Perceived Barriers towards Healthy Eating and their Association with Fruit and Vegetable Consumption

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Abstract

Background: Improving dietary intakes is a key public health target. Perceived barriers to healthy eating (PBHE) are an important component of the Health Belief Model which aims to understand why individuals do not adopt preventive health measures. This study investigates the relationship between PBHE and reported fruit and vegetable (F&V) consumption.

Methods: Data from the Scottish Health Survey 2008-2011 (n=8,319) for PBHE and self-reported F&V consumption were used in Probit regression models to test the association between meeting the 400g per day F&V recommendation and PBHE.

Results: Regression models show women who reported a lack of cooking skills were 10.4% less likely to meet the F&V recommendations (p=0.001). Not liking the taste of healthy foods or finding them too boring (10.2%, p=0.022), preparation time (5.6%, p=0.020) or willpower (3.0%, p=0.021) were also significant. For men, reporting not liking the taste of healthy foods or finding them too boring (6.8%, p=0.02) was the only significant result. Price, a commonly reported PBHE, was not significantly associated with F&V consumption.

Conclusions: Not all commonly reported perceived barriers to healthy eating are significantly associated with meeting the recommended F&V intake.

Keywords: Perceived barriers, healthy diet, willpower, hedonics, fruit & vegetables

Introduction

Improving population diet is a key public health target. Poor dietary intakes have been associated with higher risk of non-communicable diseases, such as cardiovascular diseases, cancer, and type 2 diabetes, which have large health and economic consequences.[1] James *et al.* stated there is an enormous potential health gain through eating a healthier diet.[2]

The determinants of dietary choices have been researched extensively. Brug *et al.* conclude that the environment has an important influence on diet, and the social environment has a greater impact than the physical environment[3,4]. Socioeconomic factors, such as education and income, have been positively associated with a healthy diet whilst lifestyle behaviours, such as physical inactivity and alcohol consumption, have been negatively associated with a healthy diet[5]. Perceptions are included within theoretical models used to explain health behaviours, such as the Theory of Planned Behaviour[6] and the Attitude, Social influence, Self-Efficacy model[7]. These models have been applied to food highlighting perceptions play an important role when explaining dietary choices[8].

Perceived barriers are a key component of the Health Belief Model; a model used to explain why individuals failed to adopt a preventative health measure[9]. A recent meta-analysis has shown perceived barriers and benefits were consistently the strongest predictor of whether an individual adopted a preventative health measure, such as to quit smoking, attend a screening programme, or increase calcium consumption[10]. Perceptions of foods can also influence dietary behavior. Individuals perceive consumption of fruit and vegetables (F&V) and meat to be important components of a healthy diet[11,12,13]. While most people are aware of what constitutes a healthy diet, surveys of dietary intakes show that many do not eat a diet that meets recommendations for health [14].

Kearney and McEhone investigated perceived barriers towards healthy eating (PBHE) by carrying out a survey in 15 EU member states, with approximately 1,000 adults from each member state. The most frequently reported perceived barriers were related to time, irregular working hours, and taste preferences[15]. A qualitative study, with men of retirement age, reported poor cooking skills and low motivation to change dietary habits as the main perceived barriers to eating a healthy diet[16]. A more recent study, also with the retired age group, found an association between time-related perceived barriers, such as a busy lifestyle, and a more unhealthy diet amongst individuals of retired age[17]. The aim of this study, building on this previous research, is to investigate the relationship between reported PBHE and F&V consumption, in a general adult population. This study focuses on F&V consumption as an important component of a healthy diet, playing a protective role in the prevention of coronary heart disease[18] and a range of other diseases[19].

Methods

Data

This study used Scottish Health Survey (SHeS) data, a nationally representative survey of Scottish households selected by home postcode using a multi-stage stratified design (n=36,922)[20]. The survey excludes individuals living in institutions and households without a postcode[20]. Data are collected annually, and in this study data were pooled from 2008, 2009, 2010, and 2011. The survey is completed by all individuals in the household, with parents completing the survey for children up to the age of 12 years.

The SHeS comprises several modules, some of which are only completed by a subsample of the respondents. The main survey includes questions about general health and wellbeing, F&V consumption, alcohol consumption, smoking, and physical activity. All respondents complete the main survey (n= 36,922) and a subsample complete the knowledge, attitudes and motivations (KAM) module (n=8,404). The KAM module is completed by adults over 16 years of age and includes questions on PBHE. Participants are asked to select a maximum of three from a list of 13 PBHE that they think applied to them or choose 'none' as their response. In this study, to reduce multicollinearity amongst variables, the perceived barriers were reduced to nine binary variables by grouping those which were considered similar in nature, as shown in Table I. Excluding observations with missing data, the final sample size was 8,319.

Respondents self-reported F&V consumption the previous day, including those in composite dishes. Measurements such as tablespoons, slices, and fruit sizes[20] were used in the SHeS to make reporting easier for respondents and to semi-quantify the amount reported. The data taken from the SHES were dichotomised to reflect whether the respondent met the dietary recommendation of a minimum of 400g F&V per day[1].

[Insert table I here]

The main focus of the study was on the relationship between F&V consumption and PBHE. To model this each of the nine PBHE are included as binary variables to represent whether the individual did or did not perceive a certain variable as a barrier to healthy eating (see table I). Other demographic, socioeconomic and lifestyle variables were controlled for in the model. These variables were selected based on the existing literature, in particular, a systematic review of the determinants of F&V consumption[21] and a large study on the determinants of women's diet [22].

Demographic variables included age, marital status, number of children (under 16 years) in the household and an urban/rural indicator[20,21,22]. Socioeconomic variables such as quintiles of equivalised household income, highest attained educational qualification and employment status were controlled for in the analysis[21,22]. Lifestyle behaviours included in the analysis were smoking, alcohol intake[23], and exercise[5]. Smoking status was dichotomised to reflect whether the individual was a current smoker or not a current smoker (ex-smoker or never smoker). Exercise was categorised as reporting to meet the World Health Organisation guidelines of exercising more than 2.5 hours per week[1.] Alcohol consumption was measured by self-reported units consumed weekly and included as a continuous variable.

Statistical analysis

A descriptive analysis calculated the proportion of respondents who reported each PBHE and the significant difference in proportions between men and women using chi-squared tests. Correlations between all variables included in the analysis were estimated (results available upon request).

A probit regression was used because the dependent variable, meeting recommended F&V consumption, was binary[23]. Probit regression models are very similar to logit models[24] but the probit analysis was preferred because it is more consistent with the normality assumption of the error terms of the equation[25]. The probit regression models the inverse of a standard normal distribution of the probability of consuming the recommended F&V intake as a linear combination of the main predictors of interest, in this case PBHE, whilst controlling for demographic, socioeconomic, and lifestyle variables. Separate models were estimated for men and women as gender differences in dietary studies are well documented[26]. Coefficients estimated in a probit model can only be interpreted in terms of being positive or negative; therefore the marginal effects were estimated to derive probabilities which can be interpreted quantitatively[27]. Marginal effects quantify the probability the individual will meet the 400g per F&V recommendation. A link test was undertaken to test model specification[27] and a likelihood ratio test was undertaken to assess model fit[28]

The analysis was conducted in Stata 13 using the "probit" and "margins" command. A link test and a likelihood ratio test was undertaken using "linktest" and "lrtest" commands.

Results

Descriptive analysis

Fifty-eight percent of the survey participants were women and the mean age of the sample was 52 years. Table II shows the differences in the PBHE reported and the proportion of the control

variables for men and women. Twenty-one percent of men report consuming more than the recommended 400g of F&V per day compared to 25% of women (p=<0.001). A lack of willpower was the most commonly reported PBHE for men and women, followed by the cost of healthy eating for women and hedonics (not liking healthy foods/healthy foods are too boring) for men. Table II shows a significantly higher proportion of women than men report a lack of willpower (p=<0.001) and support from others as a perceived barrier (p=<0.001). For men, a significantly higher proportion report hedonics (p=<0.001) and a lack of cooking skills (p=0.002) to be a barrier to healthy eating relative to women.

With respect to variables controlled for in the main analysis, a higher proportion of men than women were in the highest income quintile (p=<0.001) but there are no significant differences in the proportion of men and women with a degree (p=0.302). There were a higher proportion of women in the oldest age category (p=0.003), consistent with population demographics. Men were more likely to be married (p=<0.001) and to be living in households with no children (p=<0.001). A significantly higher proportion of women report not smoking (p=0.024) and consume less alcohol (p=<0.001), relative to men. A higher proportion of men report meeting the recommended weekly exercise duration compared to women (p=<0.001).

[Insert table II here]

Regression Analysis

Marginal effects derived from the coefficients of the probit model are presented in table III (coefficients are reported in Appendix A). Marginal effects reflect the probability of meeting the F&V recommendation. For example, men are 2.56%, and women are 3.00%, less likely to meet the recommendation if they report willpower as a PBHE compared to those who do not report it; this was statistically significant for women but not men. Post-estimation tests are reported at the bottom of Table III. The result of the link test indicates the model was correctly specified and the log likelihood ratio test confirms the model fits well.

Table III shows that reporting hedonics as a PBHE was the only significant PBHE for men and reduces their probability of meeting the recommended F&V intake by 6.8%. More PBHE were relevant for women; in addition to hedonics, which reduces the probability of meeting F&V recommendation by 10.2%, a lack of cooking skills (10.4%), a lack of preparation time (5.6%) and willpower (3.0%) also significantly reduce the probability of meeting the F&V recommendation. Despite willpower being reported as the most common PBHE (Table II), men who reported willpower as a PBHE were not

significantly less likely to meet the 400g per day F&V recommendation compared to men who did not report it.

Reporting healthy foods being too expensive as a PBHE was not a significant determinant of the individual consuming the recommended intake of F&V, despite being the second most commonly reported barrier for women and third most common for men (Table II). This PBHE may be insignificant because it is closely related to income. Correlation coefficients, estimated as part of the descriptive analysis, show a significant correlation between income and perceiving healthy foods as too expensive ($\rho=0.14$). However, the PBHE remained insignificant when the income variable was dropped from the analysis suggesting views on price do not influence F&V consumption.

[Insert table III here]

Table III shows that as age, income, and level of education increase, both men and women were more likely to report meeting the 400g per day F&V recommendation. Non-smokers and those who meet the exercise guidelines of over 2.5 hours per week were significantly more likely to eat the recommended F&V intake. Alcohol consumption was negatively associated with the probability of meeting the F&V recommendation.

Discussion

Main finding of this study

This study gives an important insight into the relationship between PBHE and F&V intake. Results show hedonics is the only perceived barrier for men significantly associated with F&V consumption. For women, willpower, cooking skills preparation time, and hedonics are perceived barriers significantly associated with F&V consumption. The analysis shows that not all commonly reported PBHE have a significant association with F&V consumption.

Willpower was the most commonly reported barrier but only had a significant effect on F&V consumption amongst women. Perceiving healthy foods as too expensive was insignificant in the regression analysis despite being the second most commonly reported perceived barrier by women, and third most common PBHE for men. Interestingly, other healthy lifestyle behaviours such as not smoking, meeting the exercise guidelines and lower alcohol consumption were significantly associated with meeting the recommended F&V intake. This result highlights the possibility of spill over effects from other healthy behaviours and requires further research.

What is already known on this topic

A lack of willpower has been highlighted as a common PBHE [15,29,30]. Perceiving willpower as a barrier is a strong indicator of healthy eating intentions[31]. In this study, 29% of men and 35% of women reported a lack of willpower as a PBHE, but, it was only significant for women and had a relatively small effect on the probability of consuming 400g of F&V per day. This small effect compared with the high rate of reporting may be explained by willpower capturing an individual's inability to avoid unhealthy foods rather than consumption of healthy foods such as F&V.

In other studies, time related factors were the most commonly reported PBHE amongst general populations (24%)[15], students (40%)[32] and low income populations (49%)[33]. Our results show that a lack of preparation time was a significant PBHE only for women. It is worth noting only 7% of men and women reported a lack of time as a PBHE. The low proportion of individuals reporting preparation time as a PBHE may be explained by the question format. Other studies focus on perceived time barriers more broadly such as "busy lifestyles" and "irregular working hours" [15,32,33] whereas the SHeS focused on preparation time as "healthy foods take too long to prepare".

Previous findings on how perceived cooking skills impacts on healthy eating are mixed. Hughes *et al.* found a lack of cooking skills to be an important barrier in a sample of retired men[16]. Kearney and McElhone found that cooking skills was not an important barrier in a sample of adults aged 15 years and upwards over 15 European countries [15]. Also, a more recent study suggests individuals did not lack skills to cook but rather lacked a desire to cook[34]. This was also demonstrated in another study which provided individuals with 'easy' recipes and found individuals wanted more ready meals and convenience foods rather than recipes[35]. This study has found that a lack of cooking skills is a significant PBHE for women, but not for men, even though men report it more frequently. It may be that the association was not found for men because they do not tend to be the main food provider in the household[36,37].

What this study adds

The main contribution of this study is quantifying the effects of PBHE on the probability of meeting the recommended F&V intake. The analysis shows that not all commonly perceived barriers are associated with reported F&V intake. For example, perceiving healthy foods as being too expensive was the second most commonly reported barrier for women and third most commonly reported barrier for men. However, men and women who reported this barrier were not significantly less likely to meet the recommended F&V intake compared to those who did not report the barrier. Existing studies have identified the most common perceived barriers amongst populations, but this study estimates their effects on an individual's reported F&V intake. This is important because it

suggests perceiving healthy foods as expensive is common but it does not appear to impact on the individual's F&V consumption. This may be explained by F&V being only one aspect of a healthy diet. Individuals may perceive healthy eating as too expensive and this may impact on other aspects of diet, but, according to our results, it does not impact on F&V consumption.

The marginal effects obtained from our estimates suggest, for women, hedonics and a lack of cooking skills have a larger effect on the probability of consuming F&V than preparation time and a lack of willpower. Interventions aimed at increasing the liking (hedonics) of fruit have been effective in younger populations and these techniques could be tested in other populations[38]. However, 35% of women reported a lack of willpower as a PBHE suggesting a larger proportion of the population could achieve a smaller gain from policies focused on motivating healthier dietary habits or changing the 'obesogenic' environment[4].

For men, hedonics was the only PBHE which was significantly associated with healthy eating. Nutritional policies aimed at increasing liking of healthy foods may help lead to an improvement in dietary intakes[38]. Increasing exposure to healthy foods has been shown to increase liking and consumption of healthy eating for children[38], and this could form the basis of a potential intervention through the implementation of fruit and vegetable vouchers[39] or subsides[40]. However, it is worth noting that numerous health campaigns and interventions have attempted to improve population diet and the issue cannot be fixed with a silver bullet.

Limitations of this study

Cross sectional data allows associations between F&V intake and PBHE to be observed but causality cannot be inferred. Also, the measure of diet is self-reported and problems of dietary misreporting are well documented[41]. F&V consumption was based on reported intake on the previous day which may not have represented habitual intakes. One final limitation is the PBHE may relate to difficulty in giving up unhealthy foods whilst our dependent variable, F&V consumption, only captures eating healthy foods. This highlights the issue that F&V consumption is only one aspect of a healthy diet; however, F&V intake is a key component of what constitutes a healthy diet quality[1, 42].

Conclusions

To conclude, this study shows PBHE do not always have a significant impact on consumption of F&V. Perceiving hedonics as a barrier to healthy eating is significantly associated with not meeting the F&V recommended intake for men and women. However, perceiving healthy foods as too expensive is commonly reported by individuals but does significantly impact on whether the individual reports

meeting the recommended F&V intake. Future research is needed on understanding when PBHE are formed and how they impact F&V consumption over time. Improving population dietary intakes is a key target in many countries and investigating individuals' PBHE helps understand motivations for F&V consumption, a key component of a healthy diet.

Acknowledgements

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Table I: Perceived barriers to healthy eating in the knowledge, attitudes and motivations module

Grouping for analysis	Perceived barriers
Support from others	Family discouraging or unsupportive
Support from others	Friends discouraging or unsupportive
Support from others	People at work discouraging or unsupportive
Knowledge	Not knowing what changes to make
Cooking skills	Not knowing how to cook more healthy foods
Availability	Lack of choice of healthy foods in canteens and restaurants
Availability	Lack of choice of healthy foods in places where you do your main shop
Too Expensive	Healthy foods are too expensive
Preparation Time	Healthy foods take too long to prepare
Hedonics	Healthy foods too boring
Hedonics	Don't like the taste/don't enjoy healthy foods
Willpower	Lack of willpower
Other Barriers	Other (e.g. shift work and lack of time)
None	None of these - nothing prevents me from eating more healthily

Table II: Frequency of perceived barriers to healthy eating (PBHE) and control variables by sex

	Men (n=3481) %	Women (n=4838) %	Chi-square p-value
Fruit & Vegetable >400g	21.89%	25.05%	<0.001
Perceived barriers to healthy eating			
Willpower	29.39%	35.43%	<0.001
Too expensive	15.74%	16.89%	0.164
Hedonics	16.35%	10.36%	<0.001
Availability	11.03%	10.85%	0.795
Preparation time	7.27%	7.30%	0.960
Cooking skills	7.76%	6.04%	0.002
Knowledge	6.29%	5.66%	0.231
Other Barriers	4.14%	4.36%	0.617
Support from others	2.53%	4.49%	<0.001
Control variables			
Age (16-25)	6.41%	7.21%	0.151
25-34	12.41%	13.83%	0.060
35-44	16.55%	16.47%	0.929
45-54	17.90%	16.08%	0.029
55-64	18.90%	16.91%	0.019
65-74	16.06%	15.48%	0.476
75+	11.78%	14.01%	0.003
Equivalised Household Income(1st Quintile)	21.23%	16.21%	<0.001
2nd Quintile	18.99%	17.09%	0.026
3rd Quintile	16.92%	17.98%	0.209
4th Quintile	15.48%	17.51%	0.015
5th Quintile (lowest)	16.66%	19.20%	0.003
Income not reported	10.72%	12.01%	0.068
Education (Degree or higher)	26.11%	25.11%	0.302
HNC/D	9.59%	9.45%	0.819
Higher Grade	13.47%	13.29%	0.809
Standard Grade	16.98%	17.40%	0.611
Other school level	7.73%	10.15%	<0.001
No qualifications	26.11%	24.60%	0.116
Urban/Rural (Primary city >200,000)	34.79%	35.84%	0.322
Urban (population >10,000)	26.98%	27.92%	0.338
Small accessible towns (population >3,000)	8.56%	8.58%	0.978
Small remote towns (population >3,000)	6.09%	6.26%	0.747
Accessible rural	11.98%	10.36%	0.019
Remote rural	11.61%	11.04%	0.419

Marital Status (Married)	45.33%	38.16%	<0.001
Living as married	8.56%	8.35%	0.733
Single	24.45%	20.01%	<0.001
Separated	4.51%	4.69%	0.696
Divorced/dissolved civil partnership	9.16%	10.67%	0.024
Widowed/surviving civil partner	7.99%	18.13%	<0.001
Number of children (No children)	84.72%	76.68%	<0.001
1 child	7.58%	13.08%	<0.001
2 children	6.49%	8.08%	0.006
3 or more children	1.21%	2.15%	0.001
Economic Activity (Employed)	51.62%	47.06%	0.427
In education	3.22%	2.91%	<0.001
Permanently unable to work	7.96%	4.75%	<0.001
Looking for work	5.60%	2.00%	<0.001
Retired	29.62%	32.45%	0.006
Looking after home	1.18%	10.02%	<0.001
Doing something else	0.80%	0.79%	0.924
Lifestyle Behaviours			
Smoking: non-smoker	72.71%	74.91%	0.024
Exercise: less than 2.5 hours	43.3%	49.97%	<0.001
Alcohol: units per week (mean/Std. Dev.)	16.28 (24.33)	7.30 (12.63)	<0.001

Table III: Probit Regression –marginal effects on the probability of meeting fruit and vegetable recommendation

	Men only (n=3,481)		Women only (n=4,838)	
	Marginal effects	*[95% CI]*	*Marginal effects*	*[95% CI]*
Perceived barriers to healthy eating				
Willpower	-2.56%	[-5.61 , 0.49]	**-3.00%***	-[5.56, -0.45]
Too expensive	0.98%	[-3.00, 4.95]	0.96%	-[2.43, 4.35]
Hedonics	**-6.84%***	[-10.8 , -2.88]	**-10.23%***	-[14.6, -5.86]
Availability	3.73%	[-0.45, 7.92]	0.17%	-[3.70, 4.03]
Preparation time	-1.77%	[-7.02, 3.47]	**-5.57%***	-[10.2, -0.87]
Cooking skills	-3.79%	[-9.17, 1.59]	**-10.35%***	-[16.2, -4.42]
Knowledge	-2.65%	[-8.74, 3.44]	-3.70%	-[9.49, 2.08]
Other Barriers	-1.83%	[-8.46, 4.79]	1.24%	-[4.32, 6.80]
Support from others	-2.89%	[-12.0 , 6.22]	0.28%	-[5.41, 5.96]
Controls (base category/units in brackets)				
Age (16-25)				
25-34	**6.99%***	[0.86 , 13.12]	**6.79%***	[1.45, 12.13]
35-44	**7.83%***	[1.54 , 14.12]	**6.17%***	[0.67, 11.67]
45-54	**9.02%***	[2.68 , 15.35]	**9.56%***	[3.84, 15.28]
55-64	**11.33%***	[4.62 , 18.03]	**11.31%***	[5.21, 17.42]
65-74	**8.98%***	[0.66 , 17.30]	**10.28%***	[3.05, 17.52]
75+	**9.88%***	[0.67 , 19.08]	7.34%	-[0.29, 14.96]
Equivalised Household Income (1st quintile)				
2nd Quintile	-2.67%	-[6.96 , 1.62]	**-5.09%***	-[9.30, -0.87]
3rd Quintile	-3.76%	-[8.42 , 0.89]	**-5.72%***	-[10.2, -1.24]
4th Quintile	-1.60%	-[6.91 , 3.71]	**-7.89%***	-[12.6, -3.12]
Bottom Quintile	**-7.65%***	-[13.0 , -2.27]	**-8.22%***	-[13.3, -3.12]
Income not reported	-2.93%	-[8.36 , 2.51]	**-7.97%***	-[12.8, -3.09]
Education (degree or higher)				
HNC/D	**-5.62%***	[-10.9 , -0.26]	**-9.47%***	-[14.3, -4.59]
Higher Grade	**-7.24%***	[-12.0 , -2.30]	**-9.28%***	-[13.6, -4.89]
Standard Grade	**-9.90%***	[-14.4 , -5.30]	**-12.29%***	-[16.4, -8.11]
Other school level	**-6.22%***	[-12.2 , -0.21]	**-17.62%***	-[22.3, -12.9]
No qualifications	**-15.20%***	[-19.3 , -11.0]	**-19.34%***	-[23.2, -15.4]
Urban/Rural (Primary city >200,000)				
Urban town, pop.>10,000	-0.40%	[-3.87 , 3.08]	-0.17%	-[3.12, 2.78]
Small accessible towns, pop.>3,000	-1.89%	[-6.87 , 3.10]	2.91%	-[1.66, 7.48]
Small remote towns, pop.>3,000	-3.13%	[-8.81 , 2.54]	1.88%	-[3.21, 6.98]
Accessible rural location	-0.48%	[-4.94 , 3.97]	2.53%	-[1.61, 6.67]
Remote rural location	2.49%	[-2.2 , 7.17]	3.86%	-[0.25, 7.97]
Marital Status (married)				
Living as married	-0.92%	-[6.25 , 4.41]	-0.99%	-[5.69, 3.71]
Single	1.03%	-[3.14 , 5.20]	-0.18%	-[3.98, 3.62]

Separated -Married/civil partnership	-0.50%	-[7.37 , 6.36]	**-5.58%***	-[11.0,	-0.13]
Divorced/dissolved civil partnership	0.18%	-[5.07 , 5.43]	4.01%	-[0.33,	8.35]
Widowed/surviving civil partner	-3.67%	-[8.97 , 1.64]	3.11%	-[1.07,	7.30]
Number of children (no children)					
1 child	-2.17%	[-7.45 , 3.11]	-3.03%	-[6.97,	0.90]
2 children	**-5.67%***	[-11.0 , -0.28]	-0.80%	-[5.78,	4.19]
3 or more children	**-12.46%***	[-21.8 , -3.11]	**-8.47%***	-[15.9,	-1.00]
Economic Activity (employed)					
In education	**10.92%***	[0.35 , 21.5]	3.17%	-[5.29,	11.63]
Permanently unable to work	-3.70%	[-9.65 , 2.25]	2.76%	-[4.08,	9.59]
Looking for work	-6.28%	[-12.8 , 0.32]	3.54%	-[6.26,	13.34]
Retired	1.44%	[-4.62 , 7.50]	-0.08%	-[4.80,	4.64]
Looking after home	-3.68%	[-16.5 , 9.22]	-0.08%	-[4.62,	4.47]
Doing something else	-3.30%	[-17.1 , 10.49]	11.20%	-[3.41,	25.81]
Lifestyle Behaviours					
Non-smoker (smoker)	**7.21%***	[3.76 , 10.65]	**9.21%***	[6.12,	12.30]
Exercise (<150minutes per week)	**0.36%***	[0.23 , 0.49]	**0.55%***	[0.40,	0.71]
Alcohol (units per week)	**-0.07%***	[-0.14 , 0.00]	**-0.19%***	-[0.31,	-0.08]
R-Squared	0.072		0.086		
Linktest – residual^{2}p value	0.231		0.868		
Log Likelihood ratio test, chi sq.	263.50		471.69		

* Significant at 95% level

Marginal effects are relative to those who did not report PBHE; for controls, base category is specified in brackets

Appendix A

Table A.I: Probit Regression Full Results

	Men only (n=3,481)		Women only (n=4,838)	
	Coef-		*Coef-*	
	ficients	*[95% CI]*	*ficients*	*[95% CI]*
Perceived barriers to healthy eating				
Willpower	-0.098	[-.210, .014]	**-0.112***	[-.201, -.024]
Too expensive	0.034	[-.112, .180]	0.031	[-.086, .148]
Hedonics	**-0.259***	[-.405, -.114]	**-0.356***	[-.508, -.204]
Availability	0.141	[-.013, .294]	0.006	[-.128, .139]
Preparation time	-0.057	[-.249, .134]	**-0.194***	[-.357, -.032]
Cooking skills	-0.139	[-.336, .058]	**-0.357***	[-.561, -.153]
Knowledge	-0.094	[-.318, .129]	-0.118	[-.317, .082]
Other Barriers	-0.056	[-.299, .186]	0.041	[-.151, .233]
Support from others	-0.103	[-.438, .231]	0.008	[-.189, .205]
Controls (base category/units in brackets)				
Age (16-25)				
25-34	**0.296***	[.013, .579]	**0.266***	[.048, .484]
35-44	**0.345***	[.054, .635]	**0.265***	[.040, .491]
45-54	**0.386***	[.094, .679]	**0.388***	[.158, .618]
55-64	**0.458***	[.153, .764]	**0.435***	[.191, .679]
65-74	0.364	[.000, .727]	**0.405***	[.124, .685]
75+	**0.401***	[.012, .791]	**0.327***	[.027, .628]
Income (1st quintile)				
2nd Quintile	-0.089	[-.239, .060]	**-0.160***	[-.294, -.025]
3rd Quintile	-0.123	[-.288, .042]	**-0.184***	[-.327, -.040]
4th Quintile	-0.034	[-.218, .149]	**-0.252***	[-.408, -.095]
Bottom Quintile	**-0.267***	[-.474, -.060]	**-0.259***	[-.428, -.090]
Income not reported	-0.089	[-.281, .103]	**-0.261***	[-.423, -.098]
Education (degree or higher)				
HNC/D	-0.176	[-.352, .001]	**-0.291***	[-.443, -.139]
Higher Grade	**-0.220***	[-.382, -.058]	**-0.269***	[-.404, -.134]
Standard Grade	**-0.326***	[-.485, -.167]	**-0.382***	[-.514, -.251]
Other school level	-0.185	[-.386, .016]	**-0.568***	[-.735, -.401]
No qualifications	**-0.541***	[-.697, -.385]	**-0.651***	[-.785, -.516]
Urban/Rural (Primary city >200,000)				
Urban town, pop.>10,000	-0.005	[-.132, .122]	-0.010	[-.114, .095]
Small accessible towns, pop.>3,000	-0.058	[-.248, .131]	0.094	[-.060, .248]
Small remote towns, pop.>3,000	-0.101	[-.323, .121]	0.074	[-.099, .248]
Accessible rural location	-0.009	[-.172, .155]	0.079	[-.061, .219]
Remote rural location	0.101	[-.062, .264]	0.136	[.000, .272]
Marital Status (married)				

Living as married	-0.032	[-.230, .166]	-0.026	[-.194, .141]
Single	0.044	[-.106, .193]	0.006	[-.127, .139]
Separated -Married/civil partnership	-0.022	[-.276, .231]	-0.207	[-.425, .011]
Divorced/dissolved civil partnership	0.000	[-.191, .191]	0.131	[-.012, .274]
Widowed/surviving civil partner	-0.131	[-.344, .081]	0.115	[-.025, .254]
Number of children (no children)				
1 child	-0.090	[-.290, .109]	-0.108	[-.249, .033]
2 children	-0.226	[-.452, .000]	-0.035	[-.207, .137]
3 or more children	-0.550	[-1.109, .008]	-0.312	[-.627, .004]
Economic Activity (employed)				
In education	0.319	[.000, .637]	0.103	[-.174, .380]
Permanently unable to work	-0.112	[-.354, .130]	0.140	[-.089, .369]
Looking for work	-0.282	[-.574, .010]	0.116	[-.204, .435]
Retired	0.071	[-.145, .287]	0.005	[-.160, .169]
Looking after home	-0.120	[-.647, .406]	0.004	[-.154, .162]
Doing something else	-0.133	[-.682, .417]	0.427	[-.002, .856]
Lifestyle Behaviours				
Non-smoker (smoker)	**0.256***	[-.130, .383]	**0.305***	[.197, .412]
Exercise (<150minutes per week)	**0.279***	[-.168, .390]	**0.316***	[.227, .405]
Alcohol (units per week)	**-0.003***	[-.005, .000]	**-0.007***	[-.011, -.003]
Constant	**-1.046***	[-1.410, -.683]	**-0.814***	[-1.10, -.528]

[A] Not reporting income amounted to a large proportion of the sample (n=970) and was included as a separate category

*Odds ratios can be estimated from the β by calculating $\exp(1.7 \times \beta)$=OR**.**