

# Barriers to increasing fruit and vegetable intakes in the older population of Northern Ireland: low levels of liking and low awareness of current recommendations

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## Abstract

**Objective:** To investigate barriers to increasing fruit and vegetable (f + v) intakes in a large sample of the older population of Northern Ireland (NI), in relation to current intakes.

**Design:** The study was conducted using a telephone survey assessing f + v intakes, barriers to increasing intakes and various demographic and lifestyle characteristics. Barriers to increasing intakes were investigated using twenty-two closed-response items and one open-response item.

**Setting:** NI.

**Subjects:** Four hundred and twenty-six older people from NI, representative of the older population of NI.

**Results:** Principal component analysis of the twenty-two closed-response items revealed five factors affecting f + v consumption. Significant associations with current intakes were found where greater f + v consumption was associated with greater 'liking' for f + v ( $B = 0.675$ ,  $P < 0.01$ ), greater 'awareness of current recommendations' for consumption ( $B = 0.197$ ,  $P < 0.01$ ) and greater 'willingness to change' ( $B = 0.281$ ,  $P < 0.01$ ). 'Ease of consumption' and 'difficulties in achieving consumption' were not associated with f + v intakes. Similar associations between f + v intakes and 'liking' and 'awareness' were also found in those consuming low intakes of f + v or those at risk of consuming low intakes. Low awareness and knowledge of recommendations were also found in response to the open-ended question in all groups, although some weight was also given here to environmental difficulties, such as cost and access.

**Conclusions:** These findings suggest that interventions aiming to increase f + v intakes in the older population of NI should focus predominantly on improving liking and improving knowledge and awareness of current recommendations.

**Keywords**  
Fruit and vegetables  
Older people  
Northern Ireland  
Liking  
Awareness  
Knowledge

The health benefits of a high consumption of fruits and vegetables (f + v) are now well recognised, resulting in global recommendations that adults should be consuming at least 400 g (five portions) f + v per day<sup>(1)</sup>. The majority of the UK older population, however, have lower f + v intakes than those recommended. The National Diet and Nutrition Survey for UK older adults (>65 years) reports an average consumption of 2.5 f + v portions plus one portion of fruit juice per day, excluding soups<sup>(2)</sup>. Independent reports also suggest similar figures<sup>(3,4)</sup>.

In attempts to improve f + v intakes, research has identified a number of barriers to increasing f + v intakes in the general population. Factors such as poor nutritional knowledge, cost and practical issues have been found to be highly predictive of low intakes of f + v<sup>(4–6)</sup>. The majority of work so far, however, has focused on the

general population, yet the importance of some of these factors are likely to differ dependent on age<sup>(5,7)</sup>.

Barriers to f + v intakes are also likely to be location-specific. Regional variations have first been found in f + v consumption<sup>(2–4)</sup>. Regional variations are also found in farming policies and practices, transport infrastructures, health education schemes and social networks<sup>(3,8,9)</sup>. f + v intakes are currently suggested to differ in Northern Ireland (NI) compared to the rest of the UK, as a result of differences in rural practices, activities and proximity and differences in social networks<sup>(10)</sup>. These different rural policies and practices and different social networks, however, may also impact on strategies to increase f + v intakes in this population.

The present project aimed to investigate the barriers to increasing f + v consumption in a large sample of older people in NI.

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## Method

Barriers to increasing f + v consumption were assessed in a representative sample of older people from NI, and subsequently related to f + v intakes using regression.

### Older people

Names, addresses and telephone numbers for 1000 people over the age of 65 years living in NI were obtained from a data sampling company (Sample Answers, London, UK). All names and addresses were representative of the population of NI over the age of 65 years with respect to gender (male/female), age (65–74 years/75–79 years/80–84 years/85–89 years/90 years plus), marital status (married/unmarried) and area of residence (Belfast, North East NI, South East NI, South NI, West NI), in line with the 2001 census data for NI ([www.nicensus2001.gov.uk](http://www.nicensus2001.gov.uk)). Gender, age, marital status and area have previously been identified as variables likely to impact on f + v intake<sup>(3,4,7,11,12)</sup>. All individuals were contacted about the study by telephone, and were informed of the nature of the study and the use of the data prior to taking part. Ethical approval for the study was obtained from the Ethics Committee of the School of Psychology, Queen's University, Belfast.

### Barriers to fruit and vegetable consumption

Barriers to f + v consumption were investigated using twenty-two closed-response questions and one open-response question. The closed-response items focused on various aspects of f + v consumption, to which individuals were asked to strongly agree, agree, neither agree nor disagree, disagree or strongly disagree (scored 2, 1, 0, -1, -2 respectively). Items were derived from previous papers investigating barriers to f + v consumption in other populations. The open-ended question asked 'Are there any reasons why you do not eat more fruit and vegetables than you currently do? (list all reasons)'. The open-response question was used to ascertain particularly pertinent reasons for not consuming f + v and reasons that had not already been investigated.

### Fruit and vegetable consumption

F + v consumption was measured using direct questioning. Individuals were asked to recall all f + v they typically consumed (type and amount) for: breakfast, morning snacks, lunch, afternoon snacks, dinner and evening snacks, on both weekdays and at the weekend<sup>(10)</sup>. Quantities consumed were converted into f + v portions at the time of asking by the researcher using Department of Health Guidelines<sup>(13)</sup>. Complete recall was assisted using prompts<sup>(14–16)</sup>. Consumption on weekdays and at weekends were investigated separately following reports that diets can vary between weekend and weekdays<sup>(15)</sup>, and subsequently combined ((weekday × 5 + weekend day × 2)/7) to provide an average consumption of f + v per day per individual.

### Demographic and lifestyle characteristics

Various demographic and lifestyle characteristics of possible impact on food consumption were also assessed. Demographic variables were gender, age, marital status (married/not married), living status (living with anyone else/not living with anyone else), region of residence and deprivation score of residence based on residential post-code<sup>(17)</sup>. Marital status was requested to allow comparison with census data. Living status was also requested as recent work suggests that effects apparently due to marriage are usually a result of co-habitation<sup>(11)</sup>. Lifestyle characteristics were distance travelled for food shopping, frequency with which individuals received help with food shopping, frequency with which individuals received help with food cooking, frequency with which individuals had food delivered and frequency with which individuals consumed food out of the house. Distance was requested in or converted into miles. All frequency questions were scored as or converted into number of days per year (0–365). All variables have previously been suggested to impact on f + v consumption<sup>(2–4,7,10–12,18,19)</sup>.

### Telephone survey

Responses to all questions were requested by telephone. Telephone interviewing was used to ensure completion of all questions and encourage engagement with individuals who may be unlikely to volunteer otherwise<sup>(20)</sup>. Telephone interviews lasted for approximately 20 min, where individuals were first asked questions on intakes, then questions on barriers and then for demographic and lifestyle details. All individuals were called during working hours, from January until April 2008. If telephones were unanswered, this individual was called once more at a different time. If telephones were answered but the requested individual was not available, this person was called once more at a more suitable time.

### Analyses

Demographic data were first investigated to ensure that the sample was representative using  $\chi^2$  tests. Responses to the twenty-two closed-response questions were analysed using principal component analysis (with oblimin rotation) to elucidate factors affecting f + v consumption. A score for each factor was then calculated per individual where responses to all items contributing to each factor were summed and divided by the number of items to result in a score for each factor per individual from 2 to -2. Factors were then analysed in relation to f + v consumption using multiple linear regression (enter method). Demographic and lifestyle variables were added to regression models. Individual responses to the open-response question were analysed using content analysis. All responses were assessed and characterised by two independent reviewers, and discordances were resolved. All analyses were conducted on the entire sample, and then repeated for those most at risk of low f + v consumption – those currently

consuming less than five portions of *f + v* per day, and those previously suggested to be at risk in this population – males, older older people and those living in more deprived areas<sup>(10)</sup>.

## Results

### Older people

A total of 426 (43%) individuals completed the survey and provided data that could be used. Of these 426 individuals, 159 (37%) were men, 267 (63%) were women, 244 (57%) were aged 65–74 years, eighty-eight (21%) were aged 75–79 years, fifty-five (13%) were aged 80–84 years, twenty-six (6%) were aged 85–90 years and thirteen (3%) were 90+ years. A total of 213 (50%) were married, 213 (50%) were unmarried, 226 (53%) were living with someone else, 200 (47%) were not living with anyone else and eighty-one (19%) were living in Belfast, ninety-five (22%) were living in North East NI, 108 (25%) were living in South East NI, seventy-nine (19%) were living in South NI, sixty-three (15%) were living in West NI. None of these percentages differed significantly from those of the 2001 census (largest  $\chi^2 = 0.70$ ,  $P > 0.05$ ).

### Barriers to increasing *f + v* intakes

#### Closed-response questions

The principal component analysis resulted in the emergence of five factors explaining 63.9% of the total variance. These five factors were named: 'willingness to change', 'liking', 'ease', 'difficulties' and 'awareness of recommendations'. Items contributing to each factor and the Cronbach's alpha for each factor are given in Table 1.

For each of the individual factors: 221 (52%) individuals reported that they would be willing to change their eating habits to include more *f + v* for a number of reasons (score  $> 0$ ), 185 (43%) reported that they would not be willing to do so (score  $< 0$ ) and twenty (5%) people didn't know if they would be willing to change or not (score 0); 391 (92%) individuals reported that they liked *f + v*, thirty (7%) individuals reported that they did not like *f + v* and five (1%) individuals neither did nor did not like *f + v*; 419 (98%) people found *f + v* easy to consume, four (1%) people reported that they did not find *f + v* easy to consume and three (2%) people neither agreed nor disagreed; four (1%) people reported that they found it difficult to consume *f + v*, 418 (98%) people did not find it difficult and four (1%) people neither did nor did not find it difficult to consume *f + v*; 352 individuals (83%) were aware of the recommendations for consumption, while sixty-four (15%) people were not. Ten (2%) people neither agreed nor disagreed.

Using regression, portions of *f + v* consumed were significantly predicted by the regression model ( $R = 0.45$ ,  $R^2 = 0.20$ , adjusted  $R^2 = 0.19$ ,  $F(14,412) = 21.39$ ,  $P < 0.01$ ). Significant coefficients were: liking ( $B = 0.675$ ,  $P < 0.01$ ), awareness ( $B = 0.281$ ,  $P < 0.01$ ) and willingness to change ( $B = 0.197$ ,  $P < 0.01$ ), where greater *f + v* consumption was associated with greater liking of *f + v*, greater awareness of recommendations and greater willingness to change for a number of reasons. Gender, however, was also significant suggesting differences between males and females. Coefficients for all variables in the regression model are given in Table 2.

To investigate effects of gender, analyses were repeated on males and females separately. For females ( $n = 267$ ),

**Table 1** Factors elucidated in the principal component analysis from the twenty-two closed-response questions

Factor	Items	Loading
Willingness to change ( $\alpha = 0.859$ )	I would consider cutting out foods I normally eat in order to eat more fruit and/or vegetables	0.548
	I would eat more <i>f + v</i> in order to help control my weight	0.328
	I would eat more <i>f + v</i> in order to help improve my health	0.836
	I would eat more <i>f + v</i> in order to protect myself against poor health	0.861
	I would eat more <i>f + v</i> in order to increase the number of nutrients I eat	0.913
	I would eat more <i>f + v</i> in order to increase the number of vitamins and minerals I eat	0.909
Liking ( $\alpha = 0.677$ )	I enjoy eating <i>f + v</i>	0.692
	I like the taste of <i>f + v</i>	0.719
	I find <i>f + v</i> tasteless and dull to eat	-0.493
	I eat enough <i>f + v</i> for my health	0.570
	I eat the recommended amount of fruit and/or vegetables for my health	0.575
Ease ( $\alpha = 0.433$ )	I find <i>f + v</i> easy to store so that they keep well at home	0.354
	I find <i>f + v</i> easy to prepare and cook for eating	0.302
	I find <i>f + v</i> easy to chew and digest	0.379
	The shop where I usually buy food has a wide choice of <i>f + v</i>	0.352
Difficulties ( $\alpha = 0.539$ )	Buying more <i>f + v</i> than I already do would be difficult for me due to the cost	0.496
	Buying more <i>f + v</i> than I already do would be difficult for me due to the effort in getting them home	0.412
	Buying more <i>f + v</i> than I already do would be difficult for me due to the effort in preparing them	0.358
	Buying more <i>f + v</i> than I already do would be difficult for me due to the limited choice in the shop	0.362
	I can afford the fruit and/or vegetables at the shop where I usually buy my food	-0.351
Awareness	I am satisfied with the choice of fruit and/or vegetables at the shop where I usually buy my food	-0.584
	I am aware of current government recommendations to eat 5+ portions of <i>f + v</i> per day	0.655

*f + v*, fruits and vegetables.

**Table 2** Coefficients for all variables predicting fruits and vegetables intake for the whole sample

Variable	<i>B</i>	$\beta$	<i>T</i>	Sig
<b>Willingness to change</b>	<b>0.184</b>	<b>0.126</b>	<b>2.74</b>	<b>&lt;0.01</b>
<b>Liking</b>	<b>0.712</b>	<b>0.345</b>	<b>7.59</b>	<b>&lt;0.01</b>
Ease	-0.083	-0.030	0.64	0.52
Difficulties	0.222	0.057	1.22	0.22
<b>Awareness</b>	<b>0.240</b>	<b>0.235</b>	<b>5.12</b>	<b>&lt;0.01</b>
<b>Gender</b>	<b>0.384</b>	<b>0.143</b>	<b>2.87</b>	<b>&lt;0.01</b>
Age	-0.009	-0.050	0.97	0.34
Living status	0.036	0.014	0.25	0.81
Region	0.003	0.003	0.08	0.94
Deprivation score	-0.008	-0.077	1.76	0.08
Distance to the shops	-0.002	-0.008	0.19	0.85
Help with shopping	0.001	0.079	1.34	0.18
Help with cooking	0.000	-0.089	1.44	0.15
Food delivered	-0.001	-0.038	0.84	0.40
Food eaten out	0.002	0.056	1.28	0.20

Significant coefficients in bold ( $P < 0.05$ ).

f + v consumption was predicted by the regression model:  $R = 0.53$ ,  $R^2 = 0.28$ , adjusted  $R^2 = 0.24$ ,  $F(14,262) = 6.89$ ,  $P < 0.01$ , where greater f + v consumption was again associated with a greater liking ( $B = 0.771$ ,  $\beta = 0.397$ ,  $P < 0.01$ ), greater awareness of current recommendations ( $B = 0.316$ ,  $\beta = 0.289$ ,  $P < 0.01$ ) and greater willingness to change ( $B = 0.318$ ,  $\beta = 0.229$ ,  $P < 0.01$ ). For males ( $n = 159$ ), f + v consumption was again predicted by the regression model:  $R = 0.47$ ,  $R^2 = 0.22$ , adjusted  $R^2 = 0.14$ ,  $F(14,155) = 2.79$ ,  $P < 0.01$ , where greater f + v consumption was significantly associated with greater liking ( $B = 0.668$ ,  $\beta = 0.305$ ,  $P < 0.01$ ) and greater awareness ( $B = 0.167$ ,  $\beta = 0.180$ ,  $P = 0.04$ ). Willingness to change was not significant for males ( $B = -0.048$ ,  $\beta = -0.032$ ,  $P = 0.71$ ).

*Those currently of low fruit and vegetable consumption.* Of 426 individuals, only 151 participants reported consuming a mean of five or more portions of f + v per day, 275 participants were consuming less f + v than currently recommended for health. For those consuming less than five portions of f + v per day, 131 (48%) individuals reported that they were willing to change their eating habits to include more f + v and 131 (48%) reported that they would not be willing to do so; 242 (88%) individuals reported that they liked f + v and twenty-eight (10%) individuals reported that they did not like f + v; 270 (98%) people found f + v easy to consume and four (1.5%) people reported that they did not find f + v easy to consume; three (1%) people reported that they found it difficult to consume f + v and 270 (98%) people did not find it difficult; and 205 individuals (75%) knew about the guidelines, while sixty-one (22%) people did not. For these individuals, portions of f + v consumed were again significantly predicted by the regression model ( $R = 0.41$ ,  $R^2 = 0.17$ , adjusted  $R^2 = 0.12$ ,  $F(15,268) = 3.42$ ,  $P < 0.01$ ), and significant associations were again found for liking ( $B = 0.410$ ,  $\beta = 0.316$ ,  $P < 0.01$ ) and awareness ( $B = 0.088$ ,  $\beta = 0.153$ ,  $P < 0.01$ ).

*Those most at risk of low fruit and vegetable consumption.* Low f + v intakes have also previously been found for males, older older people and those living in most deprived areas<sup>(10)</sup>. Analyses for males have already been provided, as above. For people aged 80 years or above ( $n = 94$ ), portions of f + v consumed were again significantly predicted by the regression model ( $R = 0.58$ ,  $R^2 = 0.34$ , adjusted  $R^2 = 0.22$ ,  $F(14,89) = 2.74$ ,  $P < 0.01$ ), and significant associations were again found for liking ( $B = 0.519$ ,  $\beta = 0.278$ ,  $P < 0.01$ ) and awareness ( $B = 0.218$ ,  $\beta = 0.294$ ,  $P < 0.01$ ). For people living in the most deprived quartile ( $n = 98$ ), portions of f + v consumed were again significantly predicted by the regression model ( $R = 0.52$ ,  $R^2 = 0.27$ , adjusted  $R^2 = 0.15$ ,  $F(14,97) = 2.23$ ,  $P = 0.01$ ), where greater f + v intakes were significantly associated only with liking ( $B = 0.570$ ,  $\beta = 0.259$ ,  $P < 0.01$ ).

#### Open-response question

A number of reasons were given for not eating more f + v than currently. These were classified as:

- Already eat enough, for example, 'I couldn't eat any more', provided by 35% of the sample;
- Medical reasons, for example, 'I'm on dialysis – I have to be careful what I eat', provided by 12% of the sample;
- Effort involved in preparing/eating, for example, 'laziness', provided by 7% of the sample;
- Not in the habit of eating f + v, for example, 'I hadn't been accustomed to eating f + v as a child', provided by 4% of the sample;
- Small appetite, for example, 'can't eat so much', provided by 3% of the sample;
- Not liking f + v, for example, 'I hate fruit', provided by 3% of the sample;
- Choose not to eat, for example, 'I have a sweet tooth – I eat sweets when I should be eating f + v', provided by 2% of the sample;
- Lack of control of intake, for example, 'home help just puts in front of me what I eat and that's it', provided by 2% of the sample;
- Age, for example, 'I'm 85 – not important at my age', provided by 1% of the sample;
- Lack of supply, for example, 'not good quality, not fresh by the time they reach Northern Ireland', provided by 0.5% of the sample;
- Price, for example, 'too dear', provided by 0.5% of the sample;
- No reason, provided by 32% of the sample.

The percentage of individuals reporting each reason in the whole sample, in those consuming less than five portions of f + v per day, in males, older older people and in those living in most deprived areas did not differ (largest  $\chi^2 = 0.70$ ,  $P > 0.05$ ).

## Discussion

### **Barriers to increasing consumption: closed-response questions**

These results first reveal significant associations between  $f+v$  consumption and various barriers to increasing consumption, where greater  $f+v$  consumption was associated with greater liking for  $f+v$  and a greater awareness of current recommendations for  $f+v$  consumption. These patterns were also seen in various groups at risk of low  $f+v$  intakes, although awareness of current recommendations was not associated with  $f+v$  consumption in those living in most deprived areas. Willingness to change for a number of reasons was also associated with increased  $f+v$  consumption in females.

Liking has been found to be a significant predictor of  $f+v$  consumption elsewhere<sup>(7,19,21–23)</sup>, and previous work on the general diet suggests that liking can be one of the strongest predictors of food choice<sup>(23–25)</sup>. The findings here suggest that increasing liking for  $f+v$  and  $f+v$  dishes may increase  $f+v$  consumption, and that interventions aiming to increase liking for  $f+v$  may be particularly beneficial for this population. These interventions may increase exposure to different more liked  $f+v$  or  $f+v$  products and dishes or may use processes found to increase food likings as a result of repeated exposure to and repeated positive experience of different  $f+v$  and  $f+v$  products and dishes<sup>(26–28)</sup>. Interventions that involve tasting  $f+v$  and  $f+v$  products and interventions that involve different recipes and methods of cooking are typically well received<sup>(19,22,29)</sup>, and have previously been found to result in improvements in  $f+v$  consumption<sup>(19,26,29)</sup>.

Associations between  $f+v$  consumption and an awareness or knowledge of current recommendations and the reasons for those recommendations have also previously been found elsewhere. Knowledge of current recommendations for intake and awareness of diseases related to  $f+v$  consumption were strong predictors of  $f+v$  intake in a UK sample of older adults<sup>(7)</sup>, attention paid towards keeping a healthy diet was a strong predictor of  $f+v$  intake in a sample of Norwegian participants<sup>(30)</sup> and high intention and attitude scores reflecting knowledge were reported by the highest third of  $f+v$  consumers in a Scottish sample<sup>(4)</sup>. Education has also been found previously to be a strong predictor of  $f+v$  intake<sup>(11,31)</sup>. These findings suggest that  $f+v$  intake may be improved in the older population, by increasing awareness of current recommendations and increasing knowledge of the benefits of  $f+v$  consumption, and interventions that have aimed specifically to improve nutrition education have been found to result in improvements in  $f+v$  intakes<sup>(32)</sup>. Previous work in this area however, highlights the complexities of the information that may be most suitable for different groups<sup>(33)</sup>. Work in older people, for example, has specified a need

for information specifically on portion size<sup>(14,33)</sup>, what is counted as  $f+v$ <sup>(6,20)</sup>, and the need for variety<sup>(34)</sup>. Further research on current understanding of recommendations would clearly be of benefit.

A willingness to change has also previously been associated with increased  $f+v$  consumption, particularly in women<sup>(5,33)</sup>. In two qualitative studies, Devine *et al.*<sup>(21)</sup> and Dye and Cason<sup>(22)</sup> also report discussion of the importance of wanting to change and the benefits of medical advice and social support to aid dietary changes. Interventions focusing specifically on individuals who are ready and willing to change also typically demonstrate greater success compared to interventions that are more general<sup>(29,35,36)</sup>. The findings of the present study suggest that  $f+v$  intake may be improved in the older female population by increasing willingness to change. Strategies previously suggested to increase willingness to change include thinking about the benefits of consuming more  $f+v$ ; providing rewards for eating  $f+v$ ; accepting or seeking help from people who promote eating  $f+v$  or avoiding people who discourage that behaviour; substituting other foods for  $f+v$ ; or planning ahead, as examples<sup>(34,36,37)</sup>. Importantly, however, willingness to change was not found to be important here for males, for those currently consuming less than five portions of  $f+v$  per day or for those most at risk of low consumption (males, older older people and those living in more deprived areas). These findings suggest that strategies to increase willingness to change may be of limited value, particularly for those who most need to change.

Ease of consumption of  $f+v$  and difficulties associated with consumption such as cost and availability were not found to be associated with  $f+v$  intakes in this sample, and levels of ease were found to be high and levels of difficulties were found to be very low. These findings suggest that strategies to improve  $f+v$  consumption that solely or predominantly target the environmental characteristics of food consumption may be unlikely to have significant impact. Other studies have drawn similar conclusions<sup>(19,33,38)</sup> and some interventions that have targeted the environmental characteristics of  $f+v$  consumption have had limited impact<sup>(38)</sup>.

The lack of significant effects as a result of demographic or lifestyle variables (with the exception of effects of gender in the analysis of the whole sample) suggest that these variables are of little impact on barriers affecting  $f+v$  consumption in this particular sample. The absence of effects of demographics may seem surprising given previous suggestions that interventions should target certain demographic groups<sup>(10,11)</sup>, but these suggestions are typically based on  $f+v$  consumption levels as opposed to the reasons for that low consumption. The absence of effects of lifestyle variables is also possibly surprising, but these lifestyle variables were also not found to have effects on  $f+v$  intakes in NI<sup>(10)</sup>. The absence of effects of demographic and lifestyle variables

suggests that all individuals within the population may benefit equally from interventions aiming to increase  $f + v$  consumption.

### **Barriers to increasing consumption: open-ended question**

Similar barriers were also gained from analysis of the open-ended question – ‘Are there any reasons why you do not eat more  $f + v$  than you currently do?’. The most common response to this question suggested that individuals do not consume more  $f + v$  than they currently do because they consume enough  $f + v$  already. Investigation of actual  $f + v$  consumption in all individuals providing this response, however, reveals consumption levels as low as two portions of  $f + v$  per day. These responses highlight a need for knowledge of current recommendations but may also suggest a need for awareness of the specifics of those recommendations, such as the nature of a portion or the need for five different  $f + v$ , as already discussed. This response may also suggest a need for an awareness of current inadequate levels of consumption. It has been suggested elsewhere that the majority of individuals are unaware that their current  $f + v$  intake is low, despite knowledge of recommendations, and that current levels of inadequate consumption should be emphasised<sup>(4,5,35,39,40)</sup>. Individuals may also be unaware of the recommendations as a minimum as opposed to a maximum, and may benefit from awareness of the increasing benefits of increasing consumption.

The second most common response to the open-ended question was that individuals could provide no reason why they were not consuming more  $f + v$ . These individuals were presumably unwilling and unused to thinking about  $f + v$  intakes, and again may benefit from knowledge and awareness of the benefits of consuming more  $f + v$ , and knowledge and awareness of current inadequate consumption levels.

The third most commonly provided response, that individuals could not eat more  $f + v$  than they currently do for medical reasons, also suggested an absence of knowledge or awareness of the benefits of  $f + v$  for health and well-being. This response, however, may also represent a misunderstanding or misrepresentation of medical advice. Medical reasons may also provide a convenient answer or a convenient excuse for not consuming  $f + v$ , again suggesting a possible unwillingness to think about  $f + v$  intakes or an unwillingness to think about changing those intakes.

A number of other responses to the open-ended question also suggested an unwillingness to think about  $f + v$  consumption or an unwillingness to change – ‘I’m not in the habit of eating  $f + v$ ’, ‘I only have a small appetite’, ‘It’s my choice’, and ‘I’m too old to start eating  $f + v$ ’, responses classified as ‘not in the habit’, ‘small appetite’, ‘choose not to eat’ and ‘age’. These individuals

may benefit from increased knowledge or awareness, or any of the strategies provided to increase willingness to change. Individuals providing an ‘age’ response may benefit particularly from an increased awareness of the benefits of  $f + v$  for quality of life as well as for physical health<sup>(1)</sup> and that benefits have been found even when behavioural changes are initiated in old age<sup>(34)</sup>. Individuals providing a ‘small appetite’ response may also benefit particularly from an increased awareness of ways in which  $f + v$  can replace other foods. It has previously been suggested that ‘eating more’ or ‘buying more’ may constitute a psychological barrier compared to replacement<sup>(33,38)</sup>.

Not liking  $f + v$  was a reason for not consuming more  $f + v$  than currently for only a small proportion of the sample. The greater importance of liking in the closed-response items may be a result of the range of liking for  $f + v$  in this population.

The remaining reasons for not consuming more  $f + v$  than currently can all be classed as environmental. These included effort in purchasing and preparing  $f + v$ , lack of supply, price and a lack of control over intake. The lesser importance of environmental concerns in the closed-response items is likely to have resulted from the small number of individuals reporting environmental difficulties. Ten per cent of individuals, however, provided one of these concerns in response to the open-ended question. It is feasible that these factors are of concern for these individuals and that interventions that target these concerns may benefit these particular individuals<sup>(5,11,19,22,35)</sup>. Discrepancies between the questionnaire and open-ended responses, however, may be a result of common perceptions of  $f + v$  as expensive and requiring effort to eat due to a need for cooking<sup>(35,38)</sup>, and the use of these common perceptions as easy answers or easy excuses for a lack of consumption<sup>(38)</sup>. One study, for example, found that increases in income did not lead to an increased consumption of  $f + v$  and does not necessarily lead to increases in expenditure on food<sup>(41)</sup>. Donkin *et al.*<sup>(11)</sup> also found lower consumption of  $f + v$  by single men than single women, despite a higher income. The use of easy answers or easy excuses may again demonstrate an unwillingness to think about dietary practices in these consumers.

Small discrepancies between the results of the closed-response items and the results of the open-ended question demonstrate the value of the open-ended question, as it would appear that not all potential reasons for not increasing  $f + v$  intake were covered by the closed-response items. The reliability of the results from the closed-response items may also be questioned given the moderate Cronbach’s alpha scores for some of the scales. The breadth of responses to the open-ended question and questionable validity of some of these responses, however, also highlight the different responses obtained from direct and indirect questioning and the potential problems when using only direct questions<sup>(42)</sup>. Given some of the responses to the open-ended question, it may

also have been of value to add a question asking if anything could be done to encourage individuals to replace some of the foods they currently consume with f + v. Similar patterns of responses to the open-ended question in the whole sample, in those consuming less than five portions of f + v per day and in the various demographic groups again suggest that interventions to aid the general population will again also be applicable to specific groups and vice versa.

## Conclusions

In conclusion, the findings of the present study suggest that interventions aiming to increase f + v intakes in the older population of NI should focus predominantly on improving awareness and experience of different f + v and f + v products and dishes, which may increase liking, and improving knowledge and awareness of current recommendations, of the benefits of consuming f + v, and of current inadequate levels of consumption.

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## References

1. World Health Organization (1990) *Diet, Nutrition and the Prevention of Chronic Diseases*. WHO Technical Report Series no. 797. Geneva: WHO.
2. Finch S, Doyle W, Lowe C *et al.* (1998) *National Diet and Nutrition Survey: People aged 65 years and over*, vol. 1. London: Stationary Office: HMSO.
3. Bates CJ, Cole TJ, Mansoor MA *et al.* (2001) Geographical variations in nutrition-related risk factors in the UK: National Diet and Nutrition Survey of people aged 65 years and over. *J Nutr Health Aging* **5**, 220–225.
4. Cox DN, Anderson AS, Lean MEJ *et al.* (1998) UK consumer attitudes, beliefs and barriers to increasing fruit and vegetable consumption. *Public Health Nutr* **1**, 61–68.
5. Anderson AS, Cox DJ, McKellar S *et al.* (1998) Take Five, a nutrition education intervention to increase fruit and vegetable intakes: impact on attitudes toward dietary change. *Br J Nutr* **80**, 133–140.
6. John JH & Ziebland S (2004) Reported barriers to eating more fruit and vegetable before and after participation in a randomized controlled trial: a qualitative study. *Health Educ Res* **19**, 165–174.
7. Baker A & Wardle J (2003) Sex differences in fruit and vegetable intake in older people. *Appetite* **40**, 269–275.
8. Daly M (2004) Family relations and social networks in Northern Ireland. In *Social Attitudes in Northern Ireland*, pp. 53–66 [K Lloyd, P Devine, AM Gray *et al.*, editors]. London: Verso.
9. Safefood (2007) A consumer focussed review of the fruit and vegetable food chain. <http://www.safefood.eu> (accessed October 2008).
10. Appleton KM, McGill R, Woodside JV. Fruit and vegetable consumption in older people in Northern Ireland: levels and patterns. *Br J Nutr* **102**, 949–953.
11. Donkin AJM, Johnson AE, Lilley JM *et al.* (1998) Gender and living alone as determinants of fruit and vegetable consumption among the elderly living at home in urban Nottingham. *Appetite* **30**, 39–51.
12. Strain JJ, Elwood PC, Davis A *et al.* (2000) Frequency of fruit and vegetable consumption and blood antioxidants in the Caerphilly cohort of older men. *Eur J Clin Nutr* **54**, 828–833.
13. Department of Health (2003) Examples of portion sizes of everyday fruit and vegetable. <http://www.dh.gov.uk/assetRoot/04/06/99/23/04069923.PDF> (accessed July 2006).
14. Dixon H, Mullins R, Wakefield M *et al.* (2004) Encouraging the consumption of fruit and vegetable by older Australians: an experiential study. *J Nutr Educ Behav* **36**, 245–249.
15. Bingham SA (1987) The dietary assessment of individuals: methods, accuracy, new techniques and recommendation. *Nutr Abstr Rev (Series A)* **57**, 705–737.
16. Bingham SA, Gill C, Welch A *et al.* (1994) Comparison of dietary assessment methods in nutritional epidemiology: weighed records v. 24 h recalls, food-frequency questionnaires and estimated-diet records. *Br J Nutr* **72**, 619–643.
17. Department for the Environment, Transport and the Regions (2000) *Indices of Deprivation 2000. Regeneration Research Summary* no. 31. HMSO: London.
18. Friel S, Newell J & Kelleher C (2005) Who eats four or more servings of fruit and vegetable per day? Multivariate classification tree analysis of data from the 1998 Survey of Lifestyle, Attitudes and Nutrition in the Republic of Ireland. *Public Health Nutr* **8**, 159–169.
19. Lancaster KJ (2004) Characteristics influencing daily consumption of fruit and vegetable and low-fat dairy products in older adults with hypertension. *J Nutr Elder* **23**, 21–33.
20. Sayhoun NR, Zhang XL & Serdula MK (2005) Barriers to the consumption of fruit and vegetable among older adults. *J Nutr Elder* **24**, 5–21.
21. Devine CM, Connors M, Bisogni CA *et al.* (1998) Life-course influences on fruit and vegetable trajectories: qualitative analysis of food choices. *J Nutr Educ* **30**, 361–370.
22. Dye CJ & Cason KL (2005) Perceptions of older, low-income women about increasing intake of f + v. *J Nutr Elder* **25**, 21–41.
23. Gibson EL, Wardle J & Watts CJ (1998) Fruit and vegetable consumption, nutritional knowledge and beliefs in mothers and children. *Appetite* **31**, 205–228.
24. Costa AIA, Schoolmeester D, Dekker M *et al.* (2007) To cook or not to cook: a means-end study of motives for choice of meal solutions. *Food Qual Prefer* **18**, 77–88.
25. Steptoe A, Pollard TM & Wardle J (1995) Development of a measure of the motives underlying the selection of food: The Food Choice Questionnaire. *Appetite* **25**, 267–284.
26. Gibson EL & Wardle J (2001) Effects of contingent hunger state on development of appetite for a novel fruit snack. *Appetite* **37**, 91–101.

27. Appleton KM, Gentry RC & Shepherd R (2006) Evidence of a role for conditioning in the development of liking for flavours in humans in everyday life. *Physiol Behav* **87**, 478–486.
28. Pliner P & Stallberg-White C (2000) 'Pass the ketchup, please': familiar flavours increase children's willingness to taste novel foods. *Appetite* **34**, 95–103.
29. Anderson AS (2007) Nutrition interventions in women in low-income groups in the UK. *Proc Nutr Soc* **66**, 25–32.
30. Johansson L, Thelle DS, Solvoll K *et al.* (1999) Healthy dietary habits in relation to social determinants and lifestyle factors. *Br J Nutr* **81**, 211–220.
31. Gregory-Mercado KY, Staten LK, Ranger-Moore J *et al.* (2006) Fruit and vegetable consumption of older Mexican-American women is associated with their acculturation level. *Ethn Dis* **16**, 89–95.
32. Arnold CG & Sobal J (2000) Food practices and nutrition knowledge after graduation from the Expanded Food and Nutrition Education Program (EFNEP). *J Nutr Educ* **32**, 130–138.
33. Dibsall LA, Lambert N & Frewer LJ (2002) Using interpretative phenomenology to understand the food-related experiences and beliefs of a select group of low-income UK women. *J Nutr Educ Behav* **34**, 298–309.
34. Clark PG, Nigg CR, Greene G *et al.*, SENIOR Project Team (2002) The Study of Exercise and Nutrition in Older Rhode Islanders (SENIOR): translating theory into research. *Health Educ Res* **17**, 552–561.
35. Cox DN, Anderson AS, Reynolds J *et al.* (1998) Take Five, a nutrition education intervention to increase fruit and vegetable intakes: impact on consumer choice and nutrient intakes. *Br J Nutr* **80**, 123–131.
36. Greene GW, Fey-Yensan N, Padula C *et al.* (2008) Change in fruit and vegetable intake over 24 months on older adults: results of the SENIOR Project intervention. *Gerontologist* **48**, 378–387.
37. Greene GW, Fey-Yensan N, Padula C *et al.* (2004) Differences in psychosocial variables by stage of change for fruit and vegetable in older adults. *J Am Diet Assoc* **104**, 1236–1243.
38. Dibsall LA, Lambert N, Bobbin RF *et al.* (2003) Low-income consumers' attitudes and behaviour towards access, availability and motivation to eat fruit and vegetables. *Public Health Nutr* **6**, 159–168.
39. Lechner L & Brug J (1997) Consumption of fruit and vegetable: how to motivate the population to change their behaviour. *Cancer Lett* **114**, 335–336.
40. Oenema A, Brug J & Lechner L (2001) Web-based tailored nutrition education: results of a randomized controlled trial. *Health Educ Res* **16**, 647–660.
41. Shepherd R, Paisley CM, Sparks P *et al.* (1996) Constraints on dietary choice: the role of income. *Nutr Food Sci* **5**, 19–21.
42. Coolican H (1990) *Research Methods and Statistics in Psychology*. London: Hodder & Stoughton.