indicates that the item is consumed once a week, 0.429 indicates a consumption pattern of 2-4 times a week, and 0.786 reflects a consumption pattern of 5-6 times a week. 1 indicates that the meat item is consumed once a day, 2.5 indicates an item is consumed 2-3 times a day and 4.5 indicates a consumption pattern of 4-5 times a day.[8] The maximum value per item is 6, indicating that the item is consumed at least 6 times per day. We then aggregate the daily serving equivalents for each type of meat for each respondent so that we have a composite meat consumption scale. In theory, the meat consumption values could range between 0 and 126, however, no respondents report consuming all meat items 6 times per day. Having restricted the sample, the maximum meat consumption value is 17. The mean is 1.59. We also compute a variable which specifies the aggregated daily

[7] The *2004/05 Household Budget Survey for Ireland* (CSO, 2007) shows that the average annual gross household income in Ireland is over €53,000 while the average annual disposable household income is over €42,000.

[8] Where consumption is specified as a range we use the mid-point of the range.

consumption of combined meat and fish. The values for this variable could range between 0 and 168, however, no respondents report consuming 21 meat items and 7 fish items 6 times per day. Having restricted the sample, the maximum value for the combined meat and fish consumption variable is 24. The mean is 2. [9]

Because our dependent variables in the frequency of consumption models are ordinal, and because the intervals between levels of the dependent variable are not equal, we use Ordinary Least Squares. Previous papers which have studied the frequency of meat consumption, for example, Newman *et al.* (2001) have used double hurdle models. Such models consist of two stages, each consisting of a different set of explanatory variables. Income is usually used as an explanatory variable in the first stage but not in the second. The *SLÁN* data does not specify income levels above €50,000, thus we do not feel we know enough about the economic circumstances of the household to use this variable to explain the first stage. In addition, SLÁN specifies income at the household level but we are analysing consumption at the individual level. The OLS model is specified as follows:

$$y_i = x_i'\beta + \varepsilon_{i,}$$

In the first of these models y_i represents the equivalent daily servings of meat. In the second model y_i is the daily level of combined meat and fish consumption. x is the vector of independent variables for respondent i, and β is the vector of regression coefficients. We include the same explanatory variables in the models of meat and combined meat and fish consumption frequency as we do in the analyses of vegetarianism and pescetarianism.

All of the regressions are carried out using the statistical software package *STATA*. A list of the variables used in both the logit and OLS models and some descriptive statistics on them can be found in Table 1. A list of the 21 meat items and 7 fish categories included in *SLÁN* can be found in Table A1 of the Appendix.

IV RESULTS

For both the logit and OLS models we include all variables we believe may influence meat and combined meat and fish consumption. Due to the large number of explanatory variables in our models, only the statistically significant results are discussed.

[9] The dependent variables in these models reach very high levels for daily consumption. We have cross checked the responses for those who report consuming very high levels of meat and fish with total food consumption and we see the responses as being valid. It appears that these respondents may be following high protein or low carbohydrate diets such as the Atkins diet.

Table 1: *Descriptive Statistics*

Variable	*Description*	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
vegetarian	1 if respondent is a vegetarian, 0 if not	7,531	0.009	0.096	0	1
pescetarian	1 if respondent is a pescetarian, 0 if not	7,531	0.007	0.082	0	1
meatfreq	Daily meat consumption	7,531	1.59	0.99	0	17
meatfishfreq	Daily meat and fish consumption	7,531	2.00	1.15	0	24
	Continuous Variables					
household size	Number of residents	7,500	2.90	1.57	0	18
bmi	Body Mass Index	7,102	25.65	4.49	11.24	60.28
fruitveg	Daily fruit and vegetable consumption	7,531	6.91	3.37	0	30.08
	Dummy Variables					
active	1 if respondent gets required amount of physical activity, 0 if not	7,531	0.54	0.50	0	1
medicalprob	1 if respondent has one or more medical conditions, 0 if not	7,531	0.09	0.29	0	1
watchweight	1 if respondent watches his/her weight, 0 if not	7,531	0.44	0.50	0	1
female	1 if respondent is a female, 0 if not	7,531	0.58	0.49	0	1
smoker	1 if respondent is a smoker, 0 if not	7,531	0.26	0.44	0	1
	Alcohol Consumption					
alcohol_never	Never	7,501	0.20	0.40	0	1
alcohol_monthly	Monthly	7,501	0.17	0.38	0	1
alcohol_weekly	Weekly	7,501	0.25	0.43	0	1
alcohol_2-3 times per week	2-3 times per week (reference category)	7,501	0.29	0.45	0	1
alcohol_at least 4 times per week	At least 4 times per week	7,501	0.08	0.27	0	1
	Self Reported Health Status					
excellent health	Excellent	7,512	0.22	0.41	0	1
very good health	Very good (reference category)	7,531	0.36	0.48	0	1
good health	Good	7,512	0.29	0.45	0	1

Table 1: *Descriptive Statistics (contd.)*

Variable	*Description*	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
fair health	Fair	7,512	0.11	0.31	0	1
poor health	Poor	7,512	0.03	0.16	0	1
	Age					
age_18-29	18-29	7,531	0.18	0.38	0	1
age_30-44	30-44 (reference category)	7,531	0.32	0.47	0	1
age_45-64	45-64	7,531	0.31	0.46	0	1
age_65+	65+	7,531	0.19	0.39	0	1
	Education Level					
educ_<primary	Primary not completed	7,531	0.03	0.17	0	1
educ_primary	Primary completed	7,531	0.14	0.34	0	1
educ_junior	Junior Certificate	7,531	0.20	0.40	0	1
educ_leaving cert	Leaving Certificate (reference category)	7,531	0.25	0.43	0	1
educ_dip/cert	Diploma or Certificate	7,531	0.19	0.39	0	1
educ_degree	Degree	7,531	0.10	0.30	0	1
educ_higher degree	Higher Degree	7,531	0.10	0.29	0	1
	Marital Status					
single	Single	7,520	0.28	0.45	0	1
cohabiting	Cohabiting	7,520	0.06	0.24	0	1
married	Married (reference category)	7,531	0.51	0.50	0	1
separated	Separated	7,520	0.04	0.20	0	1
divorced	Divorced	7,520	0.02	0.13	0	1
widowed	Widowed	7,520	0.09	0.28	0	1
	Employment Status					
employee	Employee (reference category)	7,531	0.45	0.50	0	1
self-employed	Self-employed	7,502	0.08	0.27	0	1
farmer	Farmer	7,502	0.03	0.18	0	1
student	Student	7,502	0.04	0.19	0	1
training scheme	Training scheme	7,502	0.01	0.08	0	1
unemployed	Unemployed	7,502	0.03	0.16	0	1
sick/disabled	Sick/disabled	7,502	0.04	0.18	0	1
home duties	Home duties	7,502	0.14	0.35	0	1
retired	Retired	7,502	0.17	0.38	0	1
work other	Other work status	7,502	0.01	0.10	0	1
	Social Status					
professional and managerial	professional and managerial	7,531	0.35	0.48	0	1

Table 1: *Descriptive Statistics (contd.)*

Variable	*Description*	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
non-manual and skilled manual	non-manual and skilled manual (reference category)	7,531	0.38	0.49	0	1
semi-skilled and unskilled	semi-skilled and unskilled	7,531	0.16	0.36	0	1
unclassified	unclassified	7,531	0.11	0.32	0	1
	Household Income					
income <€10,000	€10,000 or less	6,816	0.05	0.21	0	1
€10,000-€19,999	€10,000-€19,999	6,816	0.19	0.39	0	1
€20,000-€20,999	€20,000-€20,999	6,816	0.18	0.38	0	1
€30,000-€39,999	€30,000-€39,999	6,816	0.17	0.37	0	1
€40,000-€40,999	€40,000-€40,999	6,816	0.15	0.36	0	1
€50,000 or more	€50,000 or more (reference category)	7,531	0.24	0.43	0	1
	Quality of life					
lifequal_very poor	Very poor	7,483	0.01	0.12	0	1
lifequal_poor	Poor	7,483	0.02	0.15	0	1
lifequal_ok	OK	7,483	0.07	0.25	0	1
lifequal_good	Good	7,531	0.49	0.50	0	1
lifequal_very good	Very good (reference category)	7,483	0.40	0.49	0	1
	Location of Household					
open country	open country (reference category)	7,531	0.32	0.47	0	1
village	Village	7,440	0.11	0.32	0	1
town	Town	7,440	0.25	0.43	0	1
city	City	7,440	0.11	0.32	0	1
Dublin city or county	Dublin city or county	7,440	0.21	0.40	0	1
	Country Born					
Ireland	Ireland (reference category)	7,531	0.87	0.34	0	1
Northern Ireland	Northern Ireland	7,506	0.01	0.11	0	1
Great Britain	Great Britain	7,506	0.06	0.25	0	1
born other	Born elsewhere	7,506	0.06	0.23	0	1
	Other variables,					
Total food	Total food consumption	7531	21.66	5.81	11.60	34.94

4.1 *Vegetarianism and Pescetarianism*

In the first of the logit models the dependent variable equals 1 if the respondent is a vegetarian, 0 otherwise. In the second, the dependent variable equals 1 if the respondent is a pescetarian, 0 otherwise. (Recall that there are too few vegans in the sample to reliably estimate a logit model.) For each categorical explanatory variable there is a reference category which acts as a baseline against which the characteristics of respondents, or their households, are compared. The results, displayed in Table 2, are presented in terms of odds ratios which reflect the odds that a respondent with a given characteristic will be a vegetarian or pescetarian, relative to those in the reference category. An odds ratio of 1 indicates that respondents with that characteristic are equally likely to be vegetarians/pescetarians as those in the reference category. An odds ratio greater than 1 indicates a higher probability that the respondent will be a vegetarian/pescetarian, while a ratio below 1 indicates that the probability is lower.

Table 2: *Determinants of Vegetarianism and Pescetarianism*[10]

	Vegetarian		*Pescetarian*	
	Odds Ratio	*Std. Err.*	*Odds Ratio*	*Std. Err.*
Continuous variables				
household size	0.725	0.095**	1.035	0.125
bmi	0.879	0.04***	0.955	0.037
fruitveg	1.242	0.04***	1.081	0.046*
Dummy Variables				
active	0.76	0.24	1.916	0.743*
medicalprob	0.203	0.175*	0.81	0.602
watchweight	1.195	0.384	1.244	0.433
female	1.572	0.62	1.913	0.762
smoker	0.598	0.235	0.937	0.376
Alcohol Consumption				
alcohol_never	1.818	0.75	2.127	1.093
alcohol_monthly	0.736	0.389	2.477	1.268*
alcohol_weekly	0.827	0.338	1.79	0.86
alcohol_2-3 times per week (reference category)				
alcohol_at least 4 times per week	0.725	0.451	0.693	0.564

[10] We use the statistical software package STATA. Any variables that are specified as being omitted in this table were omitted due to a lack of observations. We do not reform variable categories because the problem does not occur in all of the models. Also, for consistency, we wish to control for the same variables in each model.

Table 2: *Determinants of Vegetarianism and Pescetarianism (contd.)*

	Vegetarian		*Pescetarian*	
	Odds Ratio	*Std. Err.*	*Odds Ratio*	*Std. Err.*
Self reported health status				
excellent health	1.132	0.444	0.447	0.22
very good health (reference category)				
good health	2.031	0.808*	0.973	0.413
fair health	2.116	1.492	1.091	0.732
poor health	0.907	1.15	5.691	4.694**
Age				
age_18-29	0.409	0.189*	0.548	0.319
age_30-44 (reference category)				
age_45-64	0.297	0.129***	1.367	0.569
age_65+	0.193	0.167*	1.081	0.902
Education level				
educ_<primary	0.711	0.841	1.551	1.413
educ_primary	0.643	0.472	0.954	0.61
educ_junior	0.299	0.201*	0.307	0.248
educ_leaving cert (reference category)				
educ_dip/cert	1.048	0.445	1.942	0.928
educ_degree	1.15	0.552	1.651	0.972
educ_higher degree	0.863	0.456	1.469	0.881
Marital Status				
single	1.677	0.761	2.595	1.241**
cohabiting	2.808	1.438**	0.586	0.632
married (reference category)				
separated	1.335	1.116	1.416	1.205
divorced	1.472	1.675	3.887	3.164*
widowed	0.877	0.769	4.579	2.85**
Employment Status				
employee (reference category)				
self-employed	1.496	0.813	3.398	1.579***
farmer	omitted		omitted	
student	3.778	2.908*	omitted	
training scheme	omitted		11.512	10.301***
unemployed	3.36	2.845	2.361	2.034
sick/disabled	2.769	2.256	1.582	1.326
home duties	4.401	1.952***	0.411	0.3
retired	1.247	1.111	0.731	0.558
work_other	omitted		omitted	

Table 2: *Determinants of Vegetarianism and Pescetarianism (contd.)*

	Vegetarian		*Pescetarian*	
	Odds Ratio	*Std. Err.*	*Odds Ratio*	*Std. Err.*
Social Status				
professional and managerial	0.87	0.312	1.328	0.531
non-manual and skilled manual (reference category)				
semi-skilled and unskilled	1.035	0.583	0.971	0.598
unclassified	0.395	0.253	2.189	1.301
Household Income				
income_<€10,000	0.897	0.68	1.252	1.064
€10,000-€19,999	0.325	0.211*	0.909	0.597
€20,000-€20,999	0.598	0.301	0.724	0.445
€30,000-€39,999	0.352	0.175**	1.123	0.598
€40,000-€40,999	0.426	0.21*	1.329	0.658
€50,000 or more (reference category)				
Quality of Life				
lifequal_very poor	3.665	3.163	0.358	0.459
lifequal_poor	omitted		0.611	0.74
lifequal_ok	3.197	1.715**	1.452	0.924
lifequal_good (reference category)				
lifequal_very good	0.772	0.278	1.887	0.719*
Location of Household				
open country (reference category)				
village	0.282	0.22	0.96	0.535
town	0.384	0.19*	1.092	0.487
city	1.415	0.665	0.195	0.207
Dublin city or county	1.489	0.579	1.364	0.606
Country Born				
Ireland (reference category)				
Northern Ireland	1.664	1.84	omitted	
Great Britain	1.414	0.679	0.923	0.591
Born other	0.129	0.135*	1.256	0.823
Number of obs	5840		5757	
LR chi2(54)	148.92		77	
Prob > chi2	0		0.02	
Log likelihood	–227.52		–210	
Pseudo R^2	0.25		0.15	

4.1.1 *Vegetarianism*

The coefficient on the household size variable indicates that as the number of people living in the household increases the probability that the respondent will be vegetarian decreases. This may be because there are economies of scale in meat and fish consumption. Also, respondents may be more inclined to buy and prepare a meat or fish dish when there are other people to share it with. Alternatively, it could be that potential vegetarians are encouraged to eat meat when surrounded by meat eaters. Another possibility is that household size is correlated with ethnicity[11] or some other socio-economic characteristic for which we cannot control. Unfortunately, we do not have a variable that specifies the number of other vegetarians in the household. Household size was also found to be significant by Leahy, Lyons and Tol (2010b). The BMI of the respondent was found to be significant in the vegetarian model. The lower a respondent's BMI, the higher the odds that the respondent is a vegetarian. However, we cannot decipher whether vegetarians have a lower BMI because meat and some fish contain a higher fat content than many of their alternatives or if respondents with a low BMI choose to abstain from meat and fish. Unfortunately, we do not have an instrumental variable with which we can solve this problem of simultaneity. The same problem arises with the "fruitveg" variable. As the number of portions of fruit and vegetables that are consumed on a daily basis increases, so too does the probability that the respondent is a vegetarian. Perhaps vegetarians are more health conscious than their meat eating counterparts or it could be that vegetarians just consume more fruit and vegetables as part of their daily calorie intake. Respondents suffering from one or more medical conditions are less likely to be vegetarians than respondents without medical conditions. We cannot tell whether the medical condition arose as a result of meat consumption or whether these respondents have a medical condition which can be eased by consuming meat such as iron deficiency. On the other hand, those who report having good health are more likely to be vegetarians than their counterparts who report having very good health. It may be that in order to improve their health status further, these respondents have chosen to abstain from meat and fish products.

Many of the age variables are significant in the model. Being either younger or older than respondents in the 30-44 year age group decreases the probability that a respondent will be a vegetarian. The traditional Irish diet is one very heavily based around meat. It may be that those aged 45 and over are

[11] Ethnicity is included as a question in the *SLÁN* questionnaire. We subdivided the respondents into different categories based on ethnicity and included these variables as binary variables in earlier models. Unfortunately, all of the ethnicity variables dropped out of all of the models we had experimented with due to multicollinearity.

creatures of habit and have not veered away from the diet they are used to. The fact that 18-29 year olds are less likely to be vegetarian is surprising. In England, it was found that the younger the adult, the more likely it is that he/she will be a vegetarian (Leahy, Lyons and Tol, 2010b). It may be that in Ireland, one becomes more health or environmentally conscious as he/she reaches the age of 30 and, as a result, makes some dietary changes.

Respondents who are educated only to Junior Certificate level are less likely to be vegetarians than their counterparts who have completed the Leaving Certificate.[12] It may be that they are not as aware of the health, environmental and animal welfare benefits of following a vegetarian diet. Interestingly, respondents who are cohabiting are over twice as likely to be vegetarians as those who are married. It may be that vegetarianism is one of a number of lifestyle choices preferred by respondents who are cohabiting. This was also found to be the case in England (Leahy, Lyons and Tol, 2010b).

Some of the employment variables are also significant in the model. Students are 3.8 times more likely to be vegetarians than employees. Unfortunately, we cannot tell whether those who become vegetarian as a student remain so for life. A similar result was found for those involved in home duties. This may be another lifestyle choice made by vegetarians in that they prefer to work at home rather than in big corporations or government departments.

The reference category for household income is €50,000 per annum or more. Results show that respondents who live in relatively poorer households are less likely to be vegetarian than those in the reference group. The relationship between household income and vegetarianism is shown in Figure A2. For income levels up to €50,000 there appears to be a U-shaped relationship. At very low levels of income, people cannot afford to buy meat or fish and are forced to become vegetarian. As income increases it seems that those who can afford to buy meat and fish do so. After income increases beyond a certain point the rate of vegetarianism begins to rise again. These people, it would appear, are vegetarians of choice. These results are consistent with those of Leahy, Lyons and Tol (2010c) who studied the relationship between income and vegetarianism and the aggregate level.

Respondents who report having a good quality of life are more likely to be vegetarians than those whose quality of life is very good. Unfortunately, we do

[12] The Junior Certificate examination is held at the end of the Junior Cycle in post-primary schools. Students normally sit for the examinations after 3 years of post-primary education. The Leaving Certificate is an upper secondary level qualification. It is the final course in the Irish secondary school system. It is a two-year programme in which students must study at least 6 subjects. For the majority of students, English, Irish and Mathematics are compulsory, while the remaining subjects are optional. As is the case with the Junior Certificate, students may opt for tests with varying degrees of difficulty for each subject.

not know the direction of causation here. It could be that the lack of meat and fish in the diet reduces one's quality of life from very good to good or it could be that these respondents avoid meat and fish in the hope that their quality of life will improve.

Location also plays a role in explaining the vegetarian decision. Respondents who live in towns are less likely to be vegetarians than their counterparts who live in the countryside. This may be because residents of small, traditional towns in Ireland are less likely to experiment with or embrace new dietary or lifestyle choices. Being born outside Ireland or the UK decreases the odds that a person will be a vegetarian. This variable, however, does not tell us anything about nationality or ethnicity.

4.1.2 *Pescetarianism*

Results show that the variables that play a role in explaining the pescetarianism decision are very different to those that help explain vegetarianism. Only the fruit and vegetable consumption variable is significant in both models indicating that the decision to abstain from both meat and fish is different to that of meat avoidance alone.

Some of the health related variables are important for those who do not eat meat. For example, those who get the required amount of physical activity per day are almost twice as likely to be vegetarian than those who do not. This indicates that those who avoid meat may be doing so for health reasons, however, this cannot be proven with cross-sectional data. The health hypothesis is reinforced by the fact that those who consume alcohol monthly as opposed to a few times per week have higher odds of being a pescetarian. On the other hand, those in poor health are over 4 times as likely to be pescetarians than respondents who report being in very good health. We cannot tell whether a lack of meat in the diet leads to poor health or whether those in poor health are taking the step to avoid meat and improve their health status. The health related literature would suggest that the latter is the case but we would need longitudinal data to explore this further.

While cohabiting was significant in the vegetarianism model, we find that respondents who are single, divorced or widowed are all significantly more likely to be pescetarians than those who are married. This may be due to economies of scale involved in meat expenditure or it may be that meat avoidance is not only a dietary but also a lifestyle choice. In the case of divorcees it would be interesting to see whether the divorce triggered the meat avoidance or vice versa. This variable was also found to be significant among meat avoiders in England (Leahy, Lyons, and Tol, 2010b).

The employment variables also suggest that meat avoidance is a lifestyle choice. Self-employed people are over 3 times as likely to be pescetarians as

those who are employees. Also, those on training schemes have much higher odds of being a pescetarian; however, there are very few respondents in this category so this variable should be interpreted with caution. Having a very good quality of life increases the odds that a respondent will be a pescetarian compared to those who classify their quality of life as "good". However, we cannot tell the direction of causation here.

The relationship between income and pescetarianism can be seen in Figure A2. The relationship is U-Shaped for income levels up to €40,000. None of the income variables are significant in this model though.

4.3 *Frequency of Meat and Combined Meat and Fish Consumption*

Table 3 shows the results of two OLS models. In the first we investigate the factors associated with varying levels of meat consumption among adults in Ireland. The dependent variable represents the level of meat consumption on an average day and varies between 0 and 17. The second model explains the frequency of combined meat and fish consumption. The dependent variable ranges between 0 and 24. Due to the large number of explanatory variables included in the models, only the statistically significant results are discussed.

Table 3: *Determinants of Meat and Fish Consumption Frequency*

	Meat Consumption Frequency		*Combined Meat and Fish Consumption Frequency*	
	Coefficient	*Std. Error*	*Coefficient*	*Std. Error*
Continuous variables				
household size	0.072	0.009***	0.069	0.011***
bmi	0.011	0.003***	0.01	0.004***
fruitveg	–0.001	0.004	0.019	0.004***
Dummy variables				
active	–0.057	0.027**	–0.065	0.031**
medicalprob	–0.058	0.05	–0.065	0.058
watchweight	–0.124	0.027***	–0.129	0.032***
female	–0.233	0.029***	–0.265	0.034***
smoker	0.082	0.029***	0.091	0.034***
Alcohol Consumption				
alcohol never	–0.046	0.038	–0.06	0.045
alcohol_monthly	–0.103	0.038***	–0.12	0.045***
alcohol_weekly	–0.036	0.033	–0.074	0.039*
alcohol_2-3 times per week (reference category)				
alcohol at least 4 times per week	–0.018	0.047	–0.042	0.056

Table 3: *Determinants of Meat and Fish Consumption Frequency (contd.)*

	Meat Consumption Frequency		*Combined Meat and Fish Consumption Frequency*	
	Coefficient	*Std. Error*	*Coefficient*	*Std. Error*
Self Reported Health Status				
excellent health	0.05	0.033	0.073	0.039*
very good health (reference category)				
good health	0.029	0.032	0.022	0.037
fair health	0.023	0.048	0.014	0.057
poor health	0.171	0.088*	0.179	0.103*
Age				
age_18-29	0.208	0.042***	0.248	0.05***
age_30-44 (reference category)				
age_45-64	–0.126	0.033***	–0.125	0.039***
age_65+	–0.146	0.059**	–0.187	0.07***
Education Level				
educ_<primary	–0.024	0.08	0.001	0.095
educ_primary	–0.03	0.046	–0.04	0.054
educ_junior	0.025	0.038	0.03	0.045
educ_leaving cert (reference category)				
educ_diploma/cert	–0.106	0.038***	–0.071	0.045
educ_degree	–0.114	0.046**	–0.157	0.054***
educ_higher degree	–0.265	0.048***	–0.273	0.057***
Marital Status				
single	0.09	0.037**	0.098	0.044**
cohabiting	–0.006	0.056	–0.023	0.065
married (reference category)				
separated	0.025	0.065	0.079	0.076
divorced	0.054	0.093	0.054	0.109
widowed	0.018	0.052	0.002	0.061
Employment Status				
employee (reference category)				
self employed	–0.065	0.047	–0.049	0.055
farmer	0.078	0.074	0.03	0.088
student	–0.272	0.08***	–0.328	0.095***
training scheme	–0.271	0.147*	–0.235	0.173
unemployed	–0.073	0.08	–0.019	0.094
sick/disabled	–0.058	0.074	–0.041	0.087
home duties	–0.073	0.043*	–0.094	0.051*
retired	–0.058	0.055	–0.034	0.064
work_other	–0.324	0.121***	–0.37	0.142***
Social Status				
professional and managerial	–0.071	0.03**	–0.082	0.036**
non-manual and skilled manual (reference category)				

Table 3: *Determinants of Meat and Fish Consumption Frequency (contd.)*

	Meat Consumption Frequency		*Combined Meat and Fish Consumption Frequency*	
	Coefficient	*Std. Error*	*Coefficient*	*Std. Error*
semi-skilled and unskilled	0.063	0.038*	0.058	0.044
unclassified	0.178	0.048***	0.243	0.056***
Household Income				
income_<€10,000	0.072	0.071	0.07	0.084
€10,000-€19,999	0.102	0.048**	0.123	0.057**
€20,000-€20,999	0.083	0.042**	0.093	0.049*
€30,000-€39,999	0.147	0.04***	0.177	0.047***
€40,000-€40,999	0.09	0.039**	0.105	0.046**
€50,000 or more (reference category)				
Quality of Life				
lifequal_very poor	–0.019	0.105	0.135	0.124
lifequal_poor	0.004	0.09	0.012	0.106
lifequal_ok	0.023	0.051	0.053	0.06
lifequal_good (reference category)				
lifequal_very good	–0.033	0.028	–0.029	0.033
Location of Household				
open country (reference category)				
village	–0.019	0.043	0.044	0.05
town	–0.017	0.034	0.011	0.04
city	–0.007	0.043	0.031	0.051
Dublin city or county	0.054	0.036	0.13	0.042***
Country Born				
Ireland (reference category)				
Northern Ireland	–0.074	0.114	–0.156	0.134
Great Britain	–0.095	0.049*	–0.051	0.058
born other	–0.028	0.056	0.064	0.065
constant	1.36	0.109	1.639	0.128
	Model	*Residual*	*Model*	*Residual*
SS	530.24	5,650.76	632.85	7,828.79
df	58	6,223	58	6,223
MS	9.14	0.91	10.91	1.26
Number of obs	6,282			6,282
Prob > F	0			0
R^2	0.0858			0.0748
Root MSE	0.95291			1.1216

The statistically significant variables and their coefficients are similar in both models. As household size increases so too does the consumption of combined meat and fish. As stated earlier, people may be more inclined to buy and spend time preparing such dishes when there are others to share them with. The coefficient on the BMI variable suggests that body mass index increases with combined consumption of meat and fish. The fruit and vegetable consumption variable is significant in the combined meat and fish consumption model only. This suggests that those who eat a lot of meat and fish may have bigger appetites in general. Or, it may be that the health conscious, who consume high amounts of fruit and vegetables, also consume a lot of white meat or white fish.

Many of the health related variables are significant in the models. Leading an active lifestyle, watching one's weight and consuming alcohol only once per month are significantly associated with less frequent meat and meat and fish consumption. This suggests that reduced levels of meat and combined meat and fish consumption by some respondents are just some of the measures taken as part of a broader effort to lead a healthy lifestyle. On the other hand, however, respondents who classify themselves as having excellent health do not appear to be concerned with reducing the amount of meat and fish they consume. Perhaps they feel because they are in excellent health that they do not have to take precautionary measures. Respondents who feel that they are in poor health also consume relatively large amounts of meat and combined meat and fish. Because the data are cross sectional, we cannot tell whether the consumption of meat and fish has led to a poor health status or vice versa.

Consistent with evidence from England (Leahy, Lyons and Tol, 2010b) is the fact that females consume meat and combined meat and fish significantly less often than their male counterparts. This may be because females require fewer calories per day or it may be because females are more concerned about the health and environmental benefits of reduced consumption. Smokers, on the other hand, consume significantly higher amounts of meat and combined meat and fish than respondents who do not smoke. It is unlikely that the smokers have greater appetites than non-smokers (Chatkin and Chatkin, 2007; Miyata *et al.*, 1999), so, it is probably the case that non-smokers are relatively more health conscious.

Age also plays a role in explaining the frequency of meat and combined meat and fish consumption. Being younger than those in the reference category is positively associated with both meat and combined meat and fish consumption. This may simply be because younger adults have bigger appetites. Alternatively, it may be that the quality and quantity of food that they consume does not appear to have any adverse affect on their health status. Adults who are older than those in the reference group consume significantly less.

The reference category for education is having completed the Leaving Certificate. Respondents with education levels higher than the Leaving Certificate eat significantly less meat and combined meat and fish than those in the reference group. This is consistent with evidence from England (Leahy, Lyons and Tol, 2010b). It is likely that this pattern occurs because the relatively well educated are better informed about the health and environmental benefits of reduced meat consumption.

We mentioned previously that consumption of meat and combined meat and fish increases with household size. It is not surprising then that single people eat significantly less meat and combined meat and fish than their counterparts who are married. This may be to do with economies of scale associated with meat and fish expenditure or it may be that they are less likely to spend time preparing meat and fish dishes if they are cooking for one.

The work status variables prove important in explaining meat and combined meat and fish consumption frequency. Students eat significantly less meat and combined meat and fish than respondents in the reference group. This may be to do with different preferences displayed by students or it may be that lower levels of disposable income dictate that students replace meat and fish with cheaper alternatives. We would need longitudinal data to examine whether these preferences continue to be displayed later in life. Respondents who fall into the "other" work status category also eat less meat and combined meat and fish than employees, however, we have no information to suggest what these work statuses might be. The same result is found for those involved in home duties but these duties are not specified.

The social status variables were not important in explaining vegetarianism or pescetarianism, however, they are important in the frequency models. Respondents employed in a professional or managerial capacity consume meat and combined meat and fish less often than those in the non-manual and skilled manual category. The other social status variables suggest that as social status decreases the frequency with which meat and fish are consumed increases.

Respondents living in households that earn less than €50,000 eat meat more often than respondents living in richer households. The relationship between meat consumption and income is shown in Figure A3. Unlike the U-shaped relationship that we observe between income and vegetarianism, the graph of meat consumption frequency is slightly N-shaped. Meat consumption is low for the poorest households in our sample, probably dictated by income. It is even lower for the richest group in our sample, although for these respondents the consumption of meat is a choice. It is likely that health and environmental issues play a role in their choice to reduce their consumption relative to less well-off households. It may also be that they are

better able to find and afford meat alternatives. The same pattern is observed for the frequency of combined meat and fish consumption.

Also significant is the finding that those born in Northern Ireland eat significantly less meat compared to those born in the Republic of Ireland. This may be due to different preferences or different dietary traditions, for example. An interesting result is that those living in Dublin eat more meat and fish compared to those residing in the countryside. There could be a variety of factors at play here. It may be that the choice of meat and fish products is more diverse in Dublin so it is more attractive to buy meat and fish regularly. It may be that the density of specialist retailers offering high quality products is greater in Dublin. On the other hand, it could be that relatively cheap meat and fish products are available in Dublin supermarkets, but not in small, family run businesses which are found in the countryside. Recent research indicates that proximity to a supermarket affects the quality of food that people eat (Layte et. al, 2011). The authors find that as the distance to the nearest supermarket increased, it was accompanied by a small but significant decrease in the healthiness of a person's diet.

V DISCUSSION AND CONCLUSION

In this paper, we investigate the factors associated with vegetarianism and pescetarianism at the individual level. We find that household size, age, income, being educated to Junior Certificate level and cohabiting are all significantly associated with vegetarianism. Some of the health related variables also prove statistically significant in our model such as BMI and daily fruit and vegetable consumption. Alcohol consumption, marital status and the work status variables are significant in the model of pescetarianism. Only one variable is significant in both models, indicating that the process of following a pescetarian diet is very different to one in which both meat and fish are avoided. The odds ratios on the marital status and work status variables suggest that following a meat free diet is not only a dietary but also a lifestyle choice. The identification of causal relationships between some of the explanatory variables and the dependent variables is constrained by the data. We are unable to correct for problems of simultaneity due to the lack of suitable instrumental variables and because the data are cross-sectional. Also, due to data limitations, we cannot test the hypotheses that people become vegetarians or pescetarians for heath, environmental or animal welfare reasons.

We also investigate the factors driving the frequency of meat and combined meat and fish consumption. Household size, gender, level of

education, work status and household income are all significantly related to the amount of meat and fish respondents consume. The health related variables are also important in these models. Having a relatively high BMI and being a smoker are positively associated with meat and combined meat and fish consumption levels. On the other hand, watching one's weight, taking exercise and rarely consuming alcohol are negatively related to a respondent's combined meat and fish consumption levels.

Leahy, Lyons and Tol (2010b) found that the larger the household, the more often meat is consumed. It thus appears that there are economies of scale in meat consumption. Small households may be deterred from consuming meat as often as larger ones because of the associated cost, limited life span of meat, or the effort required in preparation. We were unable to control for ethnicity or the number of other vegetarians living in the household, both of which could prove to be important factors in explaining vegetarianism, pescetarianism and meat consumption frequency.

The U-shaped relationship between income and vegetarianism at the aggregate level also exists at the micro level for relatively low levels of income. The relationship between meat consumption frequency and income is the opposite. Households at the upper and lower ends of the income scale eat less meat than the middle income households in our sample. The level of vegetarianism is lowest among respondents belonging to the second lowest income group. The respondents in this income group also eat meat slightly less often than the average household in our sample. We do not know how vegetarianism or meat consumption varies for income levels above €50,000. As expected, vegetarianism increases with education. Almost 1.7 per cent of respondents with a higher degree are vegetarian while the figure is only .33 per cent for respondents who are educated to Junior Certificate level. Respondents with a third level educational qualification also eat meat on fewer occasions than the relatively less well-educated respondents in the sample. This is probably because the well-educated are aware of the health and environmental benefits that are associated with a low meat, if not a meat free, diet.

Using the *SLÁN* data has enabled us to identify links between meat and combined meat and fish consumption and characteristics of respondents that would not be possible with household expenditure data. Household data usually specifies the characteristics of the head of household which researchers often use as a proxy for all household members. Using individual level consumption data, we have shown that meat and fish consumption are related to the individual's BMI; gender; age; smoking status; alcohol intake; education level and work status, for example.

REFERENCES

BARNARD, N. D., A. NICHOLSON and J. L. HOWARD, 1995. The Medical Costs Attributable to Meat Consumption, *Preventative Medicine*, Vol. 24, pp. 646-655.

BEARDSWORTH, A. and A. BRYMAN, 1999. Meat Consumption and Vegetarianism Among Young Adults in the UK: An Empirical Study. *British Food Journal*, Vol. 101, pp. 289-300.

BURTON, M., M. TOMLINSON and T. YOUNG, 1994. Consumers' Decisions whether or not to Purchase Meat: A Double Hurdle Analysis of Single Adult Households, *Journal of Agricultural Economics*, Vol. 45, pp. 202-212.

CHATKIN, R., and J. CHATKIN, 2007. Smoking and Changes in Body Weight: Can Physiopathology and Genetics Explain this Association?, *Jornal Brasileiro De Pneumologia: Publicaçao Oficial Da Sociedade Brasileira De Pneumologia E Tisilogia*, Vol. 33, No. 6, pp. 712-719.

CHERN, W. S., K. ISHIBASHI, K., TANIGUCHI and Y. TOKOYAMA, 2002. *Analysis of the Food Consumption of Japanese Households*. Rome: Food and Agricultural Organization.

DREWNOWSKI, A. and S. E. SPECTER, 2004. Poverty and Obesity: The Role of Energy Density and Energy Costs, *American Journal of Clinical Nutrition*, Vol. 79, pp. 6-16.

CSO, 2007. *Household Budget Survey 2004/2005*. Dublin: Central Statistics Office. http://www.eirestat.cso.ie/surveysandmethodologies/surveys/housing_households/survey_hbs.htm.

DEPARTMENT OF HEALTH AND CHILDREN, 2008. *SLÁN* 2007. Irish Social Science Data Archive, http://www.ucd.ie/issda/data/surveyonlifestyleandattitudes tonutrition/

FAO, 2006. *Livestock's Long Shadow: Environmental Issues and Options*. Rome: Food and Agriculture Organization.

FAO, 2010. Food and Agriculture Organization: Meat and Meat Production http://www.fao.org/ag/againfo/themes/en/meat/home.html

FOX, N., and K. J. Ward, 2008. You are what you eat? Vegetarianism, health and identity. *Social Science and Medicine*, Vol. 66, pp. 2585-2595.

GIOVANNUCCI, E., E. B.RIMM, M. J. STAMPFER, G. A. COLDITZ, A. ASCHERIO, and W. C. WILLETT, 1994. "Intake of Fat, Meat and Fiber in Relation to Risk of Colon Cancer in Men", *Cancer Research*, Vol. 54, pp. 2390-2397.

GOULD, B. W., Y. LEE, D. DONG and H. J. VILLAREAL, 2002. *Household Size and Composition Impacts on Meat Demand in Mexico: A Censored Demand System Approach*, Annual Meeting of the American Agricultural Economics Association. July 2002, Long Beach, California.

HU, F. B., E. B. RIMM, M. J STAMPFER, A. ASCHERIO, D. SPIEGELMAN and C. W. WILLETT, 2000. "Prospective Study of Major Dietary Patterns and Risk of Coronary Heart Disease in Men", *American Journal of Clinical Nutrition*, Vol. 72, pp. 912-921.

JABS J., C. M. DEVINE and J. SOBAL, 1998. "Model of the Process of Adopting Vegetarian Diets: Health Vegetarians and Ethical Vegetarians", *Journal of Nutrition Education*, Vol. 30, pp. 196-202.

JAMES, W. P. T., M. NELSON, A. RALPH and S. LEATHER, 1997. Socioeconomic Determinants of Health: the Contribution of Nutrition to Inequalities in Health," *British Medical Journal*, Vol. 314, pp. 1545-1549.

LAYTE, R., J. HARRINGTON, E. SEXTON, I. PERRY, J. CULLINAN and S. LYONS, 2011. "Irish Exceptionalism? Local Food Environments and Dietary Quality", *Journal of Epidemiology and Community Health*, http://dx.doi.org/10.1136/jech.2010.116749, Published online 3 March 2011.

LEAHY, E., S. LYONS and R. S. J. TOL,2010a. "An Estimate of the Number of Vegetarians in the World. Working Paper", Dublin: Economic and Social Research Institute, http://www.esri.ie/UserFiles/publications/WP340.pdf

LEAHY, E., S. LYONS and R. S. J. TOL, 2010b. "Determinants of Vegetarianism and Meat Consumption Frequency in England", Working paper. Economic and Social Research Institute, Dublin. http://www.esri.ie/publications/search_for_a_working_pape/search_results/view/index.xml?id=3130

LEAHY, E., S. LYONS and R. S. J. TOL, 2010c. "National Determinants of Vegetarianism. Working paper", Dublin: Economic and Social Research Institute, http://www.esri.ie/publications/search_for_a_working_pape/search_results/view/index.xml?id=3022

MEAT AND LIVESTOCK COMMISSION, 1996. "The Retail Distribution of Meat," in the UK. *Meat Demand Trends*, May, pp. 3-14.

MIYATA, G., M. MEGUID, S. FETISSOV, G. TORELLI and H. KIM, 1999. "Nicotine's Effect on Hypothalamic Neurotransmitters and Appetite Regulation", *Surgery*, Vol. 126, No. 2, pp. 255-263

NAYGA, R. M. Jr., 1995. "Microdata Expenditure Analysis of Disaggregate Meat Products", *Review of Agricultural Economics*, Vol. 17, pp. 275-285.

NEWMAN, C., M. HENCHION and A. MATTHEWS, 2001. "Infrequency of Purchase and Double-hurdle Models of Irish households' Meat Expenditure", *European Review of Agricultural Economics*, Vol. 28, pp. 393-419.

NEWMAN, C., M. HENCHION, A. MATTHEWS and J. MONNETZ, 2002. Factors Shaping Expenditure on Meat and Prepared Meals. Teagasc. http://www.teagasc.ie/research/reports/foodprocessing/4607/eopr4607.asp

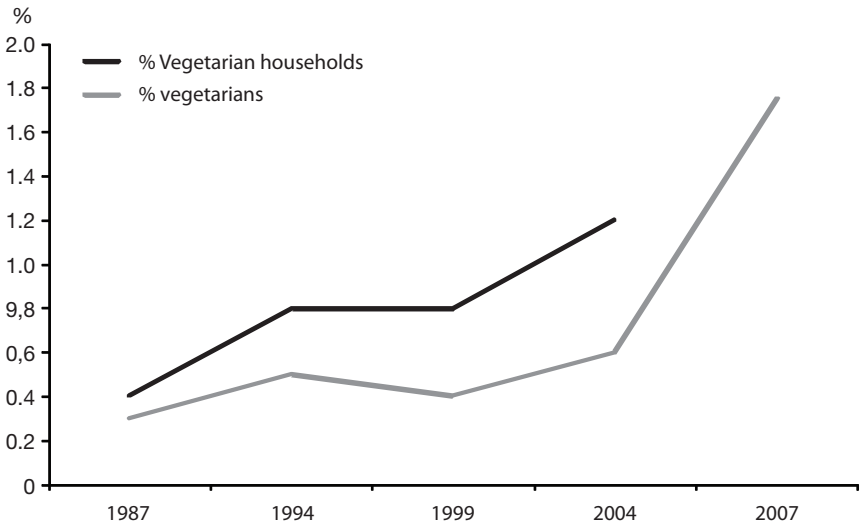
OXFORD DICTIONARIES, 2011. *Dictionary*. http://www.oxforddictionaries.com/definition/vegetarian

PRIBIS, P., J. SABATE and G. E. FRASER, 1999. "Food Consumption Among Vegetarian and Nonvegetarian California Seventh-day Adventists, 1994–1996", *American Journal of Clinical Nutrition*, Vol 70, pp. 633S-634S.

ROSE, D. P., A. P. BOYAR and E. L. WYNDER, 1986. International Comparisons of Mortality Rates for Cancer of the Breast, Ovary, Prostate and Colon and Per Capita Food Consumption. *Cancer*, Vol. 58, pp. 2363-2371.

VEGETARIAN SOCIETY, 2011. "Vegetarian Society of the United Kingdom. What is a Vegetarian?" http://www.vegsoc.org/page.aspx?pid=508

Figure A1: *Meat Avoidance in Ireland**



* 1987-2004 results are taken from Leahy, Lyons and Tol (2010a) and are based on data from the *Household Budget Survey*. The result for 2007 is estimated using *SLÁN* data.

Figure A2: *Vegetarianism, Pescetarianism and Income*

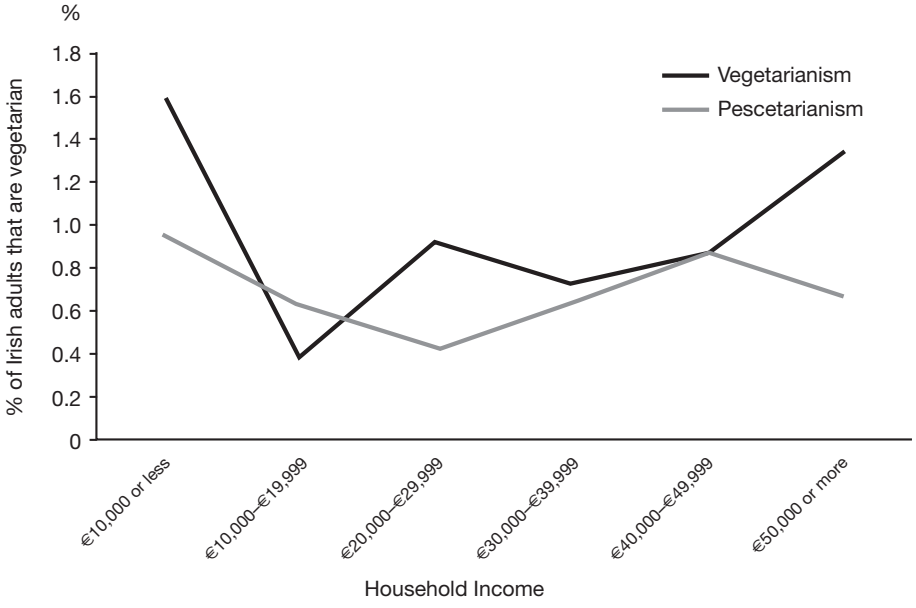


Figure A3: *Meat and Fish Consumption and Income*

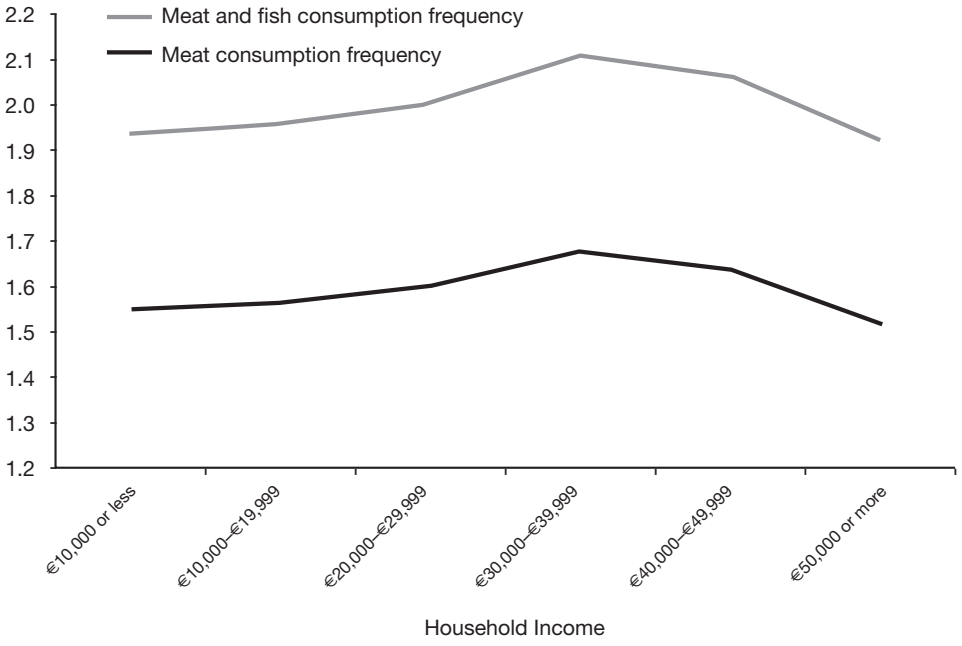


Table A1: *List of Meat and Fish Items Included in SLÁN*

Beef roast
Beef: steak
Beef: mince
Beef: stew
Beef burger
Pork: roast
Pork: chops
Pork: slices/escalopes
Lamb: roast
Lamb: chops
Lamb: stew
Chicken portion or other poultry e.g. turkey roast
Breaded chicken, chicken nuggets, chicken burger
Bacon
Ham
Corned beef, spam, luncheon meats
Sausages, frankfurters
Savoury pies (e.g. meat pie, pork pie, steak and kidney pie, sausage rolls
Liver, heart, kidney
Liver paté
Meat based lasagne
Fish fried in batter, as in fish and chips
Fish fried in breadcrumbs
Oven baked/grilled fish (in breadcrumbs or batter)
Fish fingers/fish cakes
Other white fish, fresh or frozen (e.g. cod, haddock, plaice, sole, halibut, coli)
Oily fish, fresh or canned (e.g. mackerel, kippers, tuna, salmon, sardines, herring)
Shellfish (e.g. crab, prawns, mussels)